



BeVoting

Study of Electronic Voting Systems

Part I of the “Studie Geautomatiseerde Stemming Def. Vs 18122006”

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1 Executive Summary

1.1 Scope of the Study

The Federal and Regional Administrations have requested an independent comparative study of the election systems used abroad, and to determine the requirements for the voting systems that will be used in Belgium for the elections of 2009 and later. The independent study is executed by a Study Consortium that consists of the following universities: Katholieke Universiteit Leuven, Universiteit Antwerpen, Universiteit Gent, Université Catholique de Louvain, Université de Liège, Université Libre de Bruxelles and Vrije Universiteit Brussel.

The Study consists of two parts. The goal of the first part is to derive the current state of the art of electronic and Internet voting systems in all their aspects. The state of the art is summarized in a table enumerating the system used per country, the number of eligible voters, the electoral system, their pros and cons, and the system costs. The first part also evaluates all aspects of the Belgian electoral system, including optical reading of voting ballots, partial electronic voting, and the traditional voting system.

The goal of the second part of the Study is to propose the technical and specific requirements; the level of detail need to be such that to the report can serve as a technical appendix to the *cahier des charges* for the voting system for the elections of 2009 and later. The system specified in the second part of the Study needs to be compatible with the Belgian and Regional electoral systems.

The report of the first part of the Study was formally delivered to the Administrations on 15 April 2007. The report of the second part is scheduled for 1 September 2007.

1.2 Five Study Aspects

Five chapters deal with the following aspects of eVoting systems. The chapters 3 to 7 respectively cover the political and societal aspects; the usability and accessibility aspects; the technical aspects; the legal aspects; and the organizational aspects of eVoting systems.

The Vrije Universiteit Brussel has coordinated chapter 3 and the Université Catholique de Louvain has coordinated chapter 7. The other chapters have been coordinated by the Katholieke Universiteit Leuven.

1.3 Summary

Voting on paper is very familiar to all countries, but it makes the counting of the votes a time-consuming and cumbersome activity. Ballot papers have to be transported to counting centers, and then sorted manually. For easier electoral systems (such as the single member plurality vote) this might not be too important, but for more complex electoral systems (such as preference voting or single transferable vote) the replacement of the manual counting by a counting of the digital carriers of the votes is a clear improvement. Although there is no objective reason to be extremely fast – subsequent government formation can take weeks or months – the speed of counting the votes is what drives the electronic voting mechanisms. Results can be provided a short time after

closing of the polling stations, since sorting out the votes on paper requires a lot of human activities, the chances for mistakes are quite high. If votes are registered on an electronic carrier and then counted electronically, the procedure ideally becomes less error prone. In the more complex electoral systems, voters can make mistakes. They can cast a vote that is not valid and that can therefore not be counted. By using a voting application, the voter is guided through the necessary steps for voting, which avoids invalid votes. While turnout does not significantly increase with electronic voting systems in countries where voting is not mandatory, the number of invalid votes clearly and obviously drops with the introduction of electronic voting.

According to the definition provided by the Recommendation of the Committee of Ministers to member states on legal, operational and technical standards for eVoting of 30 September 2004, electronic voting refers to elections or referendums that involve the use of electronic means in at least the casting of the vote. It thus does not only refer to Internet voting but also to the use of electronic voting machines, the so-called kiosk voting. In both cases, the voter has to cast his vote electronically either by using an electronic ballot box or by casting his vote over the Internet. It should be noted that Internet voting includes two different modalities. Internet voting can be conceived as a remote voting system where the voter casts his vote outside the polling station. This system has been implemented in Estonia and is being tested in Switzerland, The Netherlands and France. These countries usually acknowledge Internet voting to postal voting. The other modality consists of allowing voters to cast their votes using an Internet voting system that can only be used from specific access points installed at polling stations. It raises similar concerns as kiosk voting largely implemented in countries such as Belgium, The Netherlands, Germany, the United States, to less extent in France, and under testing in Ireland.

eVoting is usually argued to reduce the costs of elections, to give more accurate results, to eliminate spoiled votes, to speed up the count procedure, to modernize the electoral system, to allow for a longer time period during which the voters have the chance to cast their vote, and to improve the voters' turnout. However, the use of new technologies in the democratic voting process at public elections should not lower the safeguards surrounding the election's procedure, condition of their legitimacy. These mandatory safeguards set up two main principles: non-discrimination and respect of democratic elections. This means that all voters should be treated equally, i.e., they should have the same opportunities to cast their vote, they should be free to vote, without undue influence or coercion of any kind, the vote cast should remain secret, i.e., voters should be able to cast their vote in secrecy and once cast the link between the voter and the vote should be cut, one person should only be able to cast one vote, the ballot box should reliably and securely represent the voter's preference. Finally, the whole voting process should be transparent, i.e., verifiable and open to independent audits.

The possibility of using electronic voting machines is not new and several legal systems have gradually opted for implementing them in an increased number of municipalities (Belgium, the United States, the Netherlands, and Germany). These countries have acquired a valuable experience in eVoting.

At the core of the debates about the legitimacy and acceptance of electronic voting is the problem of transparency. Lack of trust is the result of citizens – or elites of citizen movements – not understanding how exactly the electronic voting system works. After

having been cast, the vote is injected into the system and is processed in a way that cannot easily be understood by all citizens. Tight regulations have been enacted to give confidence to voters in the system guaranteeing that these machines respect the fundamental principle of voting elections. However, these countries are facing substantial opposition from some members of civil society as regards the transparency and security of such processes. Their use has been for instance challenged to German Court, the plaintiffs missing the transparency of the storage of the votes in the machine and of the possibility to have a recount because the certified Nedap machines do not have a paper trail. Moreover, in 2006 Dutch researchers have detected a series of flaws in Nedap/Groenendaal ES3B voting machines used in France, Germany and by the Netherlands. In this sense, in Belgium, voting machines used in the municipality of Schaerbeek for the elections of June 2003 counted 4096 votes more than the total number of registered voters. These experiences have put at stake the claimed trustworthiness of such machines.

As for all computer (and certainly Internet) applications, some citizens are better equipped than others. If Internet voting is available from home, it favors those having a connected computer at home. Some people can for instance cast their vote at their convenience, while others cannot. The digital divide is also impossible to avoid fully when using computers for registering the vote. Some voters are more familiar with these machines than others. Nevertheless, during the last few years, electronic voting mechanisms are being implemented in several countries as an alternative means to the traditional voting procedure. Estonia has permanently introduced remote Internet voting into its electoral system based on the national eID as means of authentication and on the secure on-line banking system to ensure the required security. The first national elections allowing Internet voting took place in March 2007 without any remarkable incident. Some experiences have also been carried out in Switzerland, The Netherlands and in France to develop reliable Internet voting procedures. All these efforts intend to raise the voters' turnout and are normally enshrined into the legislation as a new form of postal voting. The Estonian case is somehow particular as Internet voting is introduced as an alternative advanced voting means with the possibility to change the vote cast by Internet as many times as desired and even to cast the vote traditionally. The last vote cast is the one which will be taken into account. The possibility of changing one's vote has been considered as a prerequisite of Internet voting in order to guarantee the freedom of the vote, and as a mechanism to allow for more reflection and thus for a wiser decision. Rather than having to make the one and final choice during the short moment of presence in the voting booth, the voters receive more time to think and evaluate the meaning and effects of their vote. In some cases the system is set up in a way that allows indeed for changing one's mind several times before 'closing time'. Using the Internet can indeed enhance the quality of the vote. The Internet is today a valuable source of information. Getting online for casting a vote might be an incentive to go and look first for the available information online. Parties and candidates do indeed use the Internet as a means to present themselves to the voter. In many countries interactive devices are available with which the voters can position themselves in the party-political offer (Stemwijzer, Stemtest, Stemadvies...).

In 2004, the Council of Europe has approved the first international set of standards for eEnabled voting. The legal standards are intended to apply the principles of the existing Council of Europe and other international instruments in the field of elections to the

circumstances of eEnabled voting. The Recommendation on legal, operational and technical standards for eVoting states that “the right to vote is one of the primary foundations of democracy, and that, consequently, eVoting systems procedures shall comply with the principles of democratic elections and referendums”. Countries willing to implement eVoting procedure have now a frame of reference to adapt their legislations.

As mentioned above, eVoting systems should comply with the principles of non-discrimination and of democratic elections.

Although access to the voting process for persons with impairment has been organized and studied intensively over the past, three major issues are nowadays still very much open: in the past the fact that a handicapped voter could be accompanied by a third (non-handicapped) person was seen as sufficient. Nowadays more and more handicapped people want to cast their vote *completely independently*; very little experience with voting machines and even less with Internet voting by handicapped people is available. One will have to rely here on existing and future *computer usability standards* developed by groups such as the World Wide Web consortium, ISO, and ETSI; lastly, voting machines will have to be bought through public tender. The European Commission has given recently a Mandate (#376) to the European standardization bodies (ETSI, CEN & CENELEC) in order to come up with an accessibility requirements list that should be added to all public tender documents. By doing so, accessibility in the future will also become a *tendering criterion* in its own right.

The non-discrimination principle implies that every eligible voter can participate in the election process and nobody can be –directly or indirectly– excluded or discriminated. The electoral procedure should thus ensure that every voter is equally treated and has the same opportunities to cast his vote. In this sense, specific provisions are being introduced in electoral laws to enable disabled, ill and elderly people to cast their votes. Mobile polling stations are usually introduced in order to allow these people to cast their vote. Similar provisions are foreseen for people not able to vote on the Election Day because they will not be present. These provisions can vary from advanced voting procedures to proxy-voting. Internet voting allows voters to cast their votes the days before the Election Day, either by dropping their vote off at designated polling stations, or by post. Proxy-voting consists of giving mandate to another voters registered in the same list to cast one’s vote.

The Council of Europe recommends that eVoting systems should be universally accessible. As mentioned above, remote Internet voting allows the possibility of casting one’s vote from any place provided the voter has a computer and an Internet connection. Internet voting however raises the issue of the digital divide and equal access to the Internet. The Estonian case is illustrative in this sense. The Estonian President refused to sign the Internet voting Act as he argued he would have breached this principle and discriminated voters who do not have access to the secured system used for the elections (i.e., in the Estonian case, to online banking systems). The Estonian National Court has however considered there were no discrimination as the vote could also be cast by alternative forms.

The second principle, the democratic elections principle means that the election process should guarantee a universal, equal, free and secret suffrage. Free suffrage means that the ‘elector has to be able to cast his vote without undue influence or coercion of any kind for

this may distort or inhibit the free expression of his will'. This constitutes one of the most important challenges to Internet voting and perhaps justifies the preference of some countries for electronic voting machines where the traditional safeguards of the electoral process guarantee the free formation of the voter's will, protected by the polling booth. The difficulties raised by this principle can be illustrated by the original decision adopted by the Estonian National Court which considered the possibility to replace eVotes by another eVote or paper ballot as a precondition of constitutionality of eVoting. According to this Court, the right to change the eVote is the only way to guarantee the principle of free voting by remote Internet voting systems.

Finally, due to the technical complexity of electronic voting systems, the free formation and expression of the voter's opinion now imply that the system must make sure that the voter has cast the vote he wanted to cast, avoiding technical mistakes and malicious interventions. The Council of Europe states that eVoting system should be understandable and easily usable. The "Australian ballot" forms the foundation of the pre-printed ballot paper actually used in traditional elections. It has raised the level of knowledge required to cast one's vote when implemented in the nineteenth century. Electronic voting raises the same concern nowadays. The Swiss legislation is in this sense remarkable as it states that the way in which voters are guided through the eVoting process shall prevent them from voting precipitately or without reflection. It further compels the system to guarantee that voters are aware of the fact that casting their vote electronically is a formal act of voting and asks for confirmation before the voter definitively casts his vote.

Secret suffrage is also related to the necessity of guaranteeing the free formation of the voter's will and justify the actual use of polling booths. However, it should be observed not only during the casting of the vote but also after this event and when the vote is transferred and further processed. The identity of the voter should be maintained secret and the votes in the electronic ballot box should remain anonymous, not being possible to reconstruct a link between the vote and the voter. Technical and procedural measures should ensure for one part that the voter is who he claims to be and for the other part to anonymize every vote once they are cast.

eVoting systems should comply with the principle of "one person, one vote", preventing voters to cast their voting ballots through different voting channels but also guaranteeing to voters that their vote correctly reflects their choice and that it will correctly be taken into account. The later has been managed in The Netherlands by the publication of voters who have cast an Internet vote. This system allows the voters to check that their individual vote has been taken into account.

This principle also raises the problem of voters' authentication. In traditional eVoting procedures this exigency is met by the identification of the voter to the chairman either by his physical ID or any other means of proof admitted in Electoral law. The progressive introduction and use of electronic IDs with authentication functions for eAdministration procedure can be part of the solution. Several experiences have been carried out in this sense in Switzerland in the canton of Neuchâtel where a unique website to all eAdministration procedure have been set up, or in France where Issy-les-Moulineaux' citizens have been delivered a Daily Life Card to be used for accessing public services but also to cast their vote electronically.

The correct authentication of eVoters requires a centralized or decentralized voters'

register, in which case, full compliance with data protection legislation is required. This aspect is not taken into account in the Recommendation of the Council of Europe on eVoting but should certainly be mentioned. The case of France is here remarkable as the French data protection authority is playing an important role in the definition of the legal requirements an Internet voting process should meet in order to guarantee the secrecy of the vote and the respect of privacy of the voters.

Another major concern that is typical to Internet voting is the fact that the secrecy of the vote cannot be guaranteed. Having to come to a polling station and receiving the possibility to vote in isolation from all societal pressures is a crucial ingredient of democratic voting. It is obvious that this can easily be violated by the use of distance voting. This is of course valid for all forms of distance voting – like postal voting – and not simply related to the electronic aspect of it. Distance voting should therefore be used as an exception rather than as a rule. The value of the voting procedure may also be devaluated. The ritual act of going out and performing the actions needed for voting – an important act indeed in a democratic system – is replaced by an easy act, resembling other activities (checking your bank account, buying online, participating in online polls...). Therefore the quality of the vote will not be higher. Voting might be more based on the emotion of the moment.

While electronic voting schemes have the inherent potential to be more reliable, one should not underestimate the increased risks for automated attacks at a large scale on the privacy and/or the integrity of the election process. This risk is definitely substantially higher when users vote on their home machine because installing and maintaining complex operating systems in a reliable state is a major challenge; current practice shows regular and spectacular failures (e.g., Trojan horses, viruses, zombie machines). A second problem is that in an electronic system the transparency of the voting process decreases. This calls for strong technical and organizational measures such as (i) publishing the software of the voting kiosks; the incidents in some countries with alleged security problems in electronic voting machines (e.g., USA) demonstrates that this is essential; and (ii) counting systems that are redundant and verifiable and that have distributed control, a property which is much easier to achieve electronically; a stronger form of guarantee would be to put mechanisms in place in which every user can verify that his or her vote has been counted (without undermining the privacy and without allowing for vote selling).

Finally, in a democratic context, an eVoting system should ensure attributes and properties such as transparency, verifiability, security, reliability, accountability, and accuracy. To meet these requirements, strict procedures and a sound eVoting mechanism have to be implemented. This forms the second part of the underlying study.

1.4 Summarizing Major European eVoting Systems

Voting System Property	Belgium	Estonia	Switzerland	Ireland	The Netherlands	France	Germany
Support for Postal Votes	Yes	Yes	Yes	Yes	Yes	?	Yes
Voting Booth Uses Internet Voting System	No	No	No	No	No	No	No
Voting Booth Uses Dedicated Voting Machine	Yes	No	Yes	Yes	Yes	Yes	Yes
Introduction of eVoting	1994	2005	2001	?	1993	?	1999
Name of eVoting System	Digivote & Jites			Nedap	Nedap & SDU	CyberVote	Nedap
Encrypted Ballot	No	Yes	Yes	No	Yes	Yes	No
Paper Trail	No	No	No	No	No	No	No
Ballots Encryption Uses Homomorphic Encryption	No	No	No	No	No	Yes	No
Voter Decryption Keys Destroyed after Tallying	No	Yes	No	No	No	?	No
Voter Signs Encrypted Ballot	No	Yes	No	No	No	Yes	No
Voter Can Vote Multiple Times	No	Yes	No	No	No	No	No
Voter Authenticates the Completed Ballot	No	Yes	No	No	No	Yes	No
eID Card is Used to Authenticate Voter	No	Yes	No	No	No	No	No
Secret Password is Used to Authenticate Voter	No	No	No	No	No	Yes	No
eID Card is Used to Digitally Sign Encrypted Vote	No	Yes	No	No	No	No	No
eID Card is Used to Encrypt a Ballot	No	Yes	No	No	No	No	No
Voter Can Cast his/her Vote in Any Voting Station	No	No	?	?	?	No	?
Voter Can Vote on Paper After Electronic Vote	No	Yes	?	?	No	No	?
Tallying Process processes Unauthenticated Ballots	Yes	Yes	Yes	Yes	Yes	Yes	Yes
System is Adapted to Citizens	Yes	?	Yes	?	Yes	Yes	yes

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Voting System Property	Belgium	Estonia	Switzerland	Ireland	The Netherlands	France	Germany
with Special Needs							
System Was Audited by Independent Auditors	Yes	?	Yes	Yes	?	?	?
Focuses Citizens Living Abroad	No	?	Yes	No	No	No	No
Cost per Postal Vote	1.5€	?	?	?	?	?	?
Cost per eVoting Booth Vote	4.5€	?	?	?	?	?	?
Cost per Optically Read Vote	7.6€						
Cost per Paper Trail Vote	13.6€						
Cost per Internet Vote	-	?	?	?	?	?	?
eVoting System Development Cost	400k€	0.32 M€	1.1 M€	?	?	?	?
Writing eVoting Software	400k€	166,175 EEK	?	?	?	?	?
Acquisition of eVoting Hardware	?	19,800 EEK	?	?	?	?	?
Organization of Election Day	2.5M€	20,450 EEK	?	?	?	?	?
Publicity Campaign	246k€	37,720 EEK	?	?	?	?	?
Salaries	1.5M€	31,960 EEK	?	?	?	?	?
Training eVoting Officials	?	17,900 EEK	?	?	?	?	?
System Audit	520k€	10,870 EEK	?	?	?	?	?
Selected Auditors Can Verify the Voting System	Yes	?	Yes	?	?	?	?
Number of Eligible Voters	7.6M	1M	5.6M	?	?	525K	60.5M
Population	10.5M	1.3M	7M		?	?	?
Internet Penetration	2005: 48%	2006: 52%	?	2005: 50%	2007: 73%	2007: 50%	2006: 61%
Percentage of eVoters	44%	2005: 1.85% 2007: 2%	?	?	?	0.53%	?

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3 Political and Societal Aspect

3.1 Introduction

Electoral systems are never neutral. They have sometimes strong effects on the nature of party competition. High thresholds lead to under representation of smaller parties, and therefore also to more strategic voting and thus replication of an existing party system.

When political elites introduce or change (aspects of) an electoral system, they are always aware of the potential effects of the electoral system. It is generally considered to be part of the struggle for power. Even if it is not necessarily extremely legitimate, the manipulating of electoral systems with party political goals is an accepted strategy.

An electoral law also contains a number of organizational aspects: voting on Sunday or on a weekday, voting on one or during several days, opening hours of the polling stations, territorial spread of the polling stations, postal voting. These aspects do not belong to the core of the electoral system itself, but they do have effects on the voting behavior. Especially voter turnout can be affected (i.e., increased) when thresholds for casting a vote are kept as low as possible.

A second aspect of the organization of the vote is the way in which the voters can express their preference, the way in which the act of voting itself is being organized. This will be the focus of this report. These more technical aspects of the way in which elections are held are however not fully independent from the electoral system. Electing one representative for each constituency requires a registration technique that differs from the one needed to elect larger number of representatives on lists competing with each other. Ordinal voting (ranking candidates or parties) differs from categorical voting (selecting and not ranking). These differences can clearly be seen on the lay-out of the ballot paper.

Registering votes has indeed now a long tradition of being done *on paper*. Voters receive a ballot paper on which they clearly indicate their choice, allowing the ballot papers to be sorted and counted (and if needed recounted).

Modern technology has moved – very slowly though – away from the traditional ballot paper. Newer voting systems however mainly changed the way in which the paper was marked in order to facilitate the counting of the votes. Punch cards are the most obvious example of this.

The most recent developments have introduced computers not only for counting but also for registering the vote. This is what is now being labeled ‘electronic voting’. The result of the vote – the trace left by the voter – is registered and stored on an electronic carrier. The machine can either immediately aggregate these votes or read again the electronic votes and count them. Electronic voting has now further been expanded – though again very slowly and also quite reluctantly – to sending the vote through electronic means of communication. That can be done both on the side of the voter who ‘sends’ his or her vote to a receptor or on the side of the counting where votes – cast in a digital form – are being transferred to another machine in order to be counted.

Voting is a crucial activity in modern parliamentary democracy. The way in which it is organized is therefore a central concern. Changing the way in which the votes are being registered and counted can therefore not be considered a minor or marginal decision. It goes to the heart of modern democracy.

In this report we will describe and compare a number of electronic voting systems. Our main aim is to see which systems have been used and – especially – whether the introduction of these new techniques has led to *discussions about legitimacy* of the electoral process. It goes without saying that technical or financial advantages that might result from alternative voting techniques cannot come with the price of losing legitimacy and trust.

There will be two parts. The first part gives an overview of electronic voting in a number of countries. That list could certainly be longer. Yet we realized soon that the first few cases already gave a good overview of advantages and problems. Adding extra cases would not improve our understanding of what is going on. The first part concludes with a comparative discussion of the elements and arguments discovered in the analysis of these countries.

The second part focuses on Belgium. Belgium has indeed introduced electronic voting in a number of polling stations – covering some 40% of the voters – from 1995 on. Two aspects of this introduction will be discussed. First we look at the effects on the voting behavior. Does electronic voting lead to different results or to different turnout? The fact that not all voters have the chance to vote electronically allows for a nice comparative investigation of this question. The second aspect that we will discuss is the acceptance of the new system by the voters. Both discussions are based on research that was previously done by teams at the VUB and at the ULB.

3.2 Comparing Existing Electronic Voting Systems

3.2.1 Estonia

3.2.1.1 Introduction

Estonia is often referred to as *E-stonia*, since the country has always included the development of e-government into its policy. It was the first country ever to use Internet voting in an election. The Internet is available to over 50% of the Estonian households, 40% of the households have a computer at home, and 81% of home computers are connected to the Internet. Since a large part of the Estonian population lives in urban areas, Internet access is widely available. The government continues to promote the accessibility and use of the Internet in rural areas, through projects like ‘Village road’ (Madise, 2006: 6). The enabling factor in the whole eVoting project is the electronic ID card, which is widely spread: it allows for remote identification and signing of documents, and it plays a critical role in the Internet voting procedure. The aim of this overview is to review the traditional electoral system of the country, and discuss the electronic voting system that is currently being used.

3.2.1.2 Types of Elections

In Estonia, there are five different types of elections:

- 1) Parliamentary elections (every 4 years)
- 2) Local government council elections (every 3 years, since 2005 every 4 years)

- 3) Referendums (1991, 1992, 2003)
- 4) Elections to the European parliament (every 5 years)
- 5) Presidential elections (every 5 years)

In this overview, only the parliamentary elections will be discussed. However, since the local election of 2005 used the same eVoting system that was used in the 2007 parliamentary elections, it will be discussed to illustrate the eVoting system.

3.2.1.3 Electoral System

- Only Estonian citizens who have reached 18 years of age have the right to vote. To stand as a candidate, a minimum age of 21 years is required (ECPRD, 2000).
- The 101 members of the Riigikogu (the Estonian parliament) are elected by proportional representation. In general, the elections are held on the first Sunday of March, in the fourth year after the previous elections – although the president can order extraordinary elections to be held (e.g., in the case of a vote of no confidence).
- In total, there are 12 multi-mandate electoral districts. The number of mandates given to each district is decided by the following formula: the number of voters in each district is divided by 101. Then the number of voters is divided by this result. The obtained number is the number of mandates for that district; the remaining mandates are distributed by the largest-remainder rule. Each electoral district has 6 – 12 mandates.
- A preferential voting system is used; each voter can only vote for one candidate. The number of seats in parliament each party receives is proportional to the number of votes for the candidates of that party. The results are calculated in three rounds. First, a simple quota is established: the number of votes cast divided by the number of mandates. Only candidates who meet this quota are considered elected. This quota is also used in the second round (full procedure can be found on the website of the parliament¹). The remaining seats are divided by a modified d'Hondt system.

3.2.1.4 Logistics of the Vote

- In each of the 12 electoral districts, a regulation of the local municipality or city government decides the rules governing the polling divisions. This includes the boundaries, numeration and location of the polling divisions. The polling divisions are permanent, and must be the same for the parliamentary, local and European elections.
- The elections are organized by electoral committees on three levels: the National electoral committee, the county electoral committees, and the division committees.

¹ <http://www.riigikogu.ee/?id=35308&langchange=1>

- Voters can choose to vote on advance polling days, or on the day of the elections. From the thirteenth to the ninth day before Election Day, voters can vote in a polling division designated by the county electoral committee. From the sixth to the fourth day before the election, voters can vote by electronic means (24 hours a day). This type of voting is performed through the webpage of the National Electoral Committee.
- The votes cast on are counted by the division electoral committees. The votes cast electronically are verified by the National electoral committee.

3.2.1.5 Electronic Voting System

eVoting, in the wider definition recommended by the Council of Europe, is the use of electronic means in one or several means of election procedures. In this sense, eVoting has existed in Estonia for years: the lists of the voters were already processed electronically, and in 1999 the National electoral Committee started using the Internet to transfer data (Madise, 2006: 11). However, since the focus of this overview is the actual *voting*, these developments won't be discussed further.

The possibilities of implementing eVoting have been discussed in Estonia since 2001. The legal framework to enable electronic *voting* was established in 2002. Following this, the National Electoral Committee started working on the eVoting project in the summer of 2003. Contrary to most of the other countries who aimed to introduce eVoting, Estonia opted for voting over the Internet. This makes the eVoting project in Estonia unique, in that it allows for remote voting, and not just voting by electronic means (Maaten, 2004). In 2005, in the local elections, it was possible to vote over the Internet. The system was tested during a pilot in Tallinn in January 2005; a question was asked about the place of the statue of liberty, and voters could issue their vote in regular voting boots, and over the Internet. Despite a low response (only 822 electronic votes were cast, and the number of eVoters was only 703), the conditions for electronic voting were met.

The eVoting system is based on the ID card. Estonia is the first country where such a card is compulsory. It allows for remote identification *and* signing; as of February 2006, more than 65% of the Estonian population holds such a card (Madise, 2006: 8). On the official website², the total number of cards issued to this date exceeds 1 million. The ID card contains two codes:

- PIN1 code, which is used for digital identification of the card-holder
- PIN2 code, which is used for the digital signature

How both codes are used in the eVoting procedure is discussed further. The identification and signing is performed through DigiDoc, which is controlled by AS Sertifitseerimiskeskus³.

The electronic voting procedure is described below (National electoral committee, 2007):

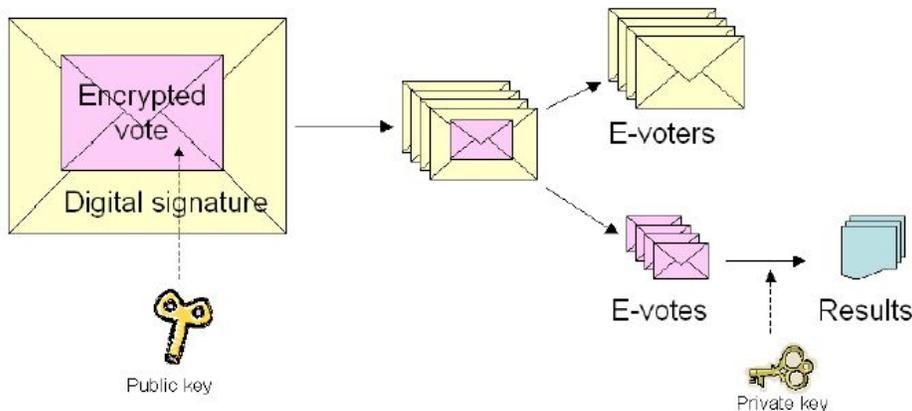
- 6) The voter inserts the ID-card into card reader and opens the webpage for voting (<http://www.valimised.ee>).

² <http://www.id.ee>

³ <http://www.sk.ee/pages.php/0203>

- 7) The voter verifies him/herself using the PIN1 of ID-card.
- 8) The server checks if the voter is eligible (using the data from population register).
- 9) The voter is shown the candidate list of the appropriate electoral district.
- 10) The voter makes his/her voting decision, which is encrypted.
- 11) The voter confirms his/her choice with a digital signature (by entering the PIN2-code).
- 12) At the vote count the voter's digital signature is removed and at the final stage the members of the National Electoral Committee can collegially open the anonymous eVotes and count them.

We do not go into the technical architecture behind the eVoting system, but we will discuss the envelope system, which is important for the legitimacy of the system. It ensures that the votes cannot be linked to the voters, while allowing a voter to change his or her vote electronically. The system is illustrated by the following picture:



The inner envelope contains the vote; the outer envelope contains the digital signature of the voter (which can be used to trace the vote back to the voter). The digital signature is checked to see if the voter was eligible to vote – if so, the vote (inner envelope) is counted, and separated from the signature of the voter. This system ensures that votes are kept separate from voter identification. The actual system is of course more complicated than the above picture, since it has to allow for the cancellation of eVotes, etcetera (National Electoral Committee, 2005). It must be noted though, that there is no paper trail that could serve as a backup: an electronic vote is not registered in print. In several other countries (most notably the Netherlands and Ireland) there has been a lot of protest due to this lack of a paper trail; however in Estonia criticism concerning the lack of a paper trail is virtually non-existent.

The local elections in October 2005 were the first elections where this type of eVoting was used, and the system hasn't been changed since. It was used in the elections in March 2007 as well. However, prior to the 2005 elections, there was some discussion about the security and legitimacy of the system. President Arnold Rüütel opposed the system, on

the grounds that it would create discrimination between the two types of voters (traditional and electronic voters): since the electronic system allows voters to change their vote (to protect against the buying of votes), they have an advantage which is not available when voting the traditional way. However, the Constitutional Court of Estonia decided on 1 September 2005 that the proposed system did not violate the constitution. Following this decision, the President signed the amendment on 5 September 2005 (Breuer & Trechsel, 2006). Other than the presidential opposition, criticism was minimal.

The main reason to introduce eVoting in Estonia was that it could increase voter turnout. The procedure would be quicker and easier, hence people would be more inclined to vote. Especially young voters were thought to be more likely to vote using this system. Other reasons mentioned by the National electoral committee were the fact that Internet voting is an ‘essential convenience in an information society’ (Breuer & Trechsel, 2006).

3.2.1.6 Costs and Benefits of the Electronic Voting System

Since the electronic voting system uses the ID card, which was already being widely distributed, the additional costs of eVoting are fairly limited. The ID card can’t be seen as a cost made purely for the Internet voting system (other services like e-banking make use of the ID card). Voters who wish to use the system use their home computer or a public computer, so these costs have also been avoided. The main cost of the system lies in the creation of a secure website, and the accompanying hardware setup. In comparison to countries like Ireland and the Netherlands, who use specific voting machines, the costs are quite low. It remains to be seen how much eVoting will actually contribute to voter turnout; in the 2005 elections, only 9681 voters used the Internet voting system, which was only about 1,8% of the votes. A survey, held by Trechsel and Breuer, furthermore showed that “*eVoting did not allow for the mobilization of structural abstentionists or rarely participating citizens*” (Trechsel, 2006). However, in the 2007 elections, the share of eVotes has risen to 3% of the vote (ENEC, 2007).

3.2.2 Latvia

3.2.2.1 Electoral System

Latvia has a proportional electoral system. The 100 members of the Saeima, the Latvian Parliament, are elected for 4 years by 5 multi-member constituencies. Latvian voters cast a vote by party list proportional representation (direct, simple majority and preferential vote) and can in addition give a plus sign to candidates on the list or reject them. The legal minimum threshold for a party to gain representation in the parliament is at least 5% of the national vote gain and the allocation of the seats is based on the Saint-Lagüe method.

3.2.2.2 Logistics of the Vote

Latvia has about 1.5 million voters that can participate in the elections. Although there is no compulsory voting, to be entitled to vote, one has to have Latvian citizenship, have

reached the age of 18 years and not been disqualified from the right to vote (legal incapacity, imprisonment). Voters have only one day to cast their vote for the parliamentary elections and this is the first Saturday of October.

3.2.2.3 Electronic Voting

Latvia has no electronic voting, but has recently started to discuss the topic. There is also no Internet voting, but from 31 August until 2 September 2006 a conference was held in Latvia by ACEEEO (Association of European Election Officials discussions on eVoting) on eVoting.

3.2.3 Lithuania

3.2.3.1 Electoral System

Lithuania has a mixed parallel electoral system consisting of both majority and the Hare quota with the largest remainder system. The Seimas, the Lithuanian Parliament, has 141 members, elected for 4 years. 71 of them are elected by 71 single-member constituencies via two round majority rules. The single-member candidates require more than 50 per cent of the vote to be elected provided that the turnout is not below 40 per cent. If the voter turnout is less than 40 per cent, a candidate that has a majority and at least one-fifth of all registered voters is considered to be elected. In case there is no winner, the top two go to a second round. In this second round, only a simple majority is needed to be elected. The other 70 MPs are elected by 1 national constituency via party list proportional representation whereby the allocation of the seats is based on the Hare quota. To have a valid election, the voter turnout should not be less than 25 per cent. The legal minimum threshold implies that a party has to win at least 5 per cent of the national vote to gain representation in the Seimas.

3.2.3.2 Logistics of the Vote

Lithuania has about 2.7 million voters that can cast a vote. Even though there is no compulsory voting, to be entitled to vote, one has to have Lithuanian citizenship, have reached the age of 18 years and not been disqualified from the right to vote (court declaration of incapability). The Election Day is usually a Sunday.

3.2.3.3 Electronic Voting

Lithuania has no electronic voting, but in November 2006, a law has been passed by the parliament approving Internet voting during elections and referenda. This Internet voting will be an advanced voting in the sense that it will begin 6 to 4 days before the Election Day. Lithuania will start a test project in order to introduce the Internet voting as an alternative voting channel at the Seimas election in autumn 2008. The Internet voting will be based on the on-line banking systems utilized by the Lithuanian banks and it is expected to enhance the voter turnout and lower the costs of future elections.

3.2.4 Germany

3.2.4.1 Electoral System

Germany has a mixed electoral system consisting of both Single Member Plurality (SMP) and Proportional Representation (PR) elections. Each voter has two votes, one vote (first vote or *Erststimme*) for constituency MPs (this vote decides which candidates from the constituency are sent to the Bundestag) and one (second vote or *Zweitstimme*) for the *Land* list MPs. The constituency seats are determined by SMP, while the list seats are determined by PR using the Hare quota, called the Niemeyer method in Germany. The German lists are closed lists and ticket-splitting is a feature of their electoral system. This means that voters can cast both votes for different parties.

From the 598 Members of the German Bundestag, 50 per cent are elected by 299 constituencies and 50 per cent by the parties' Land lists. The legal minimum threshold implies that a party has to win at least 5 per cent in the whole federation or at least three direct mandates.

Another feature of the German electoral system is the overhang mandates or surplus seats. When the first and the second votes are counted, a third stage is added to the counting process. This entails that constituency seats are subtracted from list seats and the result determines the number of additional members to which each party is entitled. These overhang mandates explain why the German Bundestag has currently a total number of 614 members (i.e., 598 + 16 overhang mandates).

3.2.4.2 Logistics of the Vote

Germany has about 60,5 million voters that can cast a vote in 80.000 polling stations. There are 299 constituencies (Wahlkreise) and each constituency is made up of a lower level, a polling district or 'Wahlbezirk'. These *wahlbezirke* may not include more than 2500 voters. Although there is no compulsory voting, to be entitled to vote, one has to be a German citizen, have the age of 18 years, been living for at least 3 months in Germany and not been disqualified from the right to vote (guardianship, mental deficiency or illness). Voters have only one day to cast their vote and this day must be a Sunday or a public holiday.

3.2.4.3 Electronic Voting

Since 1999 software based devices and electronic voting are introduced for the Bundestag election. The German electronic voting is regulated by §35 of the *Bundeswahlgesetz* (BWG) and the *Bundeswahlgeräteverordnung*.

The electronic voting machines used are the ESD1 and ESD2 from the (Dutch) company **Nedap**/HSG Wahlsysteme GmbH. For the Bundestag elections of 2005, electronic voting machines were utilized in about 30 constituencies, which consist of almost 2000 (1831) of the 80.000 polling stations and more than two million voters.

However, there are ideas to introduce a new type of electronic voting. The city of Hamburg is planning to use electronic voting for the state parliament election in 2008. They lately changed their election law and as a result a ballot booklet of approximate 25

pages instead of a ballot sheet will be utilized. To avoid complex and time consuming counting they will introduce electronic voting. Nevertheless, Hamburg will not use the Nedap machines as an enormous (and thus unpractical) Nedap computer would be needed in order to show the new ballot booklet at once. Instead they will use a *digital electoral pen*. This digital electoral pen is favored because the use of it makes nearly no difference with the traditional way of casting a vote. Moreover, since the paper ballots are collected in a ballot box, the paper ballots still offer a back-up and a fall-back and allow thus for manual recounting. This digital pen was tested during the Bundestag election of 2005 and an additional inquiry showed that 84% of the voters appreciated the use of this digital electoral pen.

3.2.4.4 Discussions/Lawsuits

Although several lawsuits against the use of electronic voting machines (Nedap) in the elections for the Bundestag in 2005 have been rejected by the Bundestag on 14 December 2006, they still can be heard by the *Bundesverfassungsgericht* (the highest German court). One lawsuit was introduced by political scientist Prof. Dr. Joachim Wiesner and by software specialist Dr. Ulrich Wiesner. Since the collecting/storing and the counting of the votes are executed by the computer, voters have no control on it. Wiesner and Wiesner criticize the non-transparency and the lack of public control on the voting results delivered by the electronic voting machines. Public control is the basis of democracy and therefore the lack of it is undemocratic and in breach with the law (§§ 10 and 31 BWG). Since the Nedap computers do not have a paper trail, checking of the election results cannot be carried out and this lack of control is also in violation of the law (Art. 41 GG (Grundgesetz)). What is more, for Wiesner and Wiesner, by using the voting machine the voter can even not be sure that he has voted.

According to computer experts from the Chaos Computer Club (CCC), the Nedap computers can be manipulated and misused. They also take the view that electronic voting machines are undemocratic as only a small elite of computer experts can check them, while every citizen can control a traditional election. For them the use of electronic voting machines has no advantage because the safer you make the computers, the more expensive they become. As a result, the CCC demands the prohibition of electronic voting machines.

Furthermore, from 17 October till 28 November 2006 more than 45.000 people signed a petition (introduced by Tobias Hahn from the Humboldt university in Berlin) against the use of electronic voting machines and for the abolition of §35 of the *Bundeswahlgesetz*. Here as well, the lack of transparency was criticized and the need for democratic control was emphasized.

In addition, a lawsuit was introduced against the electronic voting machines used for the election of the Mayor in Cottbus in 2006. The lawsuit refers to the problems with the Nedap computers in the Netherlands and disapproves the non-transparency of the vote counting and the possibility of manipulation. The CCC checked the security measures of the more than 70 computers used in Cottbus and concluded that these measures were ignored as for instance these computers were left unattended for a while in the polling station. What's more, they also criticized that the software of the electronic voting machines could not be controlled. For them, it is '*security by obscurity*' instead of transparency.

3.2.4.5 Perception of Advantages and Disadvantages

Supporters of electronic voting state that the rapidity of and the lack of making mistakes by counting votes are advantages of electronic voting machines. They also emphasize that it saves costs, avoids invalid votes and mistakes when counting votes and secures a more secret voting.

On the other hand, opponents take the view that electronic voting misses transparency and is unsecured. For them, elections can be manipulated and mistakes in election results due to software errors still can take place. Moreover, the secrecy of the elections can be undermined. Therefore, they demand transparency and an additional manual counting and keeping of the ballots.

3.2.4.6 Internet Voting

In Germany, Internet voting is being discussed but it is not yet sustained by a legal background. Nevertheless, from 1999 to 2004 a research project on Internet voting (Wahlen in elektronischen Netzwerken (W.I.E.N.)) was financially supported by the government and in 2001 a test took place in Marburg. As a result, lawyers demand that voters should register with an authority and have a classified signature; however this makes online voting expensive. Moreover, opponents emphasize the lack of transparency and security and underline that secret voting cannot be guaranteed. On

the other hand, supporters of Internet voting highlight a higher voter turnout, lower costs, less mistakes and a rapid counting of the votes. Nonetheless, the starting costs for introducing Internet voting will be extremely high and as the test in Marburg illustrated, the voter turnout only increased slightly.

3.2.5 Ireland

3.2.5.1 Introduction

Ireland presents a unique case in our overview: the proportional representation by single transferable vote (PR-STV) system is used in the national elections for the lower house (the Dáil). Ireland is the only country in this study which uses such a system. Furthermore, since the introduction of electronic voting in Ireland a lot of protest has been heard, from movements and academic sources alike. When we consider that the machines used in Ireland are produced by the same firm which developed the machines used in the Netherlands, this becomes an important issue. We will discuss the electronic voting system, as well as the complaints in detail.

3.2.5.2 Types of Elections

In Ireland, the following government bodies can be elected:

- President: every 7 years
- Dáil (lower house): every 5 years, or earlier if dissolved by the President or Prime Minister

- Seanad (upper house): every 5 years, or earlier if dissolved by the President or Prime Minister
- Local government: every 5 years
- European parliament: every 5 years
- Referendum

Only the elections for the upper and lower house will be discussed in this overview, since the aim of the study is to compare the national and regional elections of each country (ECPRD, 2000).

3.2.5.3 Electoral System

While the upper and lower houses of Ireland both have a mandate of 5 years, only the lower house is elected directly by the citizens. The members of the upper house are elected indirectly, or by a nomination of the prime minister. Since the purpose of this study is to establish an overview of actual voting mechanics, we will focus on the elections of the lower house. The Dáil is composed of 166 elected members, who represent 41 constituencies. In each constituency, 3 to 5 members can be elected. As mentioned before, the system uses ‘proportional representation by single transferable vote’. This system allows for a large input by the voter: Irish voters indicate not only their first choice for Member of Parliament but also rank the candidates in order of their preference. The voters, by ranking the candidates, give instructions as to who should receive their support should the first choice candidate be eliminated or elected. It is obvious this system results in a complicated counting system, which is described briefly below (DoEaLG, 2006).

The first step in determining which candidates are elected, is establishing the minimum threshold. The formula to determine this number is: $((\text{valid votes cast}) / (\text{number of seats} + 1)) + 1$. For example, in a district where 3 seats were to be distributed, the minimum threshold would be 25% of the votes, plus one. If a candidate reaches the threshold, each additional vote he or she receives is considered a *surplus vote*. These votes are transferred proportionally to the other candidates according to the second preference indicated by the voter. If after counting the first preferences and transferring surplus votes, the election is undecided then the lowest polling candidate is eliminated. The ballots cast initially in support of this candidate are now counted according to their indicated second preference. This way, even the votes cast for an unelected candidate are still used (using the second indicated preference) (Midwest Democracy Centre, 2002).

3.2.5.4 Logistics of the Vote

In theory, the Dáil has a maximum life of 7 years, but a shorter period of 5 years has been set by law. Furthermore, the Dáil can be dissolved by the President at any time (on the advice of the prime minister). When the lower house is dissolved, elections must be held within 30 days. The initiative is taken by the clerk of the Dáil: he or she sends a letter to the returning officer in each of the constituencies, instructing the officer to hold an election for the prescribed number of seats in the Dáil. The only member of the lower house that is not elected is the chairman of the Dáil. The chairman is automatically

returned without an election, unless he or she indicates that they do not wish to continue as a member.

The next step is establishing the polling date, which is done by the Minister for the Environment and Local Government. The polling day must be between the 18th and the 25th day after the writ was issued by the Dáil clerk. The vote is held on one day; on that day, the voters must be able to vote between 7 a.m. and 10.30 p.m.

The list of voters is compiled each year by the county and city councils. Every citizen of Ireland, and British citizens, ordinarily resident in the State who are aged 18 years or over are entitled to vote. Eligible voters who are not included in the register can apply for inclusion; this request must be made at least 15 days before the polling date. The candidates for the election can nominate themselves and be nominated by a Dáil elector. If the candidate doesn't have a political affiliation, they must have their nomination papers assented to by 30 Dáil electors registered in the constituency.

The polling places, where the actual vote will be held, are appointed by county and city councils. The usual places are schools, sports centers, or other public buildings. The returning officer must provide the polling places with polling stations. He or she is also responsible for the organization of the poll, the printing of the ballot papers, and so on. The returning officer sends a polling card to each voter, thus informing the voter of his or her number on the register, and the polling station where he or she can vote. Furthermore, the officer makes arrangements for postal and special voting.

Postal voting is available to civil servants and Defense forces on missions abroad. Electors living at home, who are unable to vote at a polling station due to a disability or illness can also vote this way. If a voter is required to be present in a polling station other than the one he or she has to vote, the voter may also request to use postal voting. Special voting is available to electors living in a hospital, nursing home or similar institution who are unable to vote at a polling station. They can vote in the presence of a special residing officer accompanied by a Garda (police officer).

On the day of the poll, each voter applies for a ballot paper by stating his name and address. The voter may be required to produce evidence of identity (a passport, credit card, and so on). Once the identity of the elector is established, the returning officer stamps the ballot paper, and gives it to the voter. At each ballot box, one polling officer and one control clerk must be present. To cast the vote, the elector enters a voting compartment. The ballot paper contains the different candidates in alphabetical order. To indicate their vote, the electors write a '1' next to their first choice, '2' next to their second choice, and so on. The elector then folds the ballot paper to conceal his vote, and puts the ballot paper in a ballot box. Each candidate may have a representing agent present at the polling station.

The votes are counted on the constituency level. In each constituency, all the ballot boxes are taken to a central counting place. Again, each candidate may have a representing agent present during the counting of the votes. Before the actual count begins, the postal and special votes are opened, and put together with the other votes in the constituency. The count begins at 9 a.m. on the day following the poll. The number of ballot papers in each ballot box is checked against a return, furnished by each returning officer. Following this, the ballot papers are sorted according to the first preferences indicated on them.

The calculation of the results has already been described in the previous paragraph, so we won't go into it here. When the count is completed the returning officer declares the results of the election, and endorses the names of the elected members on the writ, which he returns to the clerk of the Dáil (DoEaLG, 2006).

3.2.5.5 Electronic Voting

As stated above, Ireland presents us with a special case. Electronic voting has not been used in a full scale election yet, only in trials. However, the idea to introduce eVoting has been around since 1998. The main reason for the delay has been the large amount of criticism the system received. Due to recent developments in the Netherlands, where the same type of eVoting machines is used (NEDAP), the system will probably never be used at all. The debate surrounding the eVoting system will be discussed in this paragraph, but we'll discuss the main characteristics of the system first.

In June 2000, the Department of Environment and Local Government issued a procurement round for an electronic voting system. The motivation for the introduction of an electronic voting system was to 'improve the speed, efficiency, accuracy and user friendliness of the Irish elections' (Paris, 2004). As Paris notes, it is remarkable that voter turnout wasn't a consideration (as it was in other countries). As a result, the Powervote/ Nedap system was selected (DoEaLG, 2002). In March 2002, the Department published an information paper about the system. Based on this information, we will describe the basic outlines.

The Powervote/ Nedap system consists of a few components:

- The *IES software package*, which is used to set up and record the details of an election. It counts the votes, and determines the result of the poll.
- The *Nedap voting machine*, which replaces the ballot paper, voting booth and ballot box. It allows the voter to cast his or her vote by pressing buttons on large screen panel.
- The ballot module, which is used to store and transfer the votes between the Nedap machine and the IES system. The candidate selection is programmed onto the module, and when votes are cast they are stored on the module as well.

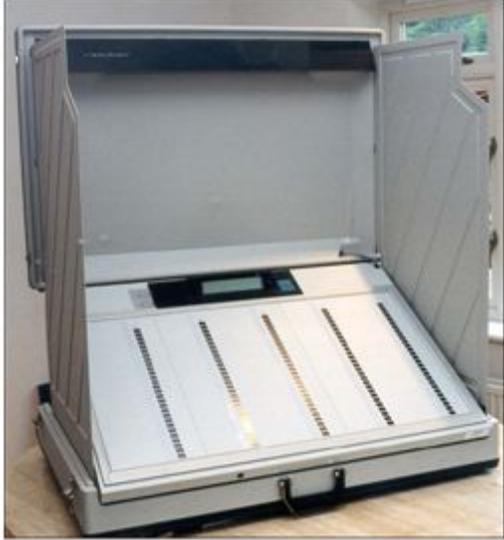


Figure 1: Nedap Voting Machine

To set-up an election the following steps must be taken: first the polling station details must be entered into a basic referral file, as well as the number of voters per polling station. For each constituency, candidate and party data (including photographs) are entered onto the ballot module. After they have been properly programmed, the modules are entered into a NEDAP machine, designated for a specific polling station.

When a voter wishes to cast a vote, he or she has to be marked of in the register first (like the voter would be in a normal election). However, the voter isn't given a ballot paper, but a token which the elector must show to the official in charge of the voting machine. The official then activates the voting machine for the voter to use. The voter then selects his or her preference by pressing the buttons next to the candidates' photographs. To cast the vote, the voter must press the button at the top of the machine. When this button is pressed, the official is alerted, and the votes are registered on the ballot module in a random fashion, so that the vote recorded cannot be linked with the voter marked in the register of electors.

After the poll, the Nedap machine prints a statement showing the number of voters who used the machine. The data on the ballot module is also copied to a backup module. Then the ballot module and the statement are sent to the returning officer at the count centre (DoEaLG, 2002).

The government of Ireland organized three initial pilot projects for the Powervote/ Nedap system during the general election of 17 May 2002. In the constituencies of Dublin North, Dublin West and Meath, electronic voting was used. Following these pilots, four other constituencies (Dublin Mid-West, Dublin South, Dublin South-West, Dun Laoghaire) used eVoting in the referendum of 19 October 2002. Following the success of these pilots, the government announced the full-scale introduction of eVoting in all constituencies for the local and European elections of 2004. On 30 April 2004, just six weeks before the elections, the Minister for the Environment, Heritage and Local Government, Martin Cullen, decided the eVoting system would not be used. Note that the system wasn't abandoned at that time, the full-scale introduction was merely postponed. Due to recent developments in the Netherlands, where due to the criticism of the action group 'Wij vertrouwen stemcomputers niet' the government decided to set up an advisory

committee to review the electoral process and make proposals to improve or alter it, critics of the system expect that the Irish government will not use the system after all. We'll quote Rop Gonggrijp, member of the group that hacked the Nedap voting machine: *'On the good side there's the reaction in Ireland, where large-scale media-coverage of our findings seems to have killed any last remaining hope for a slightly modified version of this silly machine to ever be used in any Irish elections.'* (Gonggrijp, 2007).

3.2.5.6 Criticism Concerning the Electronic Voting System

Since the conception of the Irish electronic voting system, criticism has been heard. McGaley and Gibson published a paper in March 2003, in which they indicated several key weaknesses of the Powervote/ Nedap system:

- The backup module is left in the machine after the poll. This means it can easily be altered; should the main ballot module be unusable, this becomes a vital issue.
- The system lacks a voter verified audit trail (VVAT): this would allow for a physical backup, which could be used in case the election results were contested.

Soon after, ICTE (Irish Citizens for Trustworthy eVoting) was founded by McGaley. This group released several publications in which they criticized the Nedap computers (and the general manner in which the Irish government handled the introduction of eVoting). Their main concern with the system is the lack of a VVAT. To quote their website⁴: *"The system does not include a Voter Verified Audit Trail (VVAT). Irish Citizens for Trustworthy eVoting (ICTE) is a group of ordinary citizens who believe that no electronic voting system can be trustworthy unless it includes a paper-based VVAT."*(ICTE, 2007). Since the Dutch protest group 'Wij vertrouwen stemcomputers niet' and ICTE have a lot of similar concerns (both of them criticize the Nedap machines), they often refer to each other on their websites.

Other critics include Maeve Paris, who denounces the lack of attention for disabled people. Only the 'user friendliness' was taken into account (e.g., graphic presentation), but accessibility was never a major concern for the government. People who suffer from bad eyesight, for example, could have serious problems using the system. Paris concludes that *'The new system failed to take into account a significant proportion of the electorate, and in doing so it proved to be no more democratic than the existing manual paper ballot. It may even have posed new barriers to participation.'* (Paris, 2004).

One of the most influential actors in the whole process is without a doubt the Commission on Electronic Voting (CEV). It was established as an independent actor by the Irish government on 1 March, 2004. It's main purpose was to evaluate the Powervote/ Nedap system. On 30 April 2004 it released a first interim report, in time for the elections of 11 June, in which it objected to the introduction of the Nedap system, since it compromised secrecy and accuracy (CEV, 2004). Following the advice given in this report, the Minister for the Environment, Heritage and Local Government, Martin Cullen, postponed the introduction of the machines (Paris, 2004).

Before the commission was dissolved on 4 September 2006, it released two other (final)

⁴ <http://evoting.cs.may.ie/intro.shtml>

reports on the Powervote/ Nedap system. We will only discuss these reports briefly, but they are available in their entirety on the website of the CEV⁵. The Commission tested 7 aspects of the Powervote/ Nedap system, namely:

- Software assurance (quality of the software, development process, and so on)
- Hardware security (usability, security in the context of an election)
- Testing (extension of the previous tests)
- Physical security (life-cycle review of the physical and operational security arrangements)
- Comparative assessment (comparison between the Nedap system and paper ballot)
- eVoting Best practice (overall evaluation of the implementation of eVoting in Ireland)

The Commission found several flaws in the software and hardware security, but states that *'the chosen system can potentially enhance and deliver real efficiencies in the administration of elections in Ireland... The Commission concludes that it can recommend the voting and counting equipment for use at elections in Ireland, ... , but that it is unable to recommend the election management software for such use'* (CEV, 2006). This shows that while the hardware was developed adequately, the software contained several (critical) flaws.

A final criticism often raised by the protest groups is the significant *cost* of the system. While the government estimates the cost of the system at €43m, other authors place the number much higher. Paris mentions an estimated cost of €52m, a number also used by ICTE (Paris, 2004). ICTE made an estimation of the future costs of the system, which it estimated at another €57m (McCarthy, 2004). While the verity of these numbers remains uncertain, suffice to say there has been a lot of debate about this issue as well.

3.2.6 The Netherlands

3.2.6.1 Electoral System⁶

In the Netherlands, members of the Lower House, of provincial councils and municipal councils are directly elected every four years. The Lower House has 150 members, elected by single preferential voting. The 75 members of the Upper House, sometimes called the Senate, are elected indirectly, also for four years, by the members of the provincial councils of the 12 provinces. Together the Upper and Lower Houses constitute the States-General or the Parliament. Voting was compulsory from 1917, when universal male suffrage was introduced, through to 1970.

A system of proportional representation is used. In other words, the distribution of seats corresponds to the distribution of votes in the entire constituency. In distributing the seats

⁵ <http://www.cev.ie>

⁶ Electoral Council/Netherlands Ministry of the Interior and Kingdom Relations, *Elections in the Netherlands*. Den Haag, 2005

between the parties, the whole country is treated as a single constituency. The total number of valid votes cast in the entire constituency is divided by the number of seats to be allocated (150 in the Lower House). The number of votes cast for each list is divided by the electoral quota and the quotient determines the number of seats initially allocated to that list. The remaining seats are filled using the d'Hondt method. For elections to the Lower House of Parliament the country is divided into 19 electoral districts. This is a pure technical division and aims to allow political parties to put up candidates who are well known in a particular part of the country. In determining the results of an election, the votes cast for a particular party in the various electoral districts are all counted together.

3.2.6.2 Logistics of the Vote

Each municipality is divided into one or more polling districts, each with its own three-member team of assessors. Some 10 000 such teams are involved in every election. In addition to the ordinary polling stations, the municipal executive may set up a mobile polling station to enable physically handicapped people and the elderly to cast their vote closer to home. Two weeks before polling day, voters receive a polling card, inviting them to vote between 7u30 and 21u hours on the Election Day at the polling station in the district in which they live. Most municipalities now use voting machines. Voters are given access to these machines after presenting their polling card. In municipalities which do not use machines, voters present their polling card and receive a ballot paper form the presiding officer at the polling station. Voters cast by using a red crayon to color in a white circle in a black square preceding the name of the preferred candidate.

3.2.6.3 Electronic Voting System

Electronic voting was introduced for the first time in an election in 1982, but it took a long time before the conditions for using and details on testing were legally embedded.⁷ A first General Act on Electronic Voting was issued in 1989 regulating the approval of voting machines. This Act was replaced by a more detailed Act issued in July 1997 by the Secretary of State for the Interior. The 1997 General Act of Government on the use of voting machines only regulates the conditions for the authorization and valid use of the machines. The most recent Act also provides details on the testing of voting machines and refers to an independent test-institute. In the same year TNO (TNO Electronic Products & Services) was officially appointed by the Ministry to conduct the testing of the hard- and soft-ware used in the voting machines.

The decision to use voting machines in elections is taken by the council of the municipality concerned. Only voting machines approved by the Minister of Interior may be used in elections. After purchase, the municipality and the polling station subsequently control the proper functioning of the voting machines. Two sorts of machines are used. The first one is the Nedap/Groenendaal machine, used by almost 90 percent of the municipalities where electronic voting is possible. The second one is the SDU machine, used in the other 10 percent. There is no paper trail. Although a paper trail is usually seen

⁷ Niemoller, K., *Appendix 2K. Experience with Voting Machines in the Netherlands and Germany*. Dublin: Trinity College, The Policy Institute, 2004:330

as a method to make elections controllable to the voters, the Dutch Ministry stresses the limitations of the use of a paper trail.⁸ There could be problems with the printer (the printer could get seized up or run out of ink), there could be problems pulling off the strips (and a voter could possibly see the vote cast by someone else), what to do in case of error messages (what happens with votes already cast?), etc. However, after the elections of November 2006 the government decided to set up an advisory committee to review the electoral process in the Netherlands and make proposals to improve or alter it (see below). One of the measures that probably will be considered is the introduction of a paper trail.

The Ministry of Interior states that with the introduction of voting machines the number of invalid votes dropped from almost 1% in 1971 to 0,13% in 2003.⁹ Furthermore, the Ministry claims that miscalculation is ruled out by the use of voting machines. Other advantages were seen to be as follows: the reduction in the number of polling stations, the reduction in the number of people necessary to attend the polling stations, the improvements in electoral administration and the production of earlier results.¹⁰

In 1998 the Secretary of State for the Interior asked the Elections Advisory Board to advise him on several matters (announcements of the first, temporary election results; the possibility of a so called paper-trail for the individual voter; the need for more detailed regulations on the use of the software used to calculate the results and the need to narrow the risks arising from the total dependency on the companies who deliver the hard- and software) concerning electronic voting.¹¹ The Election Advisory Board hired an external consultant to assist them in providing advice on these issues and in 1999 the Parliament passed most of the recommendations.¹² One of the conclusions of the report, based on a survey by phone with 47 cities-municipalities, is that one should consider installing legal requirements and a test- and approval procedure for election result processing systems. The main reasons mentioned for the switch of some municipalities to voting machines were the increase of the efficiency of the polling stations, the reduction of costs for the construction and arrangement of the polling station and the earlier presentation of the final results.

Electronic voting was a second time on the agenda of the Ministry of Interior in 2002.¹³ There had been a number of problems with the software calculating the final distribution of seats in the two elections that occurred during 2002. In March 2003 the Electoral Advisory Board provided several recommendations in relation to this issue.

Electronic voting was never really abolished but in fall 2006 Minister Nicolaï decertified the SDU voting machine three weeks before the elections because an action group had published a report about the security problems of the voting machines used in the Netherlands. The Dutch government was afraid that the order on Election Day would be

⁸ http://www.minbzk.nl/onderwerpen/grondwet_en/verkiezingen_en/veelgestelde_vragen

⁹ http://www.minbzk.nl/onderwerpen/grondwet_en/verkiezingen-en/stemmachines

¹⁰ Niemoller, K., *Appendix 2K. Experience with Voting Machines in the Netherlands and Germany*. Dublin: Trinity College, The Policy Institute, 2004:331

¹¹ Niemoller, K., *Appendix 2K. Experience with Voting Machines in the Netherlands and Germany*. Dublin: Trinity College, The Policy Institute, 2004:330

¹² Het Expertise Centrum, *Stand van zaken automatisering rond verkiezingsproces*. 's Gravenhage, 28 mei 1999

¹³ Niemoller, K., *Appendix 2K. Experience with Voting Machines in the Netherlands and Germany*. Dublin: Trinity College, The Policy Institute, 2004: 330

endangered.

Dissatisfaction with the use of voting machines is indeed increasing in the Netherlands. A public debate was launched by the action group 'wijvertrouwen-stemcomputersniet.nl'. In October 2006 (one month before the Dutch national parliamentary elections of November 22nd) the action group wrote a report "Nedap/Groenendaal ES3B voting computer: a security analysis" that attempted to demonstrate serious security flaws in the Nedap/Groenendaal ES3B voting machines used in the election. This particular voting system is used by 90 percent of the voting public in the Netherlands. There is another machine used, manufactured by SDU that is called 'Newvote'. This machine is based on a PC and uses a touch screen instead of buttons. Both systems lack a paper trail. When doubting the outcome, a non-electronic recount is not possible. Only ten small districts still use paper and pencil.

The report describes the results of a review of the Nedap ES3B electronic voting computer. In its report the action group argues that the inner casing around the electronics was only protected by a very simple lock, which means that the replacement of software and hardware was relatively easily possible (e.g., a memory chip swap: meaning that the memory that holds the voting data is not encrypted). The action group threatened to bring minister for government reform Atzo Nicolaï to court since they were not convinced by his assurances that there would be no fraud in the elections of November 2006. In response to the allegations and earlier press-attention given to the campaign of the action group, Nicolaï introduced new security measures for the voting machines in order to help increase public trust. Nedap checked all its machines for tampering, installed new chips and software that is less easily hacked, and sealed the machines with a unique metal seal.

Based on inspections, on October 30th the government decided that there was a problem with SDU voting machines, due to the fact that within a radius of 10 meters the machines could be wirelessly monitored. In other words, these machines could not guarantee anonymity of voting to a sufficient degree. These machines, which were in use in 35 municipalities - including Amsterdam - had to be improved or replaced with an alternative before the elections. Many municipalities - including Amsterdam - decided to switch to the traditional pen and red pencil method of voting instead of the SDU machines. In January 2007 SDU has summoned the Dutch state because of the unilateral disapproval of the SDU voting machines.

As a consequence of the 2006 voting machine controversy, Minister Nicolaï decided to set up an advisory committee to review the electoral process in the Netherlands and make proposals to improve or alter it. The underlying criteria for such proposals are free, reliable and transparent elections open to the entire electorate on equal terms, a realistic electoral process in terms of practical implementation; and the capacity to monitor elections while guaranteeing voter confidentiality. One point the committee will consider concerns the risks associated with the use of the current voting machines. The committee is chaired by Minister of State Mr. F. Korthals Altes, who is also a member. This commission should advise the government before October 1st 2007.¹⁴

Summarizing, it is possible to distinguish a number of issues that are the subject of debate, namely:

¹⁴ <http://www.minbzk.nl/bzk2006uk/subjects?ActItmIdt=104270>

- the public availability of the so called source codes
- the lack of voter verified audit (paper) trail
- the authorization of the software for the distribution of seats (hardware and software are tested by TNO but the testing reports are not available to the public)

The debate or controversy in The Netherlands is concentrated on security aspects of electronic and Internet voting, rather than on legal and socio-political questions (such as the digital divide). Until 2006, debates on the introduction and use of voting machines were rather marginal.

3.2.6.4 Internet Voting

Plans to make the voting process in the Netherlands non-place-dependent (or less place-dependent) were unfold on 4 October 2000 by the Minister of Interior and Kingdom Relations and the Minister for Major Cities and Integration Policy.¹⁵ They proposed a large-scale experiment in which the votes cast would count towards the results of the Provincial Council elections in March 2003. Voters were to be given the opportunity to vote electronically from eVoting kiosks installed in public areas, other than polling stations. To implement these plans the Interior Ministry set up the Remote (Electronic) Voting project, with a budget of 8.1 million Euros.¹⁶ However, in February 2002 the two Ministers informed the House of Representatives that they were not certain that the plans would be feasible. Six months later, in June 2002, the two Ministers sent a letter to the House of Representatives, in which they came to the conclusion that a good basis for continuing the Remote Electronic Voting project had been found. They presented a step-by-step approach and concluded that the first step could be taken in the European Parliamentary election in June 2004, during which there would be experiments with voters voting at a polling station of their own choice and voting by PC/telephone for Dutch electors abroad.

In June 2004 (the European Parliamentary election) then there was a first experiment with Internet and telephone voting for Dutch electors abroad and for voters voting at a polling station of their own choice.¹⁷ The Election Acts permits two categories of voters to vote from abroad. Dutch electors resident abroad and electors who are abroad on the day of the ballot on account of their work or business (and members of their family there with them). It was the desire to make voting easier for electors abroad that led the then Interior Minister and Minister for Cities and Integration Policy to conduct an experiment with Internet and telephone voting while retaining the existing methods (by proxy or by elector card). After having registered, 5351 votes were cast using the voting service: 480 by telephone and 4871 via the Internet. There has been some controversy about this

¹⁵ Ministry of the Interior and Kingdom Relations, *Evaluation Report. Experiment with Internet and telephone voting for voters abroad*. The Hague, 2004

¹⁶ Minister of the Interior and Kingdom Relations J.W. Remkes, *Remote Voting Project. Letter to the Chairman of the House of Representatives of the States General*. The Hague, 25 March 2002

¹⁷ Ministry of the Interior and Kingdom Relations, *Report on the Internet and telephone voting experiment*. The Hague, 2004

In 2006, during the local council elections the experiment allowing electors to vote in any polling booth they choose within their municipality was continued (<http://www.minbzk.nl/bzk2006uk/subjects?ActItmIdt=52964>).

initiative.¹⁸

The first reason had to do with security and the fear for hackers. Critics suggested to test the Internet voting on a local level in order to identify security risks. The ‘Report on the Internet and telephone voting experiment’ of the Ministry of the Interior and Kingdom Relations refers to attempts that were made to exploit ‘standard’ Internet vulnerabilities and to a few cases where a visitor to the Internet voting website tried to type in a random access code/voting code or to access a random or non-existent page on the web server. The report continues by saying that in all these cases the attempts were defeated either by the firewall or by the web server. In six cases the IP address was blocked on the instructions of the Interior Ministry as a precautionary measure so that no traffic could take place from the IP address in question to the voting service. The second reason of controversy was a rather philosophic one and had to do with the non transparency of the programs delivered by LogicaCMG.

Article 53 of the Experiments Decree requires experiments conducted under the Experiments Act to be evaluated, and this was the case with the Internet and telephone voting experiment. The primary aim of this evaluation is to establish whether the experiment fulfilled its purpose. To ascertain the voters’ verdict on Internet and telephone voting the Interior Ministry commissioned a survey of voters who had been able to vote from abroad in the European Parliamentary election from the research agency Research voor Beleid. There was also made use of the calls that came in during the period from December 10th 2003 until July 1st 2004 to the Service Desk. Respondents mainly seem to have voted by telephone or the Internet because it was simple and took relatively little time. The open-ended answers reflected curiosity with the experiment. 16% of the Internet and telephone voters stated that they had voted because these new voting methods were available. Respondents who voted by post did so because they were familiar with the procedure. Another frequently mentioned reason was that postal voting was simple. One of the questions was the open-ended one, asking for comments, suggestions, etc. In the Evaluation Report (2004:18) it is stated that: “Quite a few respondents said that Internet voting would improve turnout and therefore called for it to be introduced in the Netherlands. A few voters were afraid that Internet voting would result in more elections (as in the US and Switzerland). (...) A few comments (almost all in conjunction with a positive verdict on Internet and telephone voting) were made about the security and reliability of Internet voting, asking in general terms whether Internet voting was safe. A few voters suggested setting up a body to report on the reliability of the system”.

In 2006 there was an new experiment with Internet voting. The experiment in 2006 differed from that in 2004. In 2006, voters could register through “www.kiezenuithetbuitenland.nl”. Voting took place in five in stead of ten days. Telephone voting was not longer available. The authentication procedure was made more voter-friendly. Dutch voters, registered by November 22nd 2006 (21 593), living abroad could cast their ballot for the Dutch parliamentary elections through the Internet. Main purpose of this experiment was to enhance voting facilities. The regular postal voting was still available for the Dutch ex pats. After registration, the voters were able to choose between casting their vote by Internet or by post. After the 2006 experiment an

¹⁸ DELWIT, P., KULAHCI, E., PILET, J-B., *Le vote électronique: un choix légitime?* Bruxelles/Gent : Politique scientifique fédérale/Academia Press, 2004:70

evaluation will be held and the results will be used in a political debate about the implications and desirability of Internet voting.

3.2.7 Switzerland

3.2.7.1 Introduction

In Switzerland, when it comes to the electoral law, different levels of power are involved. The federal level rules for the election of the National assembly. But the cantonal authorities have also a say. They organize elections for the Council of States and for cantonal assemblies. Finally, both levels may also organize referendums. In that context of multi-level governance, eVoting has only been introduced in a few areas and only for some pilots. Three cantons have experimented eVoting: Neufchatel, Zurich and Geneva.

The relatively limited use of eVoting in Switzerland derives from the fact that it is not the way privileged by Swiss authorities to boost turnout. They believe that technical solutions should be explored to make voting easier and more accessible in order to increase the participation in elections and referendums. However, like in the United Kingdom, much more attention has been paid to the generalization of postal voting since the early 1990s than to eVoting.

Yet, in this short report, the three main pilots of eVoting in Neufchatel, Zurich and Geneva will be presented after having described the electoral systems in use in Switzerland. The aim of this report is to underline the main assets and problems of eVoting in the Swiss context in order to enrich the Belgian debate.

3.2.7.2 Electoral System

One can hardly talk about one Swiss electoral system. In a country of multi-level governance, divided into 26 cantons, there is actually a variety of electoral systems. Different systems are in use for different assemblies (National council, Council of States, cantonal assemblies), but also for one body to be elected, different voting systems may be applied in different cantons.

For the election of the National council (200 deputies elected every four years), the main characteristics of the electoral system are the following:

- **electoral formula:** proportional representation (Hagenbach-Bischoff quota) in multi-member districts for most cantons except in the six (Obwalden, Nidwalden, Glarus, Uri, Appenzell Ausserrhoden and Appenzell Innerrhoden) where there is only one seat. In these six cantons, seats are allocated under the single-member plurality system.
- **size of districts:** each canton counts for one constituency. The magnitude depends on the population of each canton with a minimum of one elected member and a maximum of 34 in the canton of Zurich.
- **ballot structure:** in single-member districts, it is candidate-centered as voters are asked to vote for one individual candidate and not for lists. In multi-member district open lists with panachage are in use. The panachage system gives to each

voter a number of votes equal to number of seat being vacant. The voter can use his votes in different ways. Firstly, he can approve a full list without modifying it. Secondly, he can modify one list by giving up to two votes to some candidates and by deleting some candidates on the list he supports. Thirdly, the voter can make up his own list by supporting candidates from different lists (panachage).

- **by-elections:** when a seat is vacant in single-member districts before the term of elections, a by-election is organized to elect a new MP. In PR districts, the first non-elected candidate on the same list than the deputy leaving his seat vacant is automatically appointed to the National council.

For the second chamber of the Federal Assembly, the Council of States, the electoral system for the 46 members elected every four years is the following:

- **electoral formula:** The mode of election is left to cantons. In all cantons, a system of majority election is in use (the modalities of application may vary from one canton to another). The only exception is the canton of Jura using proportional representation.
- **size of districts:** 20 cantons send two-member and six cantons (Obwalden, Nidwalden, Basel-Stadt, Basel-Landschaft, Appenzell Ausserrhoden and Appenzell Innerrhoden) elect one member of the Council of States.
- **ballot structure:** being in almost all cases an election under a majority system, it is candidate-centered as voters are asked to vote for one individual candidate and not for lists.

Finally, for cantonal elections, the electoral system is decided by each canton separately. In most cases, they elect the members of the cantonal assemblies under a system of simple majority elections. Voters can only vote for candidates and not for parties. Each voter can give one vote to one candidate. The candidate with the most votes wins the seat.

Given the multi-level structures of the Swiss electoral system, two elements have to be underlined about eVoting. First, the legislation about voting methods can be passed at two levels: federal and cantonal. Therefore, initiative of eVoting may appear at both levels independently. The second element to keep in mind is that if eVoting is to be introduced, the legislator must take into account that the system selected has to be very flexible in order to allow different votes under different systems for the National council, for the Council of States, for cantonal assemblies, but also for referendums.

3.2.7.3 Pilots of Electronic Voting

In 1998, the Swiss federal executive has launched a governmental project aiming at making it possible for citizens to exercise all political rights, ranging from signing petitions to voting for elections and referendums, by online channels. This initiative has rapidly received a wide support. Public opinions surveys have shown that about two thirds of Swiss citizens were in favor of eVoting. Most political parties were enthusiast about the project. And cantonal authorities also quickly declared their envy to engage in the initiative (Geser, 2002).

Yet, almost ten years later, few evolutions are observable. The two main problems are legal and organizational. First, there is a necessity for cantonal authorities to enact the

constitutional basis allowing shifting from paper ballots to eVoting methods. And in many cases, cantonal, authorities are very slow in this regard. Secondly, important resources have to be mobilized to provide the human and technological expertise to organize eVoting elections or referendums. This last point may be particularly problematic in a country divided into about 3,000 municipalities with sometimes very limited resources. Therefore, it is not surprising that the three main pilots of eVoting have taken place in three (partly) urban cantons: Neuchâtel, Zurich and Geneva. In the three cantons, pilots have been organized in a few municipalities in 2001-2 (for example, only in four in the canton of Geneva for a total of approx. 13,000 voters), and repeated on a wider scale in the years after (in 2004, 8 municipalities in the canton of Geneva where involved for a total of approx. 41,400 voters).

The three cantons offer to citizens the choice between three voting methods: traditional polling stations, postal voting and Internet voting. The last two methods were allowed in the days before the official Election Day. Some weeks before the elections, voters receive a polling card with an ID and a password they can use to access an online voting website and to identify them before voting. If they do not want to vote via the Internet, they can either use the postal ballot or go to the polling station to vote on the Election Day. There is no question of making elections or referendums 100% online. The authorities want to leave the choice to voters.

What appears from the first pilots organized is that most voters prefer postal voting (approx. 70 per cent). Internet voting comes second with almost 20 per cent of voters. Finally, only a minority of voters (less than 10 per cent) still vote in a polling station on the Election Day. Interestingly, Internet voters are mainly voters that were using postal voting previously and not citizens who have always kept on voting in a polling station. Internet voting is also used mainly by occasional voters and not much by the few citizens who vote for all elections and referendums (Christin & Trechsel, 2005).

3.2.7.4 Debates about Electronic Voting

3.2.7.4.1 Arguments in Favor

Four main arguments are mobilized in favor of Internet voting (Auer & Trechsel, 2001). The first one is the expected positive impact of eVoting on turnout. Online voting would enhance the commodity in the act of voting and would make voting easier. Therefore, it could convince some occasional abstentionists to vote more regularly. In a country like Switzerland where turnout for elections is around 50 per cent and even below for most referendums, the issue of turnout is crucial. In that sense, the context in which eVoting has been introduced in Switzerland is fairly different from Belgium where voting is compulsory.

The second argument is that it would enhance the quality of the vote. The logic behind this line of argument is that before voting online, voters can easily access online a wide variety of information on the election or on the referendum they are going to vote for. The expectation is that citizens will first collect information on various websites before deciding how they will vote. In order to guarantee a better access to political information, Swiss governmental agencies have been considering the creation of web pages on the official online voting website that would gather relevant and neutral information but also

some useful Internet links to political parties websites for example).

The third argument is that Internet voting would reduce the human and financial costs of elections. First, if most citizens prefer to vote via postal ballot or via the Internet, fewer polling stations would have to be open. The simple cost of printing paper ballots would also be suppressed. Fewer officials would be required to count votes. All these elements could lead to a significant reduction in the cost of elections and referendums.

Finally, promoters of eVoting in Switzerland have also underlined that Internet voting is the natural step forward for any modern society. Switzerland has developed rather advanced Internet applications in transit traffic control or in contacts between citizens and administrations (Geser, 2002). ICTs are also present in various aspects of the everyday life (banking, online shopping...). Shifting from paper ballot to eVoting would therefore be a natural change in any modern society.

3.2.7.4.2 Arguments against

When it comes to arguments against Internet voting heard in Switzerland, three potential problems are underlined. The first one is that Internet voting would potentially be a new form of social exclusion as only one half of Swiss citizens are familiar with the Internet (Auer & Trechsel, 2001). A digital divide could lead to the exclusion of some social groups from the democratic process. The fear is that the elderly, the less educated, women and the citizens with less economic resources - all groups with a difficult access to ICTs - would face problems if they have to vote on the Internet.

The second argument against eVoting raised in the Swiss debate is more psychological. It is actually related to the lack of trust voters may have about Internet voting. Having doubts about the security and the transparency of voting online, voters may have a problem of confidence with Internet voting (Cotti, 2002). The lack of confidence concerns two categories of citizens. First, citizens having a very limited knowledge of ICTs may be frightened by something they do not know. As they do not understand how it works, they may face problems to use ICTs to vote. The second category of voters having of potential problem of confidence in Internet voting is voters that know a lot about ICTs. These citizens know how vulnerable Internet systems are for hackers and viruses. Therefore, they have difficulties to use the Internet for elections or referendums.

Finally, a critique against Internet voting that has emerged in Switzerland is that it would transform the act of voting and make it more influenced by emotions. Voting may become an act citizens spend less time and effort in. They would just need to connect on the network, (sometimes) look for information and then vote. The risk is that decisions in elections and referendums are more influenced by short term impressions and that less time is given to think quietly about the arguments in presence (Linder, 2001).

3.2.7.4.3 Evaluations

Having set up the arguments in presence, we will end up by presenting the first evidences that have been made available about the few pilots of Internet voting in Switzerland.

The first element to underline is that there is no evidence that by giving the opportunity to vote online, Swiss authorities have succeeded in boosting turnout. For example, in the Canton of Geneva, in 2004, a turnout of 43.9 per cent was observed in the eight

municipalities where Internet voting was possible while the turnout was 41.1 per cent in other municipalities. In other words, there is a slight positive impact of online voting – already observable in previous elections – but the effect is extremely limited and no general conclusion can be made at that point (http://www.geneve.ch/evoting/rapports_20041128.asp).

When it comes to the question of who are the voters that decide to cast their vote online, the first observation is that the socio-demographic (age, sex, education...) do not appear to be the main determinants. Even if it appears that the older you are, the less you vote online and that the higher your wage is, the more you vote online, the most determinant variable is the familiarity with ICTs (Christin & Trechsel, 2005). The more frequently a citizen uses the Internet and the easier his access to the Internet is, the more inclined he will be to vote online. Therefore, the risk of a digital divide is not simply between richer and poorer citizens, between more and less educated voters, between older and younger persons; the digital divide is between those that do not feel afraid of ICTs because they have a relatively high familiarity with the new technologies and those who know only little about ICTs. Socio-demographic variables are highly correlated with familiarity with ICTs but some less well-off citizens may be familiar with the Internet and therefore will not show major problems with voting online.

3.2.8 The United Kingdom

3.2.8.1 Introduction

Like in most European countries, turnout has been declining constantly in the United Kingdom. In particular, turnout for local elections and for EU elections is very low. For the local elections in 2000 it was below 30 per cent. In 2004, for the election of the European parliament, only 37.2 per cent of all voters turned out and voted. In that context, the British government has decided to develop various initiatives in order to increase electoral participation.

Firstly, in 2000, a new body, the Electoral Commission, has been created. Its role is to organize elections and to look for potential reforms that could amend positively the way elections are held in Britain. In its task, the Electoral Commission has been supported by the Department of Constitutional Affairs and its Electoral Modernization Unit. These two bodies have pushed the British government to explore new ways of voting in order to increase turnout.

Since then, several experiments of new voting methods have been tested across Britain, mainly for local elections. It ranges from postal voting to electronic voting, Internet voting and even SMS voting. Yet, no decision has been taken up to now to introduce electronic voting for all elections.

3.2.8.2 Electoral System

Before going into the issue of electronic voting in the United Kingdom, the British electoral system in use must be described. Actually, it would be more appropriate to speak about the variety of electoral systems as different rules apply for elections at various levels of power. At the national level, for the 659 members of House of

Commons, elections are held every five years (maximum period) under first-past-the-post. Under this electoral system, individual candidates compete for one seat per constituency. In each constituency, the candidate having most votes - even if below 50 per cent of all valid votes – is elected. The main characteristics of the system are the following:

- **electoral formula:** single-member plurality (SMP) also called first-past-the-post (FPTP)
- **size of districts:** 659 constituencies electing each one MP
- **ballot structure:** candidate-centered as voters are asked to vote for one individual candidate and not for lists
- **by-elections:** when a seat is vacant before the term of elections, a by-election is organized to elect a new MP.

First-past-the-post is also in use for local elections in England and Wales. But for all other levels of power, different rules are applied. First, for European elections, since 1999, British Members of the European Parliament (MEPs) are elected under proportional representational organized under the following procedure:

- **electoral formula:** lists proportional representation (D'Hondt quota); in Northern Ireland, Single-Transferable Vote is being used.
- **size of districts:** 12 electoral regions (Scotland, Wales and Northern Ireland, and 9 English regions) electing each 3 to 10 MEPs.
- **ballot structure:** closed lists system, voters can only vote for a list and not for candidates within the list

For the elections of the Scottish and Welsh assemblies, a mixed electoral system called Additional Member System (AMS) is being applied. Each voter has two votes for two categories of members of regional parliament (MRPs): constituency MRPs and top-up MRPs. These two categories refer to two ways to elect MRPs. First, the majority of MRPs are elected under first-past-the-post. The second category of MRPs is elected on lists of candidates under proportional representation. But these top-up seats are not allocated under pure PR; they are attributed to correct the disproportionality of the FPTP seats. After the election of FPTP MRPs, parties having a proportion of seats equal or superior to their proportion of votes are not taken into account for the top-up seats allocation. Only parties being underrepresented are allocated top-up seats to increase their representation according to their share of votes. Top-up seats mainly favor small parties guaranteeing them a parliamentary representation they will not have under FPTP.

In Scotland, the AMS system is being used under the following rules:

- **electoral formula:** Additional member system combining single-member plurality for direct seats and list proportional representation for 56 top-up seats.
- **size of districts:** 73 single-member constituencies for the direct seats and eight electoral regions allocating each 7 MRPs (56 in total).
- **ballot structure:** voters vote for individuals for FPTP seats and closed lists system for top-up seats.

In Wales, the AMS system is being used under the following rules:

- **electoral formula:** Additional member system combining single-member plurality for direct seats and list proportional representation for 56 top-up seats.
- **size of districts:** 40 single-member constituencies for the direct seats and five electoral regions allocating a total of 20 MRPs.
- **ballot structure:** voters vote for individuals for FPTP seats and closed lists system for top-up seats.

And finally, single-transferable vote (STV) is being used for the election of the Northern Ireland assembly and for local elections in Scotland (for the first time in 2007). In Northern Ireland, STV is being used under the following rules:

- **electoral formula:** single-transferable votes.
- **size of districts:** 18 constituencies electing each 6 members of the Stormont Parliament.
- **ballot structure:** voters vote for individuals by ranking them according to their preferences.

The variety of electoral systems in the United Kingdom implies that for the introduction of electronic voting, the legislator has to look for a system with a sufficient level of flexibility to be used with different electoral rules. Another element to take into account is that the way elections are organized is decided by different actors. In most cases, the national government is in charge. Yet, for local elections in Scotland, the Scottish authority is in charge and may decide what system of voting should be used. Local governments are also deciding how elections for local bodies (councils, districts, parishes...) are organized in terms of methods of voting (paper ballot, eVoting, postal voting...).

3.2.8.3 Pilots of Electronic Voting

Since 2000, the British government has authorized local authorities to test new ways of voting for local elections¹⁹. When it comes to eVoting, the 2002-3 local elections were crucial. The government allocated 30 millions pounds for 17 eVoting pilots across the country for a total of about 1.5 million voters (1.426.318) having the possibility to use eVoting methods²⁰. The goal was to offer a wider range of voting methods to all citizens. It was no question of replacing paper ballots; the aim was to allow citizens deciding between various ways of voting. The main methods tested are discussed below.

3.2.8.3.1 Remote Internet Voting

For 14 local elections, a special electoral website was created. Each voter had received on

¹⁹ Since 2000, postal voting is also permitted. Now, for local elections, all citizens may choose between going to the polling stations or to vote by post. In some areas, pilots of electronic counting have taken place. In this report, we have decided to concentrate strictly on new methods of voting using electronic and ICT devices to cast a vote. Therefore, we will not talk about postal voting an electronic counting.

²⁰ In most pilots, more than one eVoting method were being tested at the same time.

his poll card credentials (most of the time, an ID and a password) to log on the website. Once logged on, the voter had to choose the elections he wants to take part (parish or district) and then to vote for his favorite candidate by clicking on his name. The vote has to be confirmed before being validated.

Number of pilots: 14

Number of voters concerned: 1.252.312

3.2.8.3.2 Electronic Voting at Polling Stations

This system is fairly similar to the one using in Belgium. Voters go to the polling station and there they vote on a computer and not on a ballot paper. The goal is to avoid spoiled votes and to make vote easier and faster, especially when it comes to counting votes. At the polling station, voters are identified by showing their poll card to the electoral officers. They receive a smart card to record their vote. They introduce the smart card in the computer. A first screen appears with all candidates. They can choose one by touching the screen. They are then asked to confirm their vote. The voter has then to return the smart card to the poll clerks. The smart card is then introduced by the electoral official in a computer to be counted.

Number of pilots: 8

Number of voters concerned: 729.088

3.2.8.3.3 Telephone Voting

This method of voting was only accessible for citizens using touchtone telephones. Voters who wish to use telephone voting had to call a free phone number indicated on their poll card. The voter was then asked to log on by entering via the touchtone the credentials indicated on his poll card. Following voice prompts, the voter was able to vote by entering the candidate code (mentioned on the poll card). The chosen candidate's name is then read to the voter and he is asked to confirm his vote.

Number of pilots: 12

Number of voters concerned: 1.135.378

3.2.8.3.4 SMS Voting

A few pilots using among SMS voting have also been tested. This method is different from the previous ones because of being less interactive. On each poll card is written a number where to send the vote. The voter is asked to send one single message containing his credentials, the code of his ward and the code of the candidate he wants to vote for. If the message is valid then a confirmation SMS is sent to the voter.

Number of pilots: 4

Number of voters concerned: 471.383

3.2.8.3.5 Digital TV Voting

This voting method is fairly similar to Internet voting in the way it is applied. Voters have to navigate the menu system of their digital TV to access the eVoting service. Once it is done, the voter is asked to enter his credentials (indicated on his poll card). Being identified, he is then asked to select its favorite candidate, to vote for him and to confirm

his vote.

Number of pilots: 1

Number of voters concerned: 39 472

An important point to mention about the pilots held on the occasion of the 2003 local elections is that different service providers were involved. Not less than five companies took part in the seventeen pilots²¹. The goal of the government was to create some competition but also to test different procedures proposed by different service providers.

New pilots of eVoting methods will be taking place for the next local elections in May 2007. On this occasion, Internet voting and telephone voting will be tested.

3.2.8.4 Debates about Electronic Voting

3.2.8.4.1 Arguments in Favor

As said earlier, the initial argument for introducing eVoting in the United Kingdom was to curb the sharply declining trend in turnout for elections at all levels (Pratchett & Wingfield, 2002). For promoters of Internet voting, telephone voting, digital TV voting and SMS voting, enhancing the commodity in the act of voting, making voting easier and quicker will convince some abstentionists to vote. Those who think voting takes too much time and effort could be seduced by the variety and flexibility of new voting methods. Another argument related to the abstention issue is that remote voting, under whatever form, could allow the government to extend the period when voting is possible. Less electoral officials have to be mobilized to control the voting procedures and no public building has to be requisitioned. As a consequence, having elections in more than one single day would be possible without drastically increasing the cost of elections. Seeing the importance of the abstention issue, it is clear that the context in which eVoting has been introduced in the United Kingdom is fairly different from the context in Belgium where voting is compulsory.

Another argument raised in favor of eVoting is that to be socially legitimate, the State should follow the evolutions of society. Booking plane or train tickets, banking or buying books and many other articles, even voting for TV shows is nowadays possible via the Internet or the phone. Therefore, some citizens might not be supportive for a State asking them to vote on ballot paper, in the same way as one century ago. This argument is made clear by Richard Allen MP who declared that ‘for a democracy to command respect, it must operate in the same way as people do everything else in their lives’ (Pratchett *et al*, 2002). In that sense, eVoting is modern voting for a modern Britain (Office of the eEnvoy, 2002).

A third argument mobilized by the promoters of eVoting in Britain is about the variety of choices offered to voters. It has been made clear from the beginning by the Government that new voting methods must come as complements to traditional ways of voting. There is no question to go for a full eVoting election. Multiple channels of voting must be proposed to voters leaving the choice to them (Office of the Deputy Prime Minister, 24

²¹ Athena, Opt2Vote, Strand, BT and Unisys.

May 2002). Here again, the British logic differs significantly from the Belgian one where only one way of voting is offered to voters, either paper ballot or eVoting.

3.2.8.4.2 Arguments Against

Even if relatively limited, the debate about electronic voting in the United Kingdom has been enriched by a few authors insisting on what are, according to them, the main barriers to generalize eVoting for British elections. Three main barriers have been identified. The first one is the issue of security. The main risk is that where Internet voting - but also digital TV, telephone and SMS voting - is used, hackers would try to attack the voting system to either steal votes or to break down the whole system, making electoral results less reliable (Coleman, 2002). If elections are vulnerable to hackers, citizens would probably see the elected bodies as being less legitimate.

The second problem with remote voting is the difficulty to guarantee the secrecy of the vote. In that respect, remote voting techniques are potentially in contradiction with several conventions ratified by the United Kingdom like the European Convention on Human Rights, documents produced by the OSCE and also EU texts like the 1990 Copenhagen declaration (Watch & Birch, 2002). All these documents insist on the obligation for the State to guarantee that vote is kept secret but also that voters are not influenced by others when they vote. In the polling stations, the two requirements can be met but there is no control when it comes to remote voting.

Finally, the third problem with all eVoting methods is that they may potentially damage the principle of equality. Some voters would be denied their right to vote if only voting via the Internet, the telephone, SMS, digital TV but also on computers in polling stations was possible. First, those having no access to these new media would face difficulties to vote. In the United Kingdom, in 2002, 7 per cent of all adults had no telephone, 27 per cent had no mobile phone, 63 per cent had no digital television and 47 per cent had no access to the Internet. Moreover, even if the public authorities provide the access to these technologies, citizens that are not familiar with them may be deterred to vote. They risk believing it would be too difficult for them to vote via ICTs. The consequence could be a higher abstention among these categories of citizens. The problem is that the access to ICTs and the familiarity with new media is biased. In particular, less well-off adults with lower income, women and elderly citizens have proven to have a less frequent access to new technologies (Independent Commission on New Voting Methods, 2002).

3.2.8.4.3 Evaluations

The last part of this short note on eVoting in the United Kingdom will mention the first elements of evaluation available from the pilots of electronic voting. The first lesson is that turnout has not proven to be increased strongly in areas where multiple channels of voting were offered to voters. Actually, postal voting has shown to be much more efficient than eVoting in that respect. In 2000, turnout for local elections had fallen to less than 30 per cent. In 2003, where pilots of postal voting were led, turnout raised to 49.2 per cent. eVoting methods also increased turnout – to 37.3 per cent– but it was below the level of participation observed with postal voting (Electoral Commission, 2003).

Another interesting element to mention is that where voters had the possibility to chose

between traditional ballot papers, postal voting and eVoting methods, they rarely went for eVoting. When it comes to the 2002 pilots, it appears that, in the 17 pilots, 14.6 per cent of voters opted for Internet voting, 6.1 per cent for telephone voting and 2.7 for SMS voting when 76.5 per of all voters preferred to use postal vote and traditional ballot papers (Electoral Commission, 2002: 44).

The evaluation of eVoting pilots was also made possible by a study directed by the Electoral Commission and conducted by the MORI (*Market & Opinion Research International*) to evaluate the attitude of British voters towards eVoting in areas where pilots were held. First, the ease of using new eVoting methods has been investigated. The results seem to show that none of the new ways of voting are fairly difficult (see table 1). Among the five eVoting methods tested (Internet, telephone, SMS, kiosks and digital TV), telephone voting appears to be perceived as being the easiest. Interestingly, it is the device voters are most familiar with.

	Very easy	Fairly easy	Nor easy nor difficult	Fairly difficult	Very difficult	Don't know
Internet voting	33	26	7	3	4	27
Telephone voting	49	27	6	4	3	12
SMS voting	41	23	5	3	5	23
Digital TV voting	22	28	11	5	5	29
Electronic kiosk voting	33	26	8	4	2	27

Table 1: How easy was it to use...? (all in per cent), Source: MORI (2003)

The MORI survey also tried to evaluate if effectively using eVoting methods changes the perception voters have about Internet, telephone and kiosk voting. This analysis has been conducted by comparing a sample of voters having effectively used one of the eVoting methods and another sample of voters that have never used eVoting methods. The two samples were questioned about easiness of use, commodity, security and secrecy (see table 2).

		Easiness	Commodity	Security	Secrecy
	Number of voters questioned	Proportion of positive answers			
Telephone Telephone	119 2733	88% 70%	98% 84%	71% 37%	87% 52%
Internet Internet	207 3134	93% 52%	98% 67%	59% 23%	81% 40%
Kiosks Kiosks	182 808	84% 54%	79% 54%	60% 42%	57% 49%

Table 2: Easiness, commodity, security and secrecy of new voting methods. Source: MORI (2003)

Lines in black count for those voters who effectively used the new voting methods. Other lines count for voters who did never used one of the new voting methods. From table 2, it appears that having an effective experience of the new voting methods do increase the support for the eVoting. The proportion of voters who are positive about Internet voting, telephone voting and kiosk voting is significantly higher among respondents who did have one experience of these new ways of voting. The difference between the two groups is valid for easiness of use, commodity, secrecy and security. These figures seem to show that using once eVoting can demystify the fear some voters have about the new ways of casting a vote.

3.3 Evaluation of Electronic Voting in Belgium

3.3.1 The Effects on Voting Behavior

Electoral systems are not neutral. They have clear effects on the way in which people vote. The technical aspects of the vote – like voting on paper or using a computer – should however not have any effects on the vote.

The introduction of electronic voting in Belgium has been realized in stages, and is today still not complete. That has set the ideal environment for an analysis of the effects of the introduction. Indeed, the dynamics of the vote *in the same election* could be compared between the areas where the voting was done on paper and the areas where the computer was used. Especially the election of 1999 was a good moment to check for effects. In 1999 the set of cantons where electronic voting was used was large enough to compare with those where ballot papers were used. For many voters the electronic vote was a new phenomenon, and if it would have effects on the voting behavior, this should have been quite visible in 1999.

Yet the conclusions are very clear: there is no significant effect of the introduction of electronic voting on voting behavior. We summarize the conclusions below.

- None of the parties wins or loses as a result of the introduction of electronic voting. Electoral swings are not significantly different in the two sets of cantons, and differences in the total results per set can be explained by differences in results in these cantons at previous elections.
- The introduction of electronic voting reduces – as could be expected – the number of blank and invalid votes. Since invalid voting is not possible with the computer, the decline can easily be explained.
- The introduction of electronic voting seems to have slightly reduced the voter turnout. This is especially clear in the Flemish cantons, where the turnout in the cantons with electronic voting was reduced by more or less 1%. In Brussels the turnout dropped slightly in 1995, but not only in the cantons where computers were used. This was therefore not an effect of electronic voting. Turnout dropped also in general in Wallonia in 1995, but not in 1999. The effect on turnout is therefore small and quite mixed.

In Brussels there were interesting lay-out effects, with candidates on ‘visible’ places on

the computer screen – top of bottom of columns – receiving more preference votes. This is however not an effect of electronic voting as such. Lay-out effects can also occur with paper ballots.

3.3.2 The Acceptance by the Public

It was very clear from our comparative analysis of other countries where electronic voting was introduced that discussions arise about the legitimacy of the use of computers. In some countries – especially the Netherlands very recently – there have even been quite heated debates. This was never the case in Belgium. No groups or actions committees have criticized in a systematic way the gradual introduction of the voting computers. On Election Day complaints can sometimes be heard about technical failures, but hardly about the lack of trust in the machines and in the system.

A research team from the ULB checked for the legitimacy of electronic voting in 2003 (summary of the report in appendix). At that time the electronic voting was not new any more. While it was good to check for effects immediately after the introduction in order to be able to set up a quasi-experimental design, the ULB team was able to see whether the repeated use of electronic voting had led – if distrust there was – to acceptance of the system.

The results are quite clear. The absence of any systematic mobilization against the system reflects a wide and basic acceptance of it by the voters themselves. Delwit & co write in their conclusion:

“Without a doubt, and based on the data from this research using questionnaires, it is shown that the relationship of Belgian voters with electronic voting is largely positive. Both in terms of ease of use as well as of societal acceptance, the surveys conducted recorded large rates of support in the new method of voting”.

3.4 References

- Auer, A & Trechsel, A.H., *Voter par Internet? Le projet eVoting dans le canton de Genève dans une perspective socio-politique et juridique*, Centre d'études et de documentation sur la démocratie directe, Genève, 2001.
- Breuer, F. and Trechsel, A.H., 'Report for the Council of Europe - eVoting in the 2005 local elections in Estonia'. 2006
- Christin, T. & Trechsel, A.H., *Analyse du scrutin du 26 septembre 2004 dans quatre communes genevoises (Anières, Carouge, Cologny et Meyrin)*, E-Democracy Center, Genève, 2005.
- Commission on Electronic Voting, 'First report of the CEV on the Secrecy, Accuracy and Testing of the Chosen Electronic Voting system'. 2005, online: http://www.cev.ie/htm/report/first_report/pdf/01Part.pdf.
- Commission on Electronic Voting, 'Interim report of the CEV'. 2005, online: http://www.cev.ie/htm/report/view_report.htm.
- Cotti, L, "eVoting: Analyse comparative des implications techniques et politiques", Rapport final COST A14, IDHEAP, Chavannes-près-Renens, 2002.
- Delwit, P., Kulahci, E., Pilet, J.-B., *Le vote électronique: un choix légitime?*

- Bruxelles/Gent: Politique scientifique fédérale/Academia Press, 2004
- Department for Constitutional Affairs, Electoral Modernization Pilots. Local Government Elections 3 May 2007. Details of Pilot Initiatives (January 2007).
- Department of the Environment and Local Government, 'How the Dial is elected (lower house of parliament)'. 2006, online: [http://www.environ.ie/DOEI/DOEIPol.nsf/0/7b0f5af65995bd3980256f0f003bc80e/\\$FILE/Dail%20\(E\).pdf](http://www.environ.ie/DOEI/DOEIPol.nsf/0/7b0f5af65995bd3980256f0f003bc80e/$FILE/Dail%20(E).pdf).
- Deschouwer K., Buelens J. & Heyndels B., *De invoering van het elektronisch stemmen in 1995 en 1999. De impact op het stemgedrag en op de verkiezingsuitslag*, Vakgroep Politieke Wetenschappen, Vrije Universiteit Brussel. Rapport in opdracht van het Ministerie voor Binnenlandse Zaken
- ECPRD, 'Electoral systems in Europe: an overview' 2000, online: http://www.ecprd.org/Doc/publica/OTH/elect_system.html.
- ECPRD, 'Electoral systems in Europe: an overview'. 2000, online: http://www.ecprd.org/Doc/publica/OTH/elect_system.html.
- Electoral commission, Local Electoral Pilot Schemes 2003 (April 2003).
- Electoral commission, Modernizing elections - A strategic evaluation of the 2002 electoral pilot schemes (August 2002).
- Electoral commission, Technical Report on the May 2003 Pilots (April 2003).
- Electoral Council/Netherlands Ministry of the Interior and Kingdom Relations, 'Elections in the Netherlands'. Den Haag, 2005
- Electoral Reform Society, Pilot Alternative Voting Methods in the 2003 Local Elections in England.
- Estonian National Electoral Committee, 'Estonian evoting system'. 2005, online: http://web-static.vm.ee/static/failid/011/e-voting_system.pdf.
- Estonian National Electoral Committee, 'Evoting system: overview'. 2005, online: <http://www.vvk.ee/elektr/docs/Yldkirjeldus-eng.pdf>.
- Etat de Genève, Rapport sur le 7e scrutin officiel en ligne du canton de Genève, second scrutin fédéral pour lequel le vote par internet était offert, Genève, 28 novembre 2004,
- Estonian National Electoral Committee, 'Parliamentary elections 2007 – Turn out'. 2007, online: <http://www.vvk.ee/r07/paeveng.stm>.
- Farrell D. M. (2001), *Electoral Systems, a comparative introduction*, Houndmills, Palgrave
- Franklin, Mark (2002), The dynamics of electoral participation, in L. LeDuc, R. Niemi & P. Norris, *Comparing democracies. New challenges in the study of elections and voting*, London: Sage Publications, p. 148-168
- Geser, H., "Electronic Voting in Switzerland", in Kersting, N. & Baldersheim, H., *Electronic Voting and Democracy. A Comparative Analysis*, Palgrave, London, 2002, pp. 75-96.
- Gonggrijp, R., Hacking the Nedap – the aftermath'. 2007, online: 'http://rop.gonggri.jp/.
- Het Expertise Centrum, Stand van zaken automatisering rond verkiezingsproces. 's Gravenhage, 28 mei 1999 <http://web.inter.nl.net/users/sf/wortels/hec99.html>

- Independent Commission on Alternative Voting Methods, Elections in the 21st Century: from paper ballot to eVoting (January 2002).
- Linder, W., “Gutachten zum eVoting”, Rapport d’expert pour la Chancellerie fédérale, dans le cadre du groupe de travail Vote électronique, Bern, 2001.
- MAATEN, E., ‘Towards remote eVoting: Estonian case’. 2004, online: http://static.twoday.net/evoting/files/maaten_p81-90.pdf.
- MADISE, U., ‘eVoting in Estonia experience’. 2006, online: http://static.twoday.net/evoting/files/First_Experience_with_eVoting_in_Estonia.pdf.
- McCarthy, J., Electronic Voting in Ireland – Summary of Costs’. 2004, online: <http://evoting.cs.may.ie/Documents/CostofElectronicvoting.pdf>.
- McGaley, M. and Gibson, J.P., ‘Electronic Voting: A safety critical system, March 2003’. 2003, online: <http://evoting.cs.may.ie/Project/report.pdf>.
- Midwest Democracy Center, ‘Irish elections – election of the Dial’. 2002, online:
- Minister of the Interior and Kingdom Relations J.W. Remkes, Remote Voting Project. Letter to the Chairman of the House of Representatives of the States General. The Hague, 25 March 2002
- Ministry of the Interior and Kingdom Relations, Evaluation Report. Experiment with Internet and telephone voting for voters abroad. The Hague, 2004
- Ministry of the Interior and Kingdom Relations, Report on the Internet and telephone voting experiment. The Hague, 2004
- MORI (Market & Opinion Research International) Social Research Institute, Public opinion and the 2003 electoral pilot schemes (May 2003).
- Niemoller, K., Appendix 2K. Experience with Voting Machines in the Netherlands and Germany. Dublin: Trinity College, The Policy Institute, 2004
- Office of the Deputy Prime Minister, Implementation of Electronic Voting in the UK (24 May 2002).
- Office of the Deputy Prime Minister, Public Attitudes Towards the Implementation of Electronic Voting. Qualitative Research Report, (28 June 2002).
- Office of the eEnvoy, In the Service of Democracy: A Consultation Paper on a Policy for Electronic Democracy, Cabinet Office, London, 2002.
- Paris, M., ‘Accessible democracy and electronic voting in the republic of Ireland’. 2004, online:
- Pratchett, Lawrence & Wingfield, Melvin, “Electronic Voting in the United Kingdom: Lessons and Limitations from the UK Experience”, in Kersting, Norbert and Baldersheim, Harald, Electronic Voting and Democracy. A Comparative Analysis, Palgrave, London, 2002, pp. 172-189.
- Pratchett, Lawrence, Birch, Sarah, Candy, S., Fairweather, B., Rogerson, S., Stone, V., Watt, B., Wingfield, M., The Implementation of Electronic voting in the UK, Local Government Association, London, 2002.
- Volkamer M. & R. Vogt (2006), New generation of voting machines in Germany, <http://fee.iavoss.org/2006/papers/fee-2006-iavoss-New-Generation-of-Voting-Machines-in-Germany.pdf>
- Watch, Bob & Birch, Sarah, “Electronic Voting: Free, Fair and Secret? A paper on the

legal constraints (and possible solutions) facing remote electronic voting”, in Mény, Yves & Treschel, Alexander H. (eds), *eVoting and the European Parliamentary Elections*, Florence, European University Institute, 2002, 19 p.

3.4.1 Online Information

<http://bundesrecht.juris.de/bwahlg>
<http://de.wikipedia.org>
<http://ec.europa.eu/idabc>
http://www.cev.ie/htm/report/download_first.htm
http://www.coe.int/t/e/integrated_projects/democracy/02_activities/02_eVoting/00_eVoting_news/finalreportevotingestoniaco6_3_06.asp#P52_4680
http://www.coe.int/t/e/integrated_projects/democracy/EVoting/
http://www.geneve.ch/evoting/rapports_20041128.asp
http://www.instantrunoff.com/Irish-Voting/Irish_Elections.html
http://www.minbzk.nl/bzk2006uk/subjects/constitution_and/internet_elections/publications?ActItmIdt=13253
<http://www.minbzk.nl/bzk2006uk/subjects?ActItmIdt=4799>
<http://www.minbzk.nl/bzk2006uk/subjects?ActItmIdt=6407>
<http://www.rit.edu/~easi/itd/itdv10n2/paris.htm>
<http://www.balticvoices.otg/litelexlaw.htm>
<http://www.bundestag.de>
http://www.coe.int/t/e/integrated_projects/democracy/EVoting/JONAS%20UDRIS-Strasbourg2006.ppt
<http://www.das-parlament.de>
<http://www.heise.de/newsticker>
<http://www.idea.int>
<http://www.ipu.org/parline-e/reports>
<http://www.tagesschau.de/aktuell>
<http://www.ulrichwiesner.de>
<http://www.wahlrecht.de/news>

3.4.2 Summary of “Le vote électronique: Un choix Légitime?”

This section gives a summary of the paper written by Delwit, P., Kulahci, E. and Pilet, J.-B.: “Le vote électronique: un choix légitime?”, appeared in *Bruxelles/Gent: Politique scientifique fédérale/Academia Press, 2004*

3.4.2.1 Introduction

Does representative democracy imply that there is ... representation? What does one mean by *representation*? Looked at very generally, it means that the legislative

(Parliament and government) and executive (government) bodies represent the opinions of those who are represented.

The primary method for expressing opinions in democracies is by voting: the Parliaments are made up of representatives that reflect the different trends of the opinion expressed by the vote. So to say “that a regime is based on the principle of representation means that society’s conflicts and divisions are projected onto the election playing field and give their content to the power stakes implied by the contest”²². Universal suffrage is neither a historical fact nor a clear-cut contemporary feature.

There have been and there still are individuals who are excluded from voting and universal suffrage²³. For a long time, several European countries had representational parliamentary systems that were not democracies. Elected representatives and voters represented the elite (whether economic or cultural) and the vote was only spread to a small proportion of the population. We then experienced a *notabilization* of political relations. “Political and electoral legitimacy comes before societal authority and esteem of which it is a ‘natural’ extension”²⁴. As Max Weber put it, one is not then living from politics but for politics²⁵. Several restrictions existed and still exist with universal suffrage. For many years, governments either slowed down or restrained access to voting.

Nowadays, the problems arise in new and really reverse terms. The question is more about knowing how to bring citizens back to the ballot boxes and in this manner to perpetuate the legitimacy of the democratic system.

Indeed, voter turnout rates have been falling for the past twenty years. In many European countries, abstention has risen in a straight line since the end of the seventies right up to present day. In view of this trend and considering the growing number of election choices for *a priori* non-government parties, several analysts and political leaders have been wondering about ways to curb this development.

In part, thoughts relating to *electronic voting* lie within this context. A certain number of academics and political leaders have been examining institutionalized restraints likely to improve the current state of affairs. Naturally in this framework, the automated vote is only one element amongst others. In this regard, Arend Lijphart has undoubtedly pursued this the furthest, since in 1997 he suggested (re)introducing compulsory voting in democratic States in order to respond to the sagging voter turnout: “Compulsory voting can not resolve the entire conflict between the ideals of participation and equality, but by making voter participation as equal as possible, it is a very valid partial solution”²⁶.

The will to reduce voter abstention was not the only issue at the origin of studies on the possibility of introducing or extending electronic voting. The mobilization of new communication methods and technology for voting was also at issue. Particularly as the unfortunate vote counting experience in the state of Florida during the 2000 presidential

²² Pierre Avril, *Essais sur les partis politiques*, Petite bibliothèque Payot, 1990, 223 pages, p. 176.

²³ René Rémond, « Pour une histoire idéologique du suffrage universel : d’une utopie contestée au consensus relativisé » (1982), in R. Rémond, *La politique est-elle intelligible?*, Brussels, Complexe, 1999, p. 211.

²⁴ Yves Deloye, *Sociologie historique du politique*, Paris, La découverte, 1997, p. 96.

²⁵ Max Weber, *Le savant et le politique*, Paris, Plon, 1963

²⁶ Arend Lijphart, “Unequal Participation: Democracy’s Unresolved Dilemma”, *American Political Science Review*, March 1997, Vol. 91, n° 1, p. 11.

election highlighted concerns about traditional methods of voting and vote counting²⁷.

This report shall first briefly discuss the issue of automated voting by looking at the response to the introduction of electronic voting by Belgian citizens who used. We shall show the results of a major exit poll survey conducted on the occasion of the May 18 2003 federal elections on Belgian's opinions with regard to electronic voting. Two major issues were examined. To what extent was automated voting as it was used in Belgium considered as easy or difficult to use? Was electronic voting commonly accepted or rejected by the voters who used it?

3.4.2.2 The Belgians and Automated Voting

On May 18 2003, a team of twenty-seven pollsters supervised by seven researchers and professors from the Université Libre de Bruxelles went to thirteen polling stations in the country. The fieldwork was done in Lens (Hainaut Province), Liège centre, Seraing and in Sart Tilman (Liège Province), in Asse (Province of Flemish Brabant), Antwerp centre and Borgerhout (Antwerp Province), in Anderlecht, Jette, Brussels-City and Saint-Gilles (Brussels-Capital District). In addition, two teams of pollsters went to Waarschot (East Flanders Province) and Verlaine (Liège Province) where the so-called 'ticketing' method was being tried out.

The questionnaire submitted at the polling station exit on May 18 2003 was in three parts. The first had a series of questions that enabled defining the socio-demographic profile of the individuals interviewed.

This information has a twofold use. On the one hand, it enabled assessment of the value of the sampling in terms of representativeness. On the other hand, this data also permitted us to determine whether certain socio-economic groups or certain age categories showed any specific association with electronic voting problems.

The section part of the questionnaire contributed a second round of objective data on the profile of the persons polled. Its purpose was to provide the resources needed to assess whether familiarity with computers and the information received beforehand about this new voting system tended to influence the way voters felt about computerized voting.

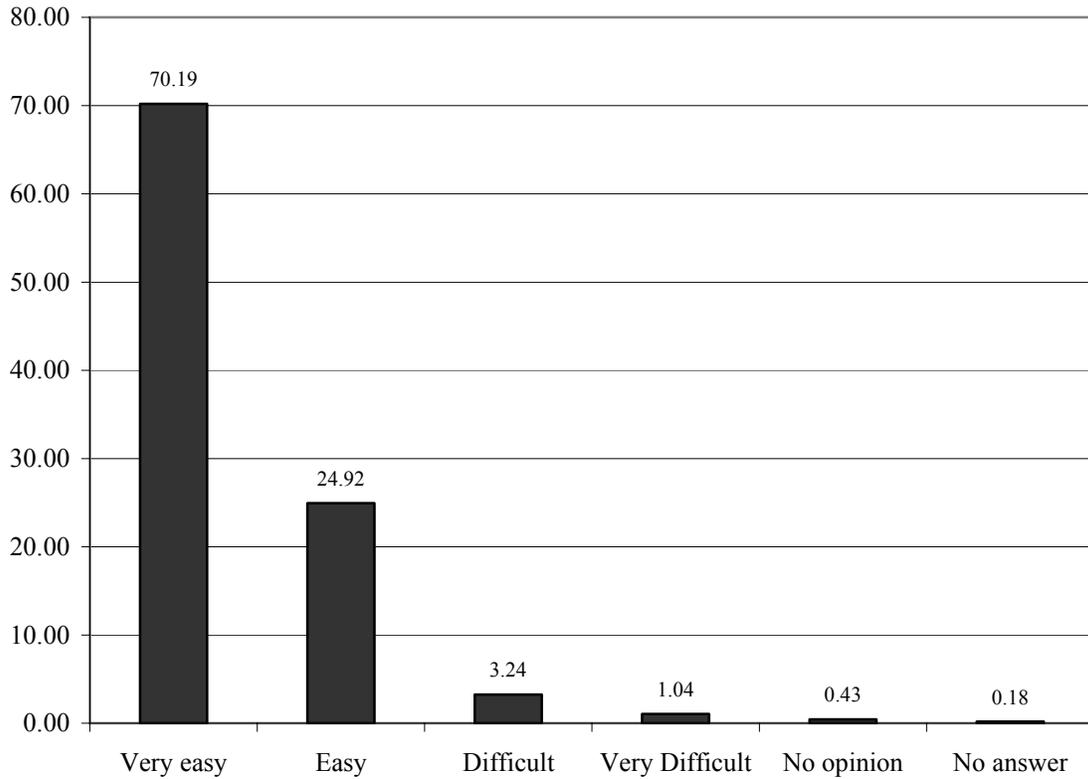
3.4.2.3 The User-friendliness of Electronic Voting

Those polled were asked to evaluate the easiness/difficulty of use by stating that electronic voting as 'very easy', 'easy', 'difficult' or 'very difficult' to use. Looking at the figures, it seemed clear that if there was any criticism voiced by the interviewees about electronic voting, the reproaches had nothing to do with the user-friendliness of this method of voting.

Indeed, just under three-fourths of respondents stated 'very easy' for computerized voting. The positive comments relating to the actual operation of the electronic voting mechanism even reached 95.11% if one adds the 24.92% of persons who noted 'easy' to vote with computer. Except for a very small minority of 3.28%, a favorable opinion was given about the user-friendliness of electronic voting.

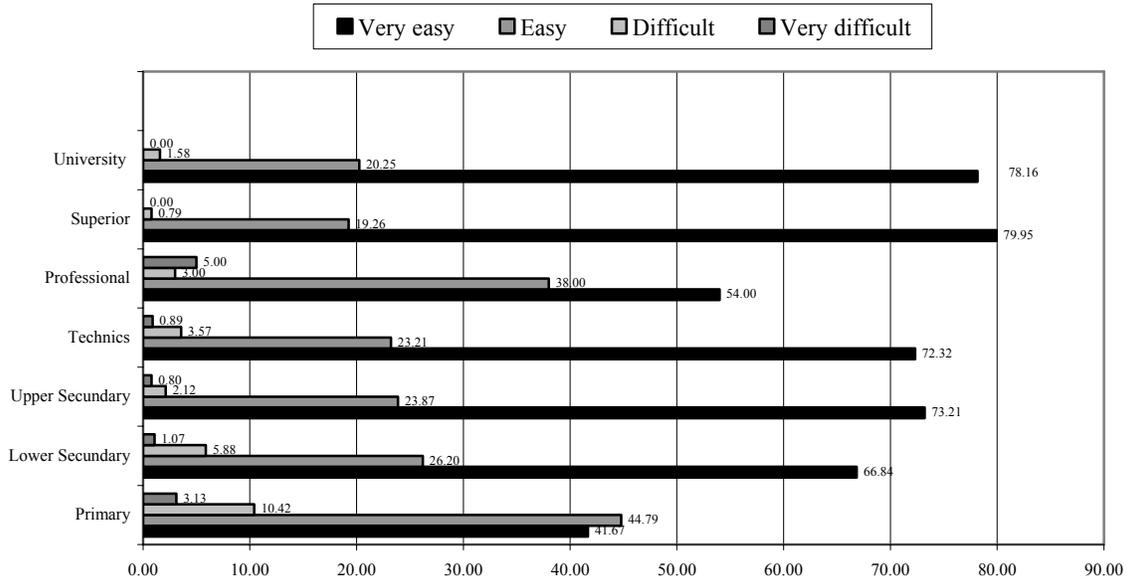
²⁷ Robert Jarvis, *Bush vs Gore. The fight for Florida's vote*, New York, Kluwer Laws's International Vote, 2001.

Easiness/difficulty in using electronic voting



If one cross checks ease of use with the educational background, one can analyze to what extent electronic voting would be more accessible to the better educated. The data obtained in our research was able to confirm this hypothesis to a certain degree. Indeed, it was with respondents having greater academic assets (university and college qualifications) that the percentages of people who stated ‘very easy’ for electronic voting were the highest. In the two cases, it was close to 80% (78.16% for university graduates and 79.95% for those who graduated from colleges). Conversely, individuals with few academic assets gave fewer favorable answers. For example, it was only 41.67% with people whose final diploma was the one they obtained at the end of their primary school education.

Degree of ease depends on academic assets

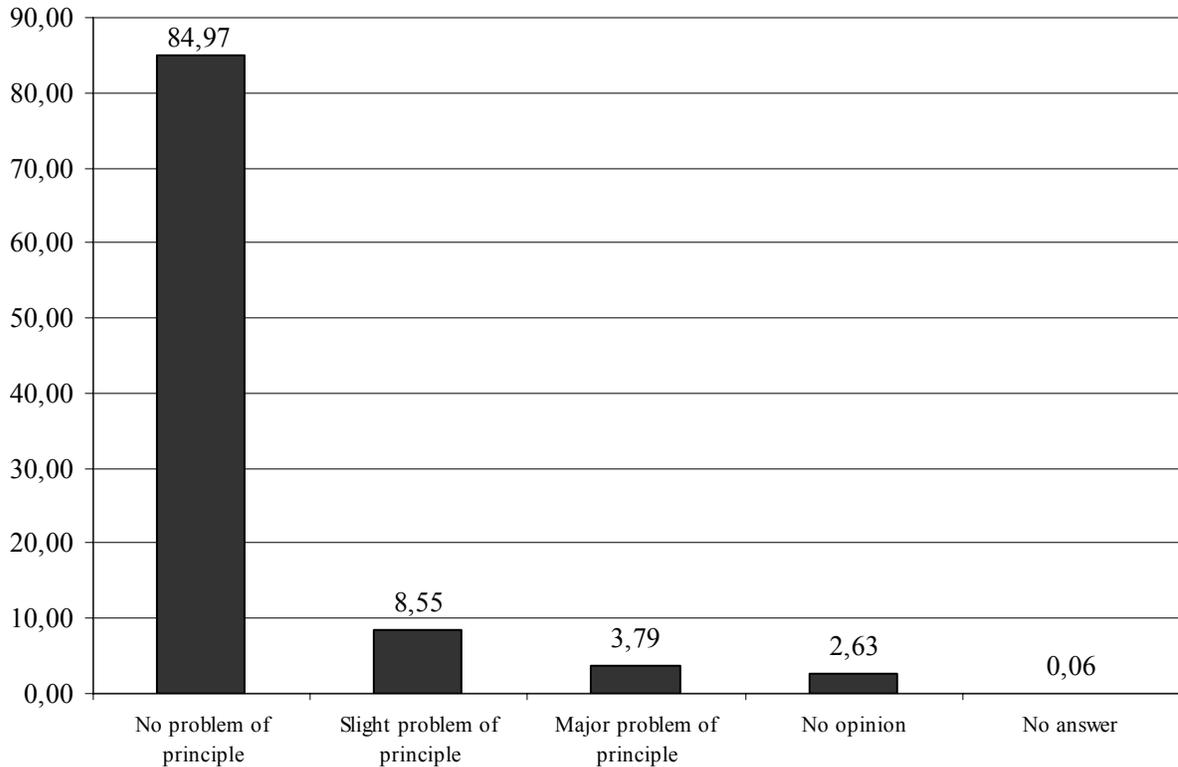


3.4.2.4 Societal Acceptance of Electronic Voting

The second variable tested was societal acceptance of electronic voting. Here, it dealt with assessing within our sampling if electronic voting posed any philosophical problems.

In order to assess if the persons interviewed had any complaints to make in this realm, an *ad hoc* question was put to them. It asked them to state if for them, electronic voting was ‘a major problem of principle’, ‘a slight problem of principle’ or ‘not a problem of principle’.

The matter of principle



The figures are clear for the matter of societal acceptance of electronic voting. By a very substantial majority (84.97%), the respondents stated that for them, the new voting method was not a problem of principle. The two other replies were only given by 12.34% of those questioned.

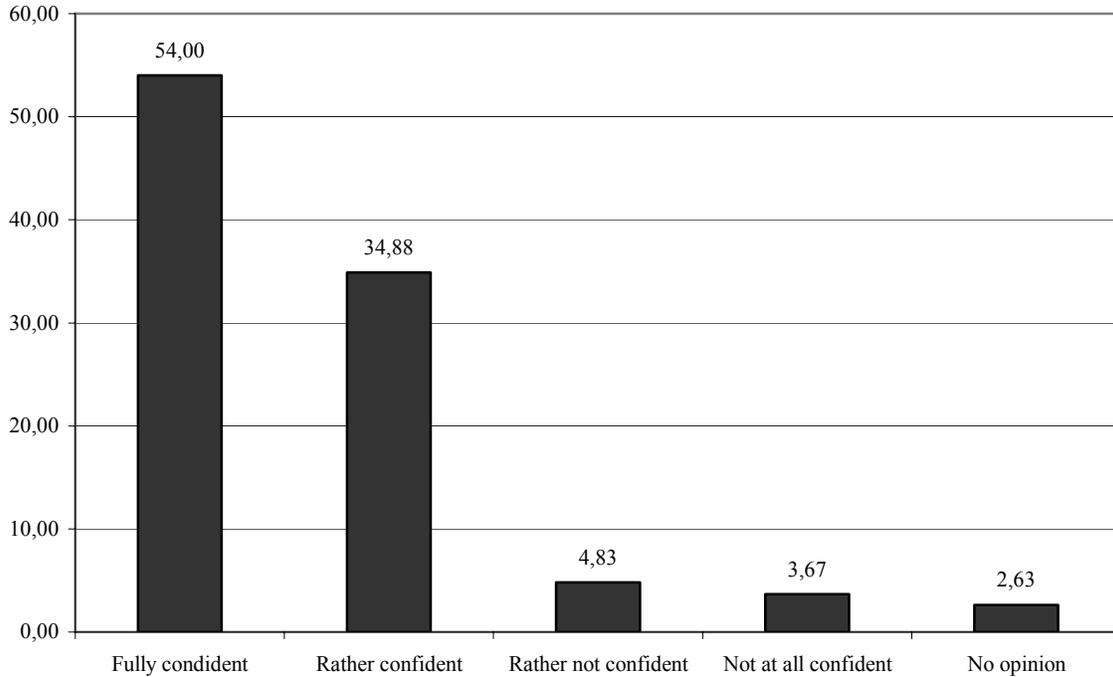
Therefore it clearly emerged that societal acceptance of electronic voting was not a disputed issue within our sampling taken on May 18 2003 at polling station exits.

3.4.2.5 The Issue of Trust/Mistrust in Electronic Voting

The third and final question was about citizens' confidence in automated voting. The last variable is vital for establishing the legitimacy of computerized voting. As several authors have repeated, without this legitimacy, any wide-scale application of this method could be problematic.

Over the sampling as a whole, there was a majority feeling of trust towards automated voting. The favorable responses ('full confidence' and 'rather confident') were mentioned in 88.88% of cases. Only 8.5% of those surveyed expressed mistrust ('rather not very confident' and 'not at all confident') towards computerized voting.

Trust/mistrust in electronic voting



The feeling of trust appeared to dominate to a large extent, although it was not without reservations. Indeed, a majority of respondents (54%) expressed complete confidence, but nearly a quarter of the sampling expressed qualified trust (34.88%).

Thus there was now a different configuration than the one for the question on ease of use. For the latter variable, the proportion of qualified responses was much lower.

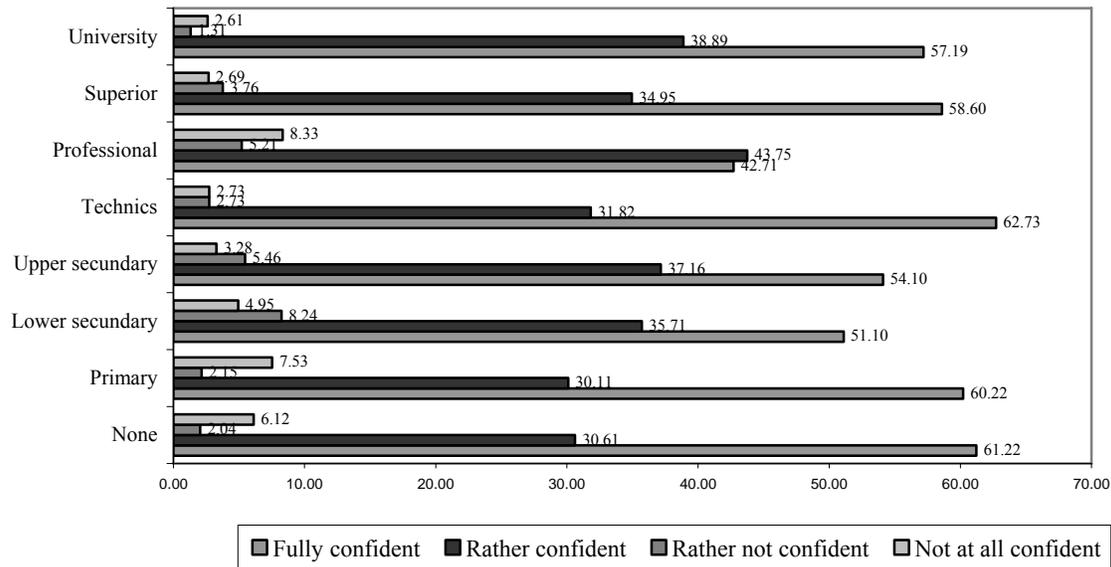
Just as with ease of use, it was interesting to cross check this data on trust with a several independent variables. The first run dealt with academic assets.

The first lesson learned was that no matter what the final diploma was, trust was expressed by the wide majority. In all cases, over 80% of respondents expressed complete or reasonable confidence in computerized voting.

Even so, some differences were noticed between the levels of academic assets. Complete confidence was highest in respondents with the lowest level of academic assets ('no diploma' [61.22%] and 'primary school diploma' [60.22%], as well as by individual who took technical education (62.73%).

It was respondents who held diplomas from higher or lower secondary studies as well as those who took vocational education who expressed the least confidence, especially with regard to their overall confidence. Those who completed their course of education in vocational studies were the only ones whose most frequent answer was 'rather confident' (43.75%).

Trust versus mistrust depending on academic assets



The differences were especially noticeable between the answers ‘Fully confident’ and ‘rather confident’. The total for these positive responses remained at around 80 to 90%, regardless of which academic assets.

In other words, the respondents who expressed mistrust (‘rather no confident’ and ‘no confidence at all’) were in all cases very much in the minority. The highest figures were in the neighborhood of 10%. Amongst respondents with a lower secondary school diploma, 13.19% expressed mistrust. As another example, we can also mention those with vocational education diplomas who expressed the highest rate of mistrust with 13.54%.

The age category that least expressed ‘full confidence’ (46.73%), the 30-39 year olds, was also the one in which the total number of confident respondents (‘full confidence’ or ‘rather confident’) was the highest (91.9%).

This clearly strange revelation reflected a broader trend in which it turned out that as the age of respondents increased, there was more ‘full confidence’ but also more mistrust.

The skeptical responses (‘rather no confidence’ and ‘no confidence at all’) were largely in the minority no matter what the age of the respondents. On average, we had rates of mistrust between 5 and 13%.

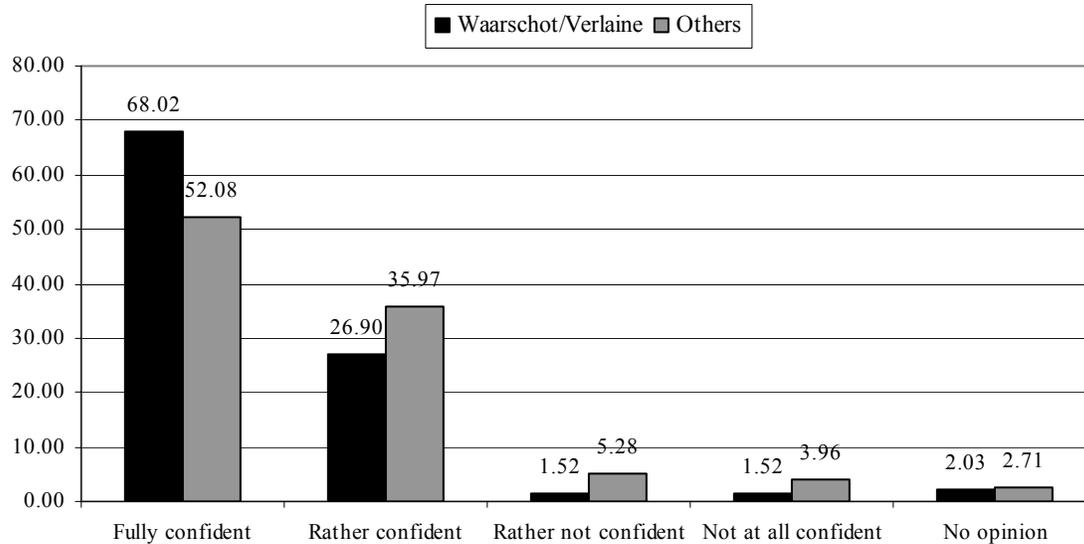
The age category expressing the least mistrust was the 30-39 year olds with 5.3%. At the other end, we found the 60-69 year olds for whom computerized voting raised a feeling of mistrust in 13.24% of cases. For the latter, as well as with the 70 + category, the answers ‘not at all confident’ even reached 6.85%. We shall return to this issue.

It seemed therefore that the oldest individuals, who were also those who had the least contact with computers and IT, expressed comparatively more caution with regard to the new way of voting. The relationship between age and mistrust was not in a straight line however. Indeed, the 30-39 year olds and those aged 50-59 were the categories in which mistrust was the lowest. In both cases, the mistrust rates remained below 8%.

Finally what about the experimental tests with ticketing? The experiment conducted at

the Waarschot and Verlaine polling stations increased confidence a bit but it especially altered its fundamental nature. 70% of voters in these polling stations actually confirmed they had complete confidence in computerized voting compared to 52% of voters in other stations. In the contrary, the number of citizens expressing some kind of mistrust was reduced to its most simple expression, 3%, compared to 9% amongst citizens voting in a different station. It did indeed seem that ticketing had a valued added effect.

Comparative table of trust/mistrust in polling stations with ticketing and in the others



Electronic voting is starting to be used more and more at the expense of paper ballots. In this respect, it was interesting to put it into perspective and see how Belgian voters felt compared to the old voting method.

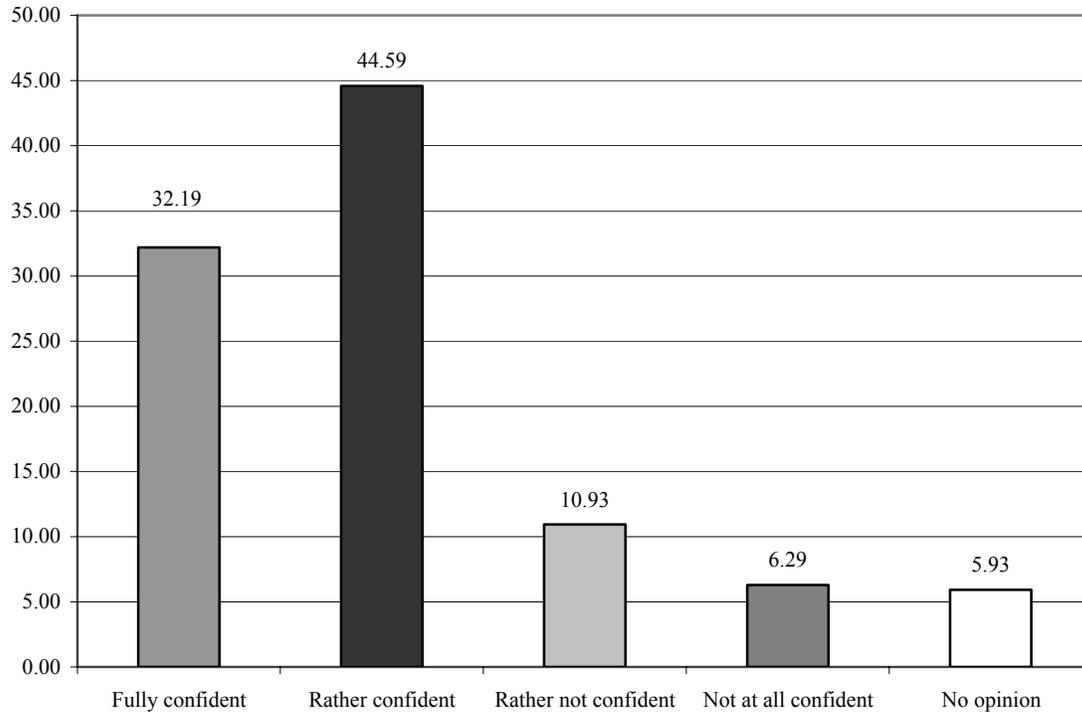
The preceding figures showed that computerized voting gave rise to relatively few negative reactions on the subject of user friendliness, societal acceptance and trust. Nonetheless, it was certainly advisable to wonder if the relationship to the new voting method was better or not as good as Belgian ties to the paper ballot.

For this purpose, the questionnaire submitted at the poll exits included a question about confidence in voting with paper ballots.

A majority of respondents expressed their confidence in the paper ballot. 32.19% of them declared to have 'full confidence' and 44.59% said they were 'rather confident', which meant 76.78% positive responses.

Negative responses were made by 17.26% of those polled (10.93% 'relatively little confidence' and 6.29% 'no confidence at all'). Finally, there were 5.93% with no opinion. Amongst the latter, one undoubtedly will find voters who have never voted with paper ballot.

Trust or mistrust in the paper ballot



Ju

st as for electronic voting, the confidence of those questioned was largely positive. Even so, it was expressed in a more nuanced manner than it was for the new voting method. The paper ballot received more ‘reasonably confident’ than ‘fully confident’. Conversely, 54% marked ‘full confidence’ for electronic voting compared to 34.88% ‘reasonably confident’. Nonetheless, this comparison must be made with caution because it compared real circumstances – the electronic voting done on May 18, 2003 – with a past situation – voting with paper ballot – or virtual, notably in the case of the under 30’s who may have never voted with paper ballot.

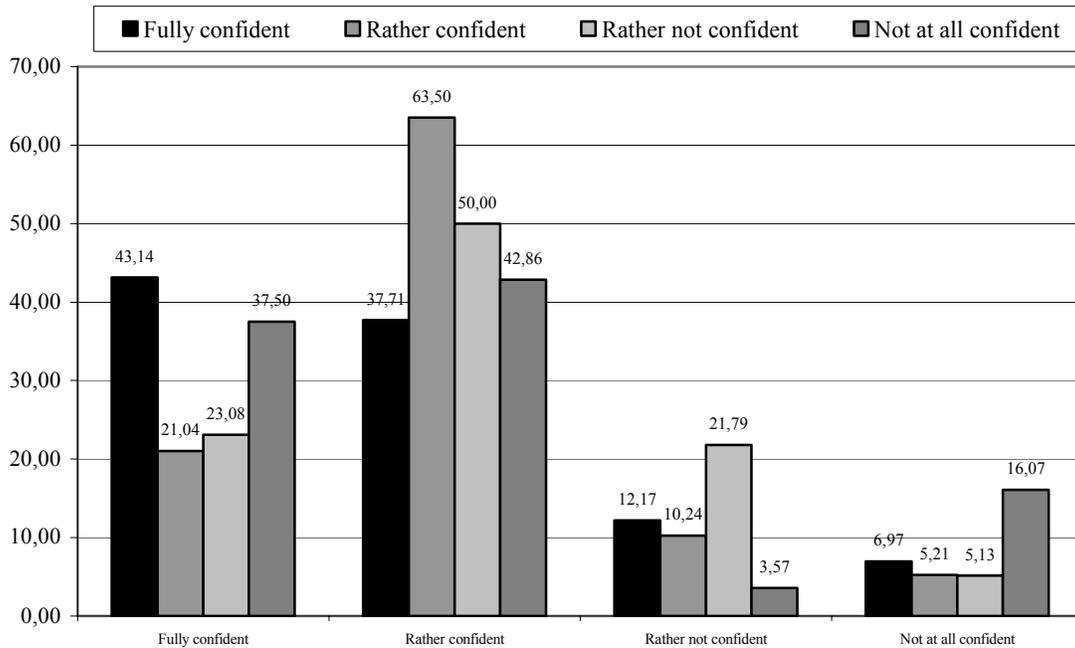
In short, the two voting methods inspired respondents’ trust. Nevertheless, the confidence grades were more moderate for voting with paper ballot.

The positions with regard to paper balloting and electronic voting could be cross-checked. The goal was to see if the positions vis-à-vis the former method were the same as for computerized voting.

The table below can be read in the following manner. The people who were completely confident about computerized voting are represented on the black columns. These respondents were subdivided between the four answers on paper ballots and according to the percentages that are above the lines. The same logic applies for the other three colors.

The people who placed complete confidence in electronic voting most often gave the response ‘fully confident’ for the other voting method (43.14%). The response that was in second place was ‘rather confident’ (37.71%). Mistrust was expressed moderately in 12.71% of cases and decidedly in 6.97%. Overall, the respondents who had complete confidence in electronic voting also placed a lot of confidence in paper ballots. Even so, less than half declared complete confidence in both cases.

Cross-checking of confidence in electronic voting and paper



Amongst those surveyed who said they had ‘reasonable confidence’ in electronic voting, 63.5% were also ‘reasonably confident’ in voting with paper ballots. The second case was ‘full confidence’ with 21.04%. Then came ‘relatively little confidence’ with 10.24% and ‘no confidence at all’ for 5.21% of cases.

Three quarters (73.08%) of those interviewed who noted relative mistrust in electronic voting were more disposed towards the former method. With the latter, the paper ballot obtained 50% of ‘reasonably confident’ and 23.08% of ‘full confidence’. Finally, 5.13% had less confidence in the paper ballot.

With the voters approached at the polling station exits who declared they had ‘no confidence at all’ in computerized voting, they also found a certain preference for the old system. 37.5% had complete confidence in the paper ballot and 42.86% were ‘reasonably confident’. 16.07% had ‘no confidence at all’ in either of the two methods of voting. Finally 3.75% of respondents in this category had ‘relatively little confidence’ the paper ballot.

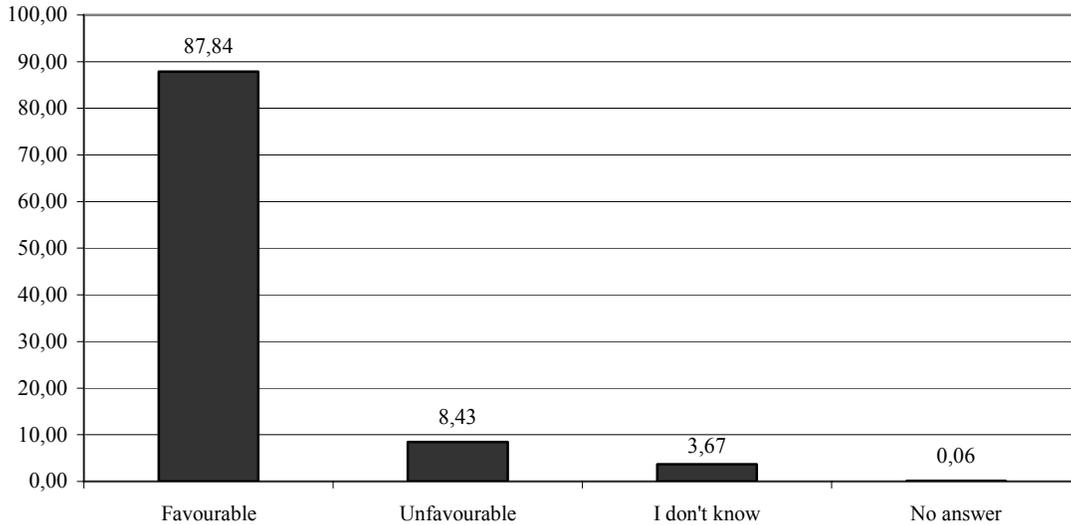
In brief, two trends appeared. A majority of those who had confidence in electronic voting also had confidence in the paper ballot, but in a more moderate fashion. On the other hand, with those who mistrusted the new method, it was generally through preference to the former technique.

The respondents’ positioning towards electronic voting was analysed in detail according to three variables: societal acceptance, user friendliness and trust. A fourth and more encompassing question was added to the questionnaire. It asked the respondents to state if in the end, they were or were not favorable to computerized voting.

A vast majority (87.84%) answered yes to this question. Less than 10% gave an

unfavorable answer (8.43%). The percentage of non-answers was 3.67%. As with the totality of questions, the opinions were positive with regard to electronic voting. But one should keep in mind the nuances that surfaced with socio-demographics and voter familiarity with computers.

Overall feeling regarding electronic voting



If we differentiate between voters from polling stations with ticketing system and the others, we once again observe a high level of acceptance. Nearly 92% of voters in Verlaine and Waarschot declared themselves in favor of computerized voting compared to 87% of surveyed voters from other polling stations. And only 6.6% had a differing opinion compared to 8.7% in the second category.

3.4.2.6 Conclusion

In every representative democracy, the act of voting is without a doubt a stumbling block. Through it, citizens exercise their sovereignty; through it, they choose representatives, they exercise control over those in power, decide on societal projects. This multitude of functions fully demonstrates the importance of voting. Under these conditions, when the ballot box verdict loses representativeness, legitimacy or credibility, it is the entire democratic system that grinds to a halt.

In the combat against abstentionism, institutional imposition is at the top of the list. This approach can lead to rather radical suggestions: the world-renown political science expert Arend Lijphart suggested (re)turning to compulsory voting²⁸. However, ‘more moderate’ proposals are being examined. One of the key approaches aims at making voting easier.

This approach would involve making voting easier through a variety of improvements. In this way, voting would become simpler, which would have the knock-on effect of bring

²⁸ Arend Lijphart, “Unequal Participation : Democracy’s Unresolved Dilemma”, *American Political Science Review*, March 1997, vol. 91, n° 1, p. 11.

voters (back) to the polling stations, even if in reality abstentionists can be considered as being 'in remission' from the voting system.

A few nuances should be added to this diagnosis. Some studies have well and truly shown that an evolution in voting methods can increase voter participation. So, Jean Blondel, Richard Sinnott and Palle Svensson in particular plotted a higher rate of abstention in the countries where voting took place on a weekday than in countries where it took place on Sunday the 8th. But the main cause of the drop in voter participation did not stem from these secondary elements and basically reflected the significance of the election.

Be that as it may, technical solutions to abstention were certainly the ones that gave rise to most of the legislative initiatives. At various levels, numerous countries experimented with technical innovations aiming at making voting *easier*.

As technical innovation technique, automated voting can have implications in terms of societal cohesion. In Belgium, it could intensify four categories of polarization:

1. between rich and poor,
2. between those who pursued higher academic studies and those who have minimum qualifications in academic terms,
3. between young and old,
4. and between the Northern half and Southern half of the country.

Just as the Netherlands, Great Britain, the United States and Brazil, Belgium partially introduced this new method of voting.

In 1991, the villages of Waarschot and Verlaine served as the first testing grounds for this. The trial was considered conclusive enough for the procedure to be expanded. At the last elections on May 18th 2003, around 44% of voters used the new method.

In this context, the *Centre d'étude de la vie politique* of the *Université Libre de Bruxelles* got involved in very extensive field research. Studies have included an 'exit poll' conducted on May 18, 2003. It enables them to compile 1637 questionnaires on the entire country.

In this concise report, we have given a brief presentation of the results of this survey. Looking at the figures, it seemed clear that if any criticism was made with regard to electronic voting, the main concern of these reproofs had no connection with the user friendliness of this voting method. Indeed, a bit less than three-quarters` of respondents felt that they had used computerized voting 'with the greatest of ease'.

Generally speaking, the fact to have already voted by computer, but also the respondent's familiarity with IT, tended to promote to a great extent the convenience of automated voting. Apropos, modest elements of a *digital gap* were noted: there was an underlying trend for people with the lowest level of academic assets to encounter the most difficulties. These reservations only involved a minority of respondents but the observation was verified by our 'exit poll' and likewise for three target publics that we analyzed in a post-election survey.

At societal acceptance level, the exit poll results showed the absence of any major problems. By a very large majority (84.97%), respondents confirmed that the new method of voting did not pose any problems in principle. Societal acceptance of

electronic voting appeared to be contest just a little and not very strongly within the scope of our sampling taken on May 18th 2003 at the polling station exits. We noted that only 8.5% of Belgians interviewed felt a ‘small problem of principle’ regarding automated voting and 3.5% of whom did express a major objection to this voting method.

The third dependent variable assessed was confidence in the new method of voting amongst Belgian voters. The favorable responses (‘full confidence’ and ‘reasonably confident’) were expressed in 88.88% of the cases.

By comparison, confidence in the paper ballot is less clear-cut. The respondents expressed moderate confidence (‘reasonably confident’) more often and complete (‘full confidence’). It was nonetheless necessary to consider this approach with cautiously because we compared two different things: an experienced action and that was commented on (automated voting) and a hypothetical scenario (voting with paper ballot) which, for a certain number of Belgians, never happened.

Looking at the cross-checking of certain socio-demographic data with levels of confidence in electronic voting, some nuances can be established. Thus we could detect differences in terms of levels of academic assets. Complete confidence was highest in respondents with the lowest academic assets (61.22% with respondents that had no diploma). Thus it was the opposite of the observation established for ease of use.

The second cross-checking carried out on the matter of trust/mistrust was the influence of age on the responses. Here too, the great majority expressed confidence. In all age categories, more than 80% of respondents reported ‘full confidence’ or ‘reasonably confident’. However, it was noted that when the age of respondents increased, the attitudes with the most opposition increased as well: *those with complete self-confidence* and those *with deep-seated mistrust*.

The aforementioned figures show that computerized voting gave little rise to negative reactions in the realms of user friendliness, societal acceptance and confidence. However some nuances existed when studying data that was dependent on specific aspects: academic assets, age or familiarity with computers.

Moreover, we observed that in the Verlaine and Waarschot polling stations, where the ticketing experiment was introduced, societal acceptance and confidence in computer voting were higher than the average.

If it is feasible financially and in terms of organization, the implementation of computerized voting together with ticketing appeared beneficial from two points of view:

- In the eyes of voters, it seemed to increase confidence in the use of electronic voting.
- For political and social party actors, political leaders, candidates, and civil society associations... – it enables verification in case of grave doubts or controversies.

Nonetheless, it would undoubtedly be more judicious to reverse the official quality of the ballot; the official ballot would be the automated ballot. The ‘paper ballot’ would be used uniquely in the event of a request for verification. Indeed, the ‘paper count’ for the Verlaine and Waarschot polling stations on the 18th and 19th of May 2003, proved to be extremely problematic and kept teams of vote counters hard at work for most of the night.

Within a context of combating abstentionism at European level, we were able to assess

the gradual introduction of computerized voting in Belgium. This research conducted by the *Centre d'étude de la vie politique* of the *Université Libre de Bruxelles* today enables the establishment of a reliable analysis of the question. Without a doubt, and based on the data from this research using questionnaires, it is shown that the relationship of Belgian voters with electronic voting is largely positive. Both in terms of ease of use as well as of societal acceptance, the surveys conducted recorded large rates of support in the new method of voting.

To be sure, some categories of citizens expressed reservations and individuals with the weakest academic assets encountered the most difficulties in using electronic voting. The same applies for senior citizens.

Conversely, the youngest expressed a more moderate level of confidence with regard to this. Nonetheless, in no example did the negative opinions have the most replies. Societal legitimacy of the new voting method within the sampling of Belgian voters that this analysis is based on did not seem to pose any insurmountable problems for the interpretation of these results.

Naturally these findings are at a *representative* level. They express the feeling of voters towards a (relatively) new method of voting. As such, they do not prove the absence or the presence of potential problems. But in the eyes of a clear majority of voters, automated voting on site at the polling station did not cause any particular difficulty with use and no specific concerns as to the tallying and announcement of the results.

We would like to emphasize that it would be interesting to poll other actors on this voting method. In particular we are thinking about the chairmen of polling stations on Election Day and of local representatives who are partly responsible for the material and financial organization of the elections. This may well be the subject of new surveys during the next elections.

4 Usability and Accessibility Aspects

4.1 Usability of Electronic and Internet Voting Systems²⁹

The progression made in the development of interactive applications in the past years, has led to a broad range of opportunities for electronic voting and voting over the Internet (eVoting). Today's technology allows voting via voting machines in kiosks, the Internet, portable devices and even interactive television. On the one hand, these electronic voting systems yield several advantages including faster election result tabulation, voting from home and voting from abroad. On the other hand these electronic or eVoting systems differ from traditional paper ballot voting in respect to design. Electronic or eVoting systems may for example utilize other input devices than paper ballots to cast a vote, including a touch screen, buttons, a mouse or a stylus. The ballot representation on electronic or eVoting systems, including layout, color usage, font usage and candidate representation (by name or by picture), may also differ from traditional paper and pen ballot designs. The several design aspects of an electronic or eVoting machine can be determinant for the usability and perceived security of the electronic or eVoting system and can as a consequence influence the voter's ability to vote (user performance), the outcome of the elections and the perceived legitimacy of the election (Herrnson, Niemi, Hanmer, Bederson, Conrad & Traugott, 2006). For example, when a voter is not able to read the names of the several candidates as a consequence of poor contrast between the used font and the chosen background or because of a glare on the screen, the voter may make a mistake and vote for a person he did not want to be elected. In this case, the electronic or eVoting system was not adapted to the needs of the user (the user needed more contrast between the text and background) and as a consequence user unfriendly voting system caused errors. As voting is a right for all Belgian citizens above the age of 18, it is important that all eligible voters are able to use the electronic or eVoting system correctly and confidently. Therefore the design of a new electronic or eVoting system for the Belgian elections should be developed with the Belgian voter and election officials in mind. This can be reached by a user-centred design process.

4.1.1.1 User-Centered Design

Adopting a user-centered design approach is essential in order to develop a user-friendly and usable electronic or eVoting system. According to the definition 'Usability is the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use' (ISO/IEC 9241-11). To create a usable or user-friendly system, the user-centered design approach will therefore always consider the user, the environment and task characteristics in each step of the design cycle in order to flexibly implement design changes which allow the user to maximize the effectiveness, efficiency and satisfaction of task performance (selecting a candidate). Therefore user-centered design requires the specification of the end user, context of use and task requirement as early on in the design cycle.

In user-centered design, initially the user, environment and task characteristics will be

²⁹ authors: Ilse Bakx, Dirk Bollen & Johan Pelssers, K.U.Leuven-CUO;
email: ilse.bakx@soc.kuleuven.be

identified. Based on the identified needs, a conceptual model or prototype of the application will be developed. Secondly, it will be assessed through usability testing whether the conceptual model or prototype meets the usability requirement. Usability testing is achieved by conducting structured observations of representative users (voters and election officials) completing key tasks (in the voting procedure) in a relevant setting (voting booth) (Federal election Commission, 2003a). Based on the effectiveness, efficiency and satisfaction of task performance of the user, design elements that negatively influence the usability of the application can be identified. The usability of voting machines, for example, can be measured in objective measures (amount of errors, time needed to correct errors) and subjective measures (perceived ease of use and the rated opinion of the users). Based on an analysis of the identified problems for usability, the application can be redesigned to better match the user, environment or tasks and consequently avoid the identified problems for usability. In order to identify whether the design changes effectively improve usability of the application, the application should again be tested based on user testing. The iterative nature of user-centered design is represented in Figure 2. More information on user-centered design can be found in the ISO/IEC 13407, more specific information about user-centered design and voting systems can be found in “Procuring a User-centered voting system” (2003b).



Figure 2 Illustration of user-centered design

It is important to implement usability testing repeatedly throughout the complete design phase, meaning from the start of development until after the completion of the application. The utilization of usability testing solely on the end of the design cycle limits the possibilities to redesign the system in order to resolve usability problems that could have been identified and corrected during usability testing. ‘Early usability testing allows the identification of usability problems when they are easier and less expensive to correct’ (Federal election Commission, 2003a). Usability testing is therefore essential to effectively identify interface design shortcomings (Federal election Commission, 2003a). The importance and a more detailed description of usability testing is outlined in ‘Usability testing of Voting systems’ report of the Federal Election Commission (2003a).

In a first step to the development of a new electronic or eVoting system for Belgian elections, the second paragraph will provide a short overview on the experience of foreign counties with usability of electronic or eVoting systems. Based on the collected research on usability in foreign countries, several general guidelines for electronic or eVoting systems will be identified and provided in the third paragraph.

4.1.1.2 Related Electronic and eVoting Usability Studies

The general awareness of the importance of usability testing of electronic voting devices dates from after 1998 (Quesenbery, 2001). It is observed that this awareness is partially fed by failure of voting systems in previous elections (Ferguson, 2004). The following two examples will illustrate this:

- The tumultuous 2000 presidential elections in the United States showed how vulnerable current voting systems were. Voting results in Palm Beach Florida needed to be recounted because of a badly design punch card ballots. Eventually the voting results in Florida determined the result of the presidential election (Bederson, Lee, Sherman, Herrnson & Niemi, 2003).
- In an Australian election in 1998 two candidates were separated by only three or four votes. After counting, officials discovered that out of 80.000 ballots, they had made about 100 mistakes.

While these events led to a shift to electronic voting systems they also stress the importance of well-designed, usable voting systems. Normally an error of 3-4% is allowed in an election (Simons 2004). The chance that the voting counts of two candidates are so close together is very low and almost never occurs. When this problem arises, as in the 2000 presidential election, the need for more reliable and usable systems is stated.

There haven't been that many opportunities to investigate the usability of an electronic voting system (Hochheiser, Bederson, Johnson, Karat & Lazar, 2005). The reason for this is that only recently there is a growing awareness of the importance of usability evaluation and elections only occur once in four or two years. Most usability studies have been conducted in the US and are performed after the 2000 presidential election. Other countries that use electronic voting systems conducted studies that concentrated on the security of the voting systems and on the attitude towards electronic voting. Although more than 19 countries are using electronic voting systems little research can be found about usability research of these systems. Several countries have even been experimenting with electronic voting over new media like the internet and text-messaging but research on this is very scarce. In the following section we describe some examples of usability studies performed in different countries.

4.1.1.3 The United States of America

As a result of the problems experienced with the 2000 presidential elections it became apparent that there was a great need for usable voting methods. After these elections U.S. Congress passed the 'Help America Vote Act' (HAVA). The act contains several recommendations for the change of the voter registrations system, transition from punch card systems to electronic voting methods that will enable voters to cast their vote without assistance (Bederson et al., 2003, Simons 2004). Research showed that most polling places in the USA used outdated voting machines including the unreliable punch card ballots. Only 1/3 of the electorate was using electronic voting systems such as optical scanning devices or direct recording systems. It also showed that the outdated,

more error prone devices were mostly used in regions which are primarily populated with poor, ethnic and racial minorities (Bederson et al., 2003).

The questions whether electronic voting machines can overcome the problems caused by outdated voting systems is investigated in a comparative study of different voting systems in the USA. This study was performed by the Caltech MIT voting technology project. Research showed that of the five types of voting machines, i.e., hand-counted paper, mechanical lever machines, punch cards ballots, optically scanned paper, and electronic voting machines. It shows that the electronic machines have the second highest rate of unmarked, uncounted and spoiled ballots in presidential, senate and governor elections of the last 12 years (measurement 1988-2000) (Alvarez, 2005). Although electronic voting machines have several advantages, in their current use, they are not better in decreasing the rate of unmarked, uncounted and spoiled ballots. This study pointed out that there is a **need for an in depth usability study** to improve the interface between voters and the electronic voting system.

The University of Maryland conducted an exit poll in 2 counties to assess the performances of the new voting machines. The system under test was the AccuVote-TS with touch screen (Herrnson, Bederson & Abbe, 2002). Results show that most voters found the electronic voting systems easy to use and trust them to accurately record their votes. Still, a significant number of users needed assistance to cast their vote. Further results were analyzed in terms of computer use, education, race, gender and age and can be found in Herrnson, Bederson & Abbe (2002).

In another study of the university of Maryland 4 different usability research methodologies were applied for the evaluation of electronic voting systems in the US (Herrnson, Niemi, Hanmer, Bederson, Conrad & Traugott, 2006). The following research methodologies were applied:

- Review by Human-Computer expert
- Laboratory experiment
- Large scale field experiment
- Natural experiment conducted in Florida and Michigan

4.1.1.4 Argentina

The Caltech voting project performed a pilot study of four different electronic voting systems in Buenos Aires (Alvarez, Ansolabehere, Antonsson, Bruck, Graves, Negroponte, Palfrey, Rivest & Stewart, 2001). Observations were performed in 43 voting station locations located throughout the city. The following data gathering methods were used in this study: Short questionnaires (all participants), long questionnaires (subset of participants), voting system logging and observations. Some examples of the usability observations:

- Some voters were having difficulty inserting the ballot in the device.
- Some machines had problems with accepting a correct completed ballot.
- Some (elderly) reported problems with inserting the smartcard into the electronic voting device. Some voters tried every possible combination of smart card

insertion before the found the correct way of inserting the smart card.

4.1.1.5 The EU CyberVote Project

In September 2000, the European Commission launched the CyberVote project. The CyberVote project involved the development of an eVoting system that was tested in different elections in 2002-2003. The first test was held in the French town of Issy-les-Moulineaux in 2002. 860 voters have elected their representatives to the city boroughs' counsels electronically. The second test took place in Germany in 2003 at the Bremen University. The trial covered the elections of the three University's representative bodies: the university council, the councils of the different university departments and the student council with a total of 47 voters casting their votes electronically. The last test took place in the Swedish Kista with the participation of the elderly citizens in Kista in 2003. Much work was needed to attract voters aged over 55. The trial was open all day during the one week. At the end of that period, 226 voters had participated in the electronic voting. In July 2003, the CyberVote project has officially ended. <http://www.eucybervote.org/main.html>.

4.1.1.6 The Netherlands

In the Netherlands mechanical voting machines were used until 1974, and then gradually electronic versions began to replace them. The University of Twente performed a pilot reliability and usability study of the NEDAP electronic voting machine (Hoof van, Gosselt, de Jong, 2007). The NEDAP voting machine is used in the provincial, national and European elections. This study was performed in reaction to the media coverage about potential drawbacks of electronic voting systems. The aim of this pilot study was to (1) provide some preliminary answers to which extend the NEDAP voting system was reliable and user friendly (2) to investigate the feasibility of this type of research for future elections.

The research was performed at the town hall of Enschede (NL). A total of 566 voters participated in this study. For this study participants were guided to a separate room where a voting office was simulated. There they received a task. Participants needed to cast a vote using the NEDAP voting machine and the traditional voting ballot. The voting process was recorded using a video camera. Result of the study show that the output of the NEDAP voting machine corresponds with the input. Only a few usability problems were reported. When personal mistakes and research setup problems are set aside both types of voting systems caused 1% problems that referred to usability problems.

<http://www.sos.cs.ru.nl/research/society/voting/index.html>

4.1.1.7 Belgium

Belgium introduced electronic voting with the federal elections in 1991. From that point on electronic voting was used in the local, provincial and European elections in 1994-2000, regional and national elections in 1995, 1999 and 2003. Belgian has tried to learn from problems in the previous electronic elections to optimize the electronic voting process.

With the federal elections on 18 may 2003 the 'Centre d'étude de la vie politique' of the

Université Libre de Bruxelles (ULB) performed an exit-poll (Delwit, Kulahci & Pilet, 2003). The goal of this exit-poll was to investigate the social acceptance of electronic voting. Questions on trust and usability were asked to 1455 voters. The majority of the voters had no problems with the electronic voting system. Only a small minority of 4.28% reported that they had problems with the electronic voting process. Further results show an inverse relationship between educational level and the number of problems reported. Within the group of voters with low- or no education degree 20,37% reported that the voting was 'difficult' to 'very difficult'.

4.1.1.8 Other Relevant Projects

An overview of electronic voting projects in different countries:

- http://en.wikipedia.org/wiki/Electronic_voting#_note-vec
- <http://www.aceproject.org/ace-en/focus/e-voting/countries>

An overview of projects that group information about electronic voting systems and usability research.

- **Usability Professionals Association (UPA) : Voting and Usability project** “The UPA Voting and Usability project works with Design for Democracy to mobilizes an interdisciplinary group of research and design professionals to increase participation in the civic experience. Their goal is to have a positive impact on experiences between the government and the governed.”
http://www.usabilityprofessionals.org/upa_projects/voting_and_usability/index.html
- **Louise Ferguson : eVoting Usability and User Experience Services** “These pages contain more than 200 annotated resources on voting and electronic voting (eVoting): design, usability, accessibility and security aspects (including verified voting) of both old and new technologies. Includes material relating to kiosk (DRE) systems and remote Internet voting. There are as yet few materials on usability of voting and electronic voting - most are US, and you'll find them listed in the US section.”
<http://www.louiseferguson.com/resources/evoting.htm>

4.1.2 Guidelines for Electronic eVoting Systems

Foreign research on the usability of electronic voting systems reveals that, in general, the implemented electronic voting systems already are positively rated on usability. Herrnson, Bederson and Abbe (2002) and Bederson, Lee, Sherman, Herrnson and Niemi (2003), among many others, report that respectively 90% and 86% of all voters positively rated the usability of the used electronic voting system. The majority of voters had favorable impressions of the system and felt comfortable using it (Hochheiser et. al, 2007). Bederson et al. (2003) reported that only 10% of all users found the tested electronic voting system difficult or somewhat challenging to use. Additionally voting machines seem to allow 97% to 98% voters to correctly cast their votes (Herrnson et al., 2002). The university of Twente (2007) reported that in only 0,9% of all trials with the

Dutch electronic voting system mistakes were made by the voters as a result of usability problems. This is the same amount of wrongfully cast votes as a consequence of usability errors as were made in paper ballots. Although an inconvenience factor of 10% and an error of 1% to 3% are relatively small, it is essential to improve the usability of electronic voting systems in order that all voters should be able to easily and correctly exercise their fundamental right of voting.

There are three broad categories in which user-interface questions regarding electronic voting can be divided (Hochheiser, Bederson, Johnson, Karat & Lazar, 2007). First of all one has to determine which knowledge one must provide prior to system usage in order to successfully complete the voting procedure and which information should be presented to the user to improve the usability of the system. Secondly an electronic or eVoting system should allow voters to cast their vote correctly, with relative ease, and requiring minimal assistance. Therefore one has to determine whether the user are able to easily and confidentially understand the voting machine, read the contents on the ballot and cast their vote. Thirdly the voter should not mistrust the overall process, nor mistrust the legitimacy of the results of the elections. A new electronic or eVoting system for Belgian elections therefore should be usable and perceived as secure. Research on the usability of electronic voting systems has resulted in several identified guidelines for usable and (perceived) security of electronic or eVoting systems. The guidelines for usability and the (perceived) security of electronic and eVoting systems will be reported on electronic voting systems.

4.1.2.1 Education

Elections for the several governments of Belgium, Flanders and local government boards only recur in cycles of four or five years with another election date for each election. Therefore elections will approximately recur once in every two years. As a consequence of this irregular and infrequent nature of elections, it is difficult, and foremost probably useless, to provide education on electronic voting machines to the voters. First of all, because of the infrequent nature of elections, voters may not remember how to use the system that they have used in previous elections. Voting on electronic voting machines never develops into a regular activity or habit. Therefore education on electronic voting machines needs to be organized and offered to the user for each and every new election, making it a costly and therefore difficult to implement. In Belgium this is traditionally achieved by giving the public the opportunity to practice voting with the electronic voting systems in the week before each election. Secondly, the voting machines may differ in format from election to election. As a consequence, voters will always be voting on unfamiliar equipment. The constant changes in user interfaces from election to election cause that education on how to use the voting system needs to be redesigned and must be provided to the complete voter population for each election. This again can be countered by allowing the public to practice voting with the electronic voting systems in the weeks leading up to the elections.

4.1.2.2 Walk-up-and-use

Ideally, the voting systems need to be “walk up and use”, requiring minimal or no training for voters before they enter the booth to cast their vote (Hochheiser et. al, 2007). From the point of arriving at the electronic voting machine, it should be absolutely and

directly clear to the user how to use the system, without that the user is relying on education on the electronic voting system. In other words, the electronic voting machine should work intuitively. Hochheiser et al. (2007) claim that walk-up-and-use electronic voting systems should be developed according to the following criteria. In order to develop a walk-up-and-use electronic voting system, the electronic voting machine should at least be developed based on user-centred design in order to meet user needs, environment requirements and task requirements. In other words, the usability of the electronic voting systems should be maximized for all users.

4.1.2.3 Usability Guidelines for the Design of Electronic Voting Systems

Oostveen and van den Besselaar (2005) and Hochheiser et al. (2007) differentiate 4 stages of voting: Registration, validation, casting of the vote and verification. In reality, each of these stages can be performed physically and through an electronic voting system. As all four stages can be performed based through an electronic voting system, usability concerns and guidelines for all four stages will be presented in the next paragraph. By not fully addressing usability issues in the whole voting process one runs the risk of overlooking potential important problems (Hochheiser et. Al., 2007).

4.1.2.3.1 Registration & Validation

In the first phase of registration the potential voter communicates with some established authority to verify and authenticate themselves as individuals that are indeed eligible to vote. Also, during this phase the voter will obtain the necessary credentials to allow him/her to participate in the next phase. During validation it is established that the person is indeed the verified person. In case registration and validation occur electronically, it is important that it is secured that only a correctly identified and validated voter can cast a vote. Until now, in Belgium registration and validation has been performed manually by an election official. With the introduction of the electronic passport, registration and validation could be automated through a card reader. The electronic passport in combination with a validation code (4 digit code) could serve as a voter card which allows each Belgian citizen to identify, register and validate him- or herself as an eligible voter or not. Still it remains a question whether such a system of registration and validation is user friendly. People might forget their 4-digit code. The system might therefore deny them to exercise their democratic right to vote. In case an electronic card and electronic card reader are used for vote registration and validation, the electronic voting system should keep the following guidelines for usability in mind.

- The voting procedure should preferably start with the insertion of the electronic passport (or voting card). Clear instructions should be available to insert the electronic passport into the card reader in order to start the voting procedure.
- The card and card reader should clearly indicate in which manner the card should be injected into the electronic card reader.
- The electronic card reader should be clearly visible to the user and be placed in a clearly recognizable and intuitive position.

- Only one card reader should be available to the user. In this manner the user can not get confused about which card reader to use.
- The card reader should accept the card conform to ATM-machines. This means that the card should be halfway entered by the user and then be swallowed by the electronic card reader. Users expect the card to be swallowed once halfway entered into the slot of the card reader as almost every card reader of banking or atm-machines works in an analogue manner (Herrnson et al., 2002). Therefore card readers in which cards should be inserted until a clicking point should be avoided.
- Digit codes may be needed for electronic validation, but it requires the user to perform an extra verification step in the beginning of the voting procedure consisting of entering numbers on a numeric keyboard or other input device (Herrnson et al., 2006). A usable voting system should allow the users to directly start selecting the candidates without preliminary efforts prior to the actual voting (Herrnson et al., 2006). Therefore it has to be decided whether electronic registration and validation are desired.
- The card-reader should not return the electronic voting card unless the voting procedure is successfully completed.

4.1.2.3.2 Vote Casting

As described above, electronic voting systems should be walk-up-and-use. When the voter arrives at the electronic voting system, it should be clear how to operate the electronic voting system and which actions the voter needs to perform to successfully cast a vote. In order to enhance the usability of the voting system, it is possible that the system needs to provide instructions for the user. According to Hochheiser et al. (2007) instructions on electronic voting systems should:

- provide clear, simple and easy-to-understand text explanations in combination with indicative pictures of the user-interface for the voting process.
- provide simple and clear task-based instructions for using the system.
- be clearly readable to all users (see information presentation)
- guide the user step-wise through the voting process
- be field-tested by a set of representable voters prior to the elections
- provide instructions that are accessible to all potential voters
- match the instructions to the used labels

4.1.2.3.2.1 Information Presentation

The presentation of information and the ballots should be readable and intuitive to the user. The user should be able to read the instructions and ballots and scan through the ballots comfortably.

- Typography

- Consistently use one type of font throughout the voting system
- Consistently use one type font style throughout the voting system
- Avoid the use of italic font style on screen displays.
- Select font-type according to function
 - Serif typography to improve line per line reading
 - Non-Serif typography to improve the scanning of the ballot
- Colour usage
 - Choose a usable and clear background-text contrast
 - Use background colour and text colour consistently through the entire voting system
- Language
 - Consistent language use throughout the voting-system
 - Simple and meaningful language for a wide range of users (expertise, education, literacy)
- Labelling
 - Consistently use meaningful and clear labels throughout the voting system
 - Meaningful labels: the label should clearly indicate the function of a button
 - Match instructions to the used labels
- Ballot lay-out/representation

Voters already use a lot of cognitive resources prior and during the voting process in order to decide which candidate to choose (Lau & Redlawsk, 2001; In: Robertson, 2005). In order to shortcut more cognitive and complex processes, the voter uses other strategies to determine where the desired candidate is located on the ballot: position checklist (location of the candidate on the checklist), the appearance of the candidate or the symbol or name of the party presented or related to the candidate. Lau et al. (2001; in Robertson 2005) provide evidence that voters use heuristics in political decision making. Additionally, when people are presented with an exemplary ballot prior to the elections, the location of each candidate on the exemplary ballot should be according to the location of the candidates on the voting machines (switchboard). People use localization strategies and remember the position the desired candidate is in. When the location of a candidate or party changes on the definite ballot, people will not be able to find the desired candidate or will blindly vote on the third person from the bottom of the list while not noticing that person is not the intended candidate.

In order to prevent errors due to use of heuristics, the voting system should use:

- Icons (for parties) or pictures (for candidates) that allow voters to easily find their preferred party or candidate.
- A logically ordered list to find the preferred candidate or party

- Fonts that easily allow scanning through the ballots

Additionally, when providing an overview of all possible candidates or parties, do not place all candidates of every party on one screen. The overview of all available information will be overwhelming and consequently the user will be unable to find the requested information (Herrnson et al., 2006). Allow voters to first select the party on which they would like to vote. After selection of the desired party, display all candidates of the selected party for whom one can vote for that election.

4.1.2.3.2.2 Navigation

It is of essential importance that voters are able to confidently and easily navigate through all menus and feel that they have control over the voting process and their vote. Therefore:

- The system should allow users to control the pace of their voting procedure.
- The system should use controls for navigation that are clear and intuitive to use (stimulus-response compatibility).
- The system should provide clear labels for the several buttons
- The controls should be laid out in order to minimize accidental completion of the ballot.
- The system must make input as simple as possible (for example, touch the relevant option).
- The system should avoid scroll-bars: all information should fit in one screen.
- The system should provide clear feedback about where one is in the voting system. Breadcrumbs, for example, may provide a clear indication for which election or party one is voting.
- The number of actual steps to any process in the voting system should be limited to 3. Therefore do not create menus of procedures with a deeper hierarchy of choices than 3 (AIGA design for democracy – election design: Models for Improvement). (For example: Choose election > Choose party > Choose candidate / Parliament > Green Party > Adam Sanders).
- Provide easy and simple navigation: back, forward and cancel.
- Present a back button in each screen of the electronic voting system (except on the start/first screen and a back button guiding back to the previous election for which one has already cast a definite vote).
- Buttons should immediately yield an action and should not be activated by pushing on a start button afterwards.
- The system should not jump screens: The pace of change in screen should not be too rapid. Voters feel that they lose control over the voting process that way (Herrnson et al., 2006). Still it shouldn't be unreasonably slow either.

4.1.2.3.2.3 Navigation Format

Paper analogue navigation

Paper-like navigation for electronic voting systems allows the user to flip the pages of the ballot in a traditional paper-like or book manner. One has to flip the pages of the book to the desired voting list in order to view the ballot of the desired party. This voting system allows older users to vote in a traditional manner, making it easier to use based on habit. The analogy to a book makes the voting system intuitive to use. For an example of paper-like navigation in electronic voting systems, consider the electronic voting project presented in subsequent link:

http://www.ontwerpwetenschappen.be/po/projecten/index.cfm?section_id=61&category_id=484&year=2004&startrow=78&maxrows=1

Touch screen

Touch screen are intuitive to use. One simply has to touch the area on the screen on which the desired candidate or option is represented. Still touch screen voting systems can be troublesome when the user is not familiar with touch screen technology (Hochheiser et. al., 2007). Therefore the system must initially (or consistently) provide the instruction to touch the desired choice on the touch screen to select that candidate or perform the presented action. In order to avoid favorability of any candidate or party, touch areas should be:

- of equal size for all parties
- of equal size for all candidates
- the size of the touch areas should at least be
 - 2 cm by 2 cm (minimally = size of a finger)
 - Spaced apart by minimally 3 mm
- Possible danger with touch screens: Parallax causes the user to push in a location in which he did not intend to push.
- The system should provide feedback when the screen is touched (highlighting and/or sound)
- Avoid scrolling on a touch screen
- Touch screens do not allow special navigation possibilities: No drag-and-drop, drop-down menu's, multiple windows, double click. These actions should be avoided for electronic voting systems because of the non-intuitively of these actions.
- Limit the amount of hand movements to complete the (voting) tasks
 - Each time a choice has to be made, a part of the screen will be occluded by the hand
 - Avoid arm fatigue
 - Choose the location of the touch areas as intuitive as possible.

- Avoid the representation of the cursor on the screen: users will focus on the screen, not on the cursor.
- Use a bright background for touch screens: this avoids the visibility of fingerprints
- Make sure the room in which the voting system is placed is correctly lit in order to avoid glare on the screen. Avoid that the light is directly directed at the screen.
- The angle of the screen needs to be adapted to the position of the user (Figure 3)
 - Sitting user: 30°
 - Standing user: 30°-55°
 - Ideally the screen should be adaptable by the user him- or herself.
 - This is presented in Figure 3.

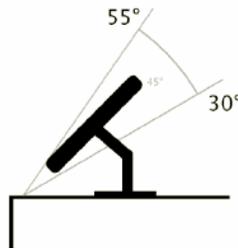


Figure 3 – The ideal angle of a touch screen

4.1.2.3.3 Verification

4.1.2.3.3.1 Reviewing the Vote

After the person has selected his or her preferred candidate, the voters should be able to review their choices before casting their vote (Herrnson et al., 2006). Therefore the system has to present an overview of the selected choices and provide two options: 'correct choices' and 'cast vote'. Provide enough feedback in the review screen. Make it clear that a review of the selected votes is presented and that confirmation or corrections are possible (Herrnson et al., 2006). The review screen should have the same layout as the ballot screen in which the initial choices were made.

4.1.2.3.3.2 Correcting or Changing a Vote

When the user, during the casting of the vote or during the review of the vote, discovers that he or she has selected the wrong candidate, it should be easy for the user to correct this mistake in both phases.

- Changing a vote should be possible by selecting the wrongfully selected one.
- Erasing all choices in the candidate list in order to correct one falsely selected candidate should be avoided. Clearing all previously made choices leaves the person to recollect all previously selected choices. Erasing the complete ballot should be made an option, but not a standard for correcting miscast votes.

- In case only one candidate can be chosen per election, one has to be able to correct a vote by simply choosing another candidate. In this situation, avoid deselecting the wrongly chosen candidate before selecting another candidate (Herrnson et al., 2006).
- Allow users to correct their mistakes on the spot, in specific, in the same screen in which the review or ballot is presented. Do not ask them to wait for an overview screen at the end of the voting procedure before they can correct the mistake. Error recovery should immediately be possible; otherwise users might forget to apply the correction.
- Make it impossible to over vote. Remind the user that votes for candidates of multiple parties are not accepted. This can be achieved by erasing the votes on individual candidates when returning to the screen in which the different parties can be selected. This yields the advantage that no over voting can take place, but the disadvantage that when one mistakenly returns to the party selection screen, all selected votes are deleted.

4.1.2.4 Security and Usability

Although electronic voting systems may very well yield advantages in regard to automatic and fast result tabulation, they have also shown to be vulnerable for technical errors and result tampering. Feldman, Halderman and Felten (2006) for example reported that malicious software, which can undetectable change the results of the election, can be installed on a voting machine in less than one minute. For a detailed description of this procedure, one can find a video explanation on the internet through following link: <http://itpolicy.princeton.edu/voting/> (retrieved from the web on March 30, 2007). Simons (2004) also reported specific cases in which electronic voting machines reported results which were technically impossible. For example, in 2003 an electronic voting system reported that 144,000 votes were cast when in reality only 5,532 citizens had participated in the election. More specific examples of result tampering or technical error can be found in *Electronic Voting Systems: The good, the bad and the stupid* (Simons, 2004). Consequently, the general feeling is that electronic voting has advantages, but security is not sufficient (Oostveen et al., 2005). As a result of low security and susceptibility to technological errors, the trust voters will have in electronic voting machines will be undermined. "If people cannot trust that the elections in which they participate are fair and the machines count correctly, they will never accept that those votes represent their voice." (Oostveen et al., 2005). Consequently it is essential not only to develop a secure and error-free electronic voting system, but to also **improve the perceived security** of the electronic voting systems of the user.

The conclusion seems simple. Build an electronic voting system, including hardware, software and election procedures, that is secure and reliable in order to increase perceived security of the voters. It seems logical that secure and functioning systems increase trust in the electronic voting system. The importance of effective security on perceived security is underlined by research on perceived security of electronic voting systems: The more people know about computers, the less people trust that the system is secure. Therefore in order to increase the perceived trust in electronic voting systems, the electronic voting system should be, first of all, effectively secure.

In reality, designing full proof secure voting systems may prove to be too complicated. Many computer specialists even doubt that paperless electronic voting systems can be made 100 % reliable and secure (Feldman et al., 2006). In order to secure that the electronic voting machine yields the correct election results and is not tampered with, and therefore to improve the perceived security, electronic voting machines should provide a voter verifiable paper (audit) trail of votes (vvpt or vvpat) (Simons, 2004; Feldman et al., 2006). Each voter is presented a paper trail of his or her vote which needs to be verified by them. The voter verifies whether the vote on the paper matches the vote that they have cast on the electronic voting machine and then puts the paper into a box. The paper version of each vote should be presented only to the voter and be inserted in a black box by the voter (cf. also next paragraph) in order to confirm the voting results in case the results are contested. In order to determine whether the electronic voting system yields the correct voting results, the results of the vvpt can be matched to the results provided by the electronic voting system.

In order to avoid that voters deliberately do not put the paper version of the vote in the box in order to sabotage the elections, the paper can alternatively be presented to the voter behind glass. It is essential that the voter does not have the possibility to keep the paper record of the vote in order to prove to someone in which way one has voted or to make it appear as if the results presented by the electronic voting systems are false.

The vvpt does not only prove to be a good security measure, but also instills trust in the voter on the security of the voting procedure. The voter sees physical proof that his or her vote is registered, while a vote on an electronic voting system without paper trail is solely stored on a hard drive and of which no physical proof is shown to the voter. On the other hand, vvpt can fail if voters do not care to check whether the paper trail of the vote is correct or when the vvpt procedure is poorly implemented (for example, people do not put their paper into the box). Additionally Herrnson et al. (2006) advocate that the implementation of paper trails increases the difficulties faced by the voters to cast their vote while nothing is extra added to the experience of voting. Still the combination of an electronic vote on an electronic voting system and a vvpt will at least seem, but possibly also prove, to be less prone to produce false election results than an electronic voting system only will.

Thirdly it is important to improve the usability of the application. The more people trust the security and the better the usability of the system is, the fewer users will doubt the system's ability to verify the count of the vote (Oostveen et al., 2005). Therefore improving security and usability will have impact on the trust people have in electronic voting systems.

Finally security and usability are not the only factors that influence the trustworthiness of an electronic voting system. The trustworthiness of an electronic voting system is also determined by the reputation and professionalism of the organizing institution of the voting procedure, the reports in the media on electronic voting systems, the opinion of family and friends, and the convenience of the new technology. Although the usability and security of electronic voting machines can therefore not be held solely accountable for the fact that voters may perceive the electronic voting system as insecure, adapting the system to the user needs and security needs will at least instill trust in the legibility of the results yielded by the electronic voting system.

4.1.3 References

- Alvarez, R.M. (2005). *Qualitative evaluation : “VotoElectronico: Prueba piloto 2005, Ciudad De Buenos Aires”*. Retrieved March 26, 2007, from CalTech-MIT/voting technology project website :
http://www.vote.caltech.edu/media/documents/wps/vtp_wp43.pdf
- Alvarez, R.M., Ansolabehere, S., Antonsson, E., Bruck, J., Graves, S., Negropono, N., Palfrey, T., Rivest, R., Stewart, C. (2001). *Residual votes attributable to technology : an assessment of the reliability of existing voting equipment*. Retrieved March 26, 2007, from CalTech-MIT/voting technology project website:
http://www.hss.caltech.edu/~voting/CalTech_MIT_Report_Version2.pdf
- Bederson, B. B., Lee, B., Sherman, R. M., Herrnson, P. S. & Niemi, R. G. (2003). Electronic voting system usability issues. *Conference on Human Factors in Computing Systems Proceedings of the SIGCHI conference on Human factors in computing systems*. P(145-152). ACM Press
- Delwit, P., Kulahci, E., Pilet, J.B. (2003). Elektronisch stemmen en politieke participatie in België. Onderzoeksrapport in het kader van het programma Sociale Cohesie. Retrieved March 26, 2007, from BELSPO Federaal wetenschapsbeleid website :
http://www.belspo.be/belspo/home/publ/pub_ostc/SoCoh/so11075vote_nl.pdf
- European Cybervote project. Retrieved March 26, 2007, from:
<http://www.eucybervote.org/main.html>
- Federal election Commission (2003a). Usability testing of voting systems. Retrieved from web, March 30, 2007. <http://www.eac.gov/docs/usability.pdf>.
- Federal Election Commission (2003b). Procuring a User-centred voting system. Retrieved from web, March 30, 2007:
<http://www.eac.gov/docs/procuring.pdf>.
- Feldman, A. J., Halderman, J. A. & Felten, E. W. (2006). Security Analysis of the Diebold AccuVote-TS Voting Machine. Retrieved from web, March 30, 2007.
<http://itpolicy.princeton.edu/voting>
- Ferguson, L. (2004). *Democracy needs good design*. Retrieved March 26, 2007, from OpenDemocracy website:
<http://www.opendemocracy.net/debates/article-8-120-2165.jsp>
- Herrnson, P. S., Niemi, R. G., Hanmer, M. J., Bederson, B. B., Conrad, F. G. & Traugott, M. (2006). *The importance of usability testing of voting systems*. Retrieved from web, March 30, 2007:
http://www.usenix.org/events/evt06/tech/full_papers/herrnson/herrnson.pdf
- Herrnson, P.S., Bederson, B.B. & Abbe, O.G. (2002). *An evaluation of Maryland’s new voting machine*. Retrieved from web, March 30, 2007.
http://www.capc.umd.edu/rpts/MD_EVoteEval.pdf
- Hochheiser, H., Bederson, B., Johnson, J., Karat, C. & Lazar, J. *The need for*

usability of electronic voting systems: Questions for voters and policy makers. Retrieved from web, March 30, 2007.

http://www7.nationalacademies.org/cstb/project_evoting_acm-sigchi.pdf

- Hoof van, J.J., Gosselt, J.F., de Jong, M.D.T., (2007). *Pilot study: The reliability and usability of the Nedap voting machine.* Retrieved from web, March 30, 2007. <http://www.electionsystems.eu/website/Read.php?PageID=1212>
- Quesenbery, W. (2001). *Voting and Usability : Lessons from the 2000 presidential election.* *STC-PMC News & Views, November 2001*
- Simons, B. (2004). *Electronic voting systems : the good, the bad, and the stupid.* *ACM Queue, 2(7).*
- ISO/IEC. (1998). 9241-11 Ergonomic requirements for office work with visual display terminals (VDTs) - Guidance on usability.
- ISO/IEC. (1999). 13407 Human-centred design processes for interactive systems.
- Oostveen, A. & van den Besselaar, P. (2005). *Trust, identity, and the effects of voting technologies on voting behavior.* *Social Science Computer Review, 23.* 304-311.
- Robertson, S. P. (2005). *Voter-centered design: Toward a voter decision support system.* *ACM Transactions on Computer-Interface interactions, 12.* 263-292.

4.2 Accessibility Aspects Elderly and Disabled People

As voting is a democratic right (sometimes a plight) for all citizens, having access to the voting activities must be guaranteed to everyone in all circumstances.

Previously “accessibility” was just about physical access to the ballot buildings or booths. Nowadays accessibility is a much broader issue because of electronic voting equipment and internet voting (*eAccessibility*).

In this report two major parts can be distinguished: a) a short overview of the situation in Belgium and in other countries and b) an aggregated list of essential requirements for any future eVoting system.

4.2.1 Overview of Accessibility Activities in Belgium and Abroad

4.2.1.1 Situation in the United States of America

4.2.1.1.1 Help America Vote Act (HAVA)

HAVA 301(A) (3)(a) describes an accessible system as follows:

“Accessibility for individuals with disabilities.--The voting system shall be accessible for individuals with disabilities, including non-visual accessibility for the blind and visually impaired, in a manner that provides the same opportunity for access and participation

(including privacy and independence) as for other voters;”

Already in 1984 the US accepted the “Voting Accessibility for the Elderly and Handicapped Act (1984); 42 U.S.C. 1973ee to 1973ee-6.”³⁰

4.2.1.1.2 National Institute of Standards and Technology (NIST)

This governmental organization has been made responsible for studying the technological implementations of modern voting systems³¹. A special “Technical Guidelines Development Committee” was created that is currently the federal advisory board drafting all voting system guidelines.

This committee has several subgroups, including the Human Factors and Privacy subcommittee (HFP). This group handles sections on usability and accessibility³².

There are a number of research reports and informal white papers on detailed issues available. The current version of the guidelines (VVSG 2005) will be superseded by the 2007 version that will be ready for public review this summer. One of the recent additions is on guidelines for Voter Verified Paper Audit Trails, which currently present accessibility problems for visually impaired voters. It is suggested that accessible voting equipment might have to provide an automated reader that converts the paper record contents into audio output³³.

4.2.1.1.3 American Association for People with Disabilities (AAPD)

This organization maintains an annotated archive on the accessibility of electronic voting under the name "Making Voting Accessible for Everyone"³⁴. Lots of links about voting machines' usability and accessibility are available. One of the links is on a rather unique concept: voting by telephone (Inspire™ Vote-by-Phone) but further study reveals that the voter still has to go to a polling booth where this type of telephone access is available. A VVPAT is also available with this system³⁵.

4.2.1.2 Situation in Europe

The situation is quite diverse. Our major sources on voting accessibility are the European

³⁰ referred to in the Hite report (March 7, 2007)
http://electionupdates.caltech.edu/GAO_report_on_electronic_voting.pdf

³¹ <http://vote.nist.gov>. This site also archives white papers and other materials from the working groups.

³² Information obtained from the committee member specialised in accessibility, Whitney Quesenbery, president of the Usability Professionals Association (whitneyq@wqusability.com). More info from:
<http://www.wqusability.com>

³³ cf p.13 of <http://vote.nist.gov/032906vvpap-update-20060317.pdf>

³⁴ <http://www.aapd.com/dvpmain/dvpindex.php>

³⁵ <http://www.ivslc.com/>

Blind Union's study from 2004, a decision from the Council of Europe (2004), a few guidelines by major national organizations for the Blind and results of recent internet voting experiments.

4.2.1.2.1 Study of the European Blind Union

The **EBU** report is based on the answers from their members to a rather open question on the national voting procedures. As a consequence, answers are rather diverse and ad hoc. Furthermore almost no reference to electronic voting was made. For this report only the most important conclusions are grouped.

In all **European countries** handicapped voters can be assisted by a third person³⁶. In some countries this person can be chosen by the voter, in others it is the president of the voting bureau who designates an independent assistant. Sometimes the help of an assistant in the voting booth must be required beforehand; in other countries no formalities are needed.

Some special situations are mentioned.

In **Austria** templates for the traditional ballot forms with holes punched out for the parties are available so that a blind person can vote independently (provided he/she knows the layout of the ballot form by heart).

In **Denmark and Finland** voting by letter is permitted for handicapped persons. In that case a guide/assistant of one's own choice can help in filling out the necessary information on the ballot sheet.

In **France** ballot forms can be received by post a few days before the elections. Handicapped users can study the slips (with some help) and choose which ones they want to put in the ballot box on the Election Day. Postal votes are not allowed.

The French Law of February 2005 requires every voting system, including voting machines, to be made accessible for persons with an impairment³⁷.

In **Germany** voting through mail ("home voting") has been practiced by blind voters in Germany for decades. Since 2002 blind people in Germany are allowed to use voting templates in the polling booths. Templates are different from state to state and are produced on demand only³⁸.

In **Spain** most of the important parties distribute their programs in Braille.

In the **UK**, visually impaired people want to be able to go to the polling station and to vote fully independently. Although promoted intensively by the Royal National Institute of the Blind, no law imposing accessible ballot forms is in place.

³⁶ In Belgium this is regulated by art. 143 of the Election Law. Proxy voting is governed by art. 147bis

³⁷ http://www.handicap.gouv.fr/IMG/pdf/Memento_Scrutin.pdf

³⁸ This procedure is therefore hardly conceivable for communal elections e.g.

4.2.1.2.2 Other National Initiatives

The **Swiss** canton of Geneva showed, back in 2003, that voting machines could have voice output and speech recognition input without compromising voting security. This was demonstrated at the International Telecommunications Union (ITU) sponsored WSIS conference.³⁹

In **Austria** some discussions are going on the question what exactly is meant by the law when imposing "equivalent alternatives" to technical solutions. For hearing impaired and deaf people sign language could be offered. An alternative to easy-to-read can be provided. E.g., Additional "reader support" might be needed as the information is to be translated into an individual context of understanding. The question remains open if these solutions are acceptable in the framework of the existing anti discrimination legislation.⁴⁰

Both in **Spain** and in the **UK** national organizations for the disabled (ONCE⁴¹, RNIB⁴², DRC⁴³) have issued specialized documents on voting accessibility. Some of their conclusions have been incorporated in our second part (cf. Aggregated Guidelines, below).

4.2.1.2.3 Council of Europe 2004

The Committee of Ministers of the Council of Europe issued a guidelines document on electronic voting in 2004⁴⁴. It contains in its appendix III a small list of accessibility related issues:

A. Accessibility

61. Measures shall be taken to ensure that the relevant software and services can be used by all voters and, if necessary, provide access to alternative ways of voting.

62. Users shall be involved in the design of eVoting systems, particularly to identify constraints and test ease of use at each main stage of the development process.

63. Users shall be supplied, whenever required and possible, with additional facilities, such as special interfaces or other equivalent resources, such as personal assistance. User facilities shall comply as much as possible with the guidelines set out in the **Web Accessibility Initiative** (WAI).

64. Consideration shall be given, when developing new products, to their

³⁹ <http://www.pctip.ch/webnews/wn/26014.asp>

⁴⁰ Personal communication by Prof. Miesenberger, Linz University

⁴¹ Document available from the author

⁴² Document available from the author

⁴³ http://www.drc.org.uk/docs/10_434_10_434_17%20nov%20version_.doc

⁴⁴ [http://www.cev.ie/htm/report/second_report/pdf/Appendix%206%20Recommendation%20Rec\(2004\)11.pdf](http://www.cev.ie/htm/report/second_report/pdf/Appendix%206%20Recommendation%20Rec(2004)11.pdf)

compatibility with existing ones, including those using technologies designed to help people with disabilities.

65. The presentation of the voting options shall be optimized for the voter.

4.2.1.2.4 European Parliament – Disability Intergroup Meeting

This parliamentary group met in October 2003 together with representatives of the European Disability forum. From the report, we distil following recommendations to electoral authorities:⁴⁵

- only accessible public buildings are to be used as polling stations;
- a statutory review has to be made of the accessibility to polling stations;
- pictorial guides have to be available for persons with learning disabilities;
- individual access needs of the voters are to be considered in the design of the system.

4.2.1.2.5 Preliminary information on Internet Voting Accessibility in Europe

Internet voting is becoming more and more popular and its principles and security measures have been studied intensively since many years. Some countries have accepted it, others are strongly opposed, almost exclusively because of security concerns.

Because of this, relatively little activities around internet voting accessibility for reading impaired persons have been going on up to now.

Estonia was the first European country to permit internet voting in October 2005 (Elections for local governments). Available technical documents⁴⁶ focus only on security issues but do not give information on accessibility⁴⁷ of the internet applications for reading impaired persons nor do they refer to the Council of Europe 2004 guidelines (cf. above). The fact that Estonia was an early adopter was due to the fact that internet access is a *constitutional right* in Estonia and that already at that time 60% of all citizens had electronic identity cards that can be used for asymmetric cryptographic operations.

Anyhow Estonians had the right to choose for traditional voting, even after having cast an

⁴⁵ <http://www.edf-fep.org/apdg/Documents/Report%20of%20the%20Disability%20Intergroup%20meeting%20Barriers%20to%20elections%20for%20disabled%20people.doc>. The text was slightly adapted from the original by the author of this report.

⁴⁶ <http://www.vvk.ee/elektr/docs/Yldkirjeldus-eng.pdf>

⁴⁷ It was confirmed in a personal communication from the "Estonian foundation of the Visually impaired" (Ülle Lepp & Erik Loide, 2007-03-30) that:
"Testing of eVoting procedure [in 2005 and 2007] and use of eVoting option by the disabled persons demonstrated that eVoting ensures full independence for the visually impaired and persons with mobility impairment for the participation in the voting and guarantees secrecy of the voting decision."

internet vote.

4.2.1.2.6 Belgium

4.2.1.2.6.1 BCBS-CBPAM

The *Belgian Confederation of Organizations for Blind and Low Vision People* groups most of the organizations in the field. It produced in 2003 a list with recommendations for access to voting machines⁴⁸. Some of these are copied in part 2 of this report (cf. Aggregated Guidelines, below). BCBS-CBPAM also collected information about physical access to voting offices, some of it related to the October 2006 elections.

4.2.1.2.6.2 GAMAH

The *Groupe d'Action pour une Meilleure Accessibilité aux personnes Handicapées* organized a web based questionnaire on people's opinions for access to the elections in October 2006⁴⁹. The results are detailed:

- Briefly on their website: <http://www.gamah.be>
- In their regular publication: *Le Vilain Petit Canard*, décembre 2006
- In a special report: "Résultats de l'Enquête – Electeurs à mobilité réduite ou présentant des difficultés de compréhension: citoyens à part entière ou entièrement à part" 50
- The major results of the 2006 questionnaire are:
- 96% of the interviewed persons had voted independently.
- About 1,6 % of those came to vote because of the new facilities proposed in the Courard decree.
- About 18% have appreciated the existence of large print instructions (1,50 times standard size) and large size paper voting bulletins.
- A majority of visually impaired voters had problems to prepare themselves for the elections: inaccessible party websites, promotion material in too small character sizes etc.
- Motor handicapped voters needed help in 29% of the cases when voting on paper and 34% in case of electronic voting.

⁴⁸ "Lijst met aanbevelingen voor het toegankelijk maken van stembureaus", BCBS-CBPAM, 2003, document available (in Dutch) in appendix I

⁴⁹ These were the first Belgian elections for whose organisation the regional governments were responsible. Especially in Wallonia, extra measures for supporting voters with a functional impairment were put in place (Décret du Ministre Philippe Courard (June 2006))

⁵⁰ Résultats de l'enquête – Electeurs à mobilité réduite ou présentant des difficultés de compréhension: citoyens à part entière ou entièrement à part? ed. par GAMAH (October 2006); available from GAMAH or from the author of the current report.

Out of these questionnaire results, GAMAH distilled a wish list for future elections. This will be detailed in the second part of this contribution

4.2.1.3 Aggregated Guidelines

Based on personal expertise and on the information collected from the different countries, we conclude that minimally the following accessibility requirements should be put forward for any new voting systems.

4.2.1.3.1 General Remarks

4.2.1.3.1.1 Internet Based Information Systems

All types of impaired users should be able to collect as much information as possible about the voting process. A major information channel (sometimes the only one that is accessible for them) is the internet, and more specifically Web pages.

Since the middle of the nineties several attempts have been made to create guidelines for the construction of accessible web pages. Many organizations from all over the world have bundled their efforts within the Web accessibility Initiative (**WAI**) within the World Wide Web consortium (W3C). This led to the creation in 1999 of the so-called **WCAG v. 1.0** guidelines⁵¹.

The WAI group proposed three levels of accessibility and consequently three logos have been developed to mark accessible web pages. As there is no strict checking mechanism in place, these logos have sometimes been abused.

In the US but also in almost all European countries national organizations have been set up to ensure that website accessibility is checked by specialists (quite often with help from checking software). In **Belgium** a national organization was set up with major support of the Blindenzorg Licht en Liefde and Oeuvre National des Aveugles organizations.

The focus of their work however is to make sure that web pages become accessible for a very wide group of users, not just visually impaired persons. In July 2006 the former name of "Blindsurfer" therefore was changed into "Anysurfer"⁵².

4.2.1.3.1.2 Internet Voting

A very specific situation appears when the internet is used for the voting itself. It is clear that the above mentioned WAI/Anysurfer guidelines have to be obeyed by the equipment, but in this case it also must be guaranteed that all related aspects are catered for:

⁵¹ <http://www.w3.org/TR/1999/WAI-WEBCONTENT-19990505/>
(PDF version in appendix II)

⁵² The website www.anysurfer.be is a bilingual one. Direct access to the French pages is through: www.anysurfer.be/fr/
Anysurfer guidelines can be found in Dutch at: <http://www.anysurfer.be/nl/richtlijnen> and in French at: <http://www.anysurfer.be/fr/directives/ce-que-vous-devez-savoir>

- accessibility of the identity checking procedures; variants must be admitted as e.g., some biometric systems will not work when people do not have fingers, hands, functional eyes, an understandable voice etc.
- accessibility to the information on electronic identity cards
- accessibility to any peripherals that are needed in the voting process

4.2.1.3.1.3 Information Material

Several regions in Belgium have issued flyers for the past elections. E.g., the Brussels and Walloon regions have produced (under guidance of the Passe-Muraille organization) a specialized brochure for handicapped voters of the 2006 elections⁵³. This is especially valuable for those persons but in that case governments have to make sure that accessible versions do exist⁵⁴.

4.2.1.3.2 Specific Guidelines

- 1) All authorities (and preferably also the political parties) involved in information distribution via the internet should respect the Anysurfer guidelines for accessible web page design. Anysurfer testing should be made obligatory for official websites related to the voting process. Attention must be paid to persons that need easy-to-read information.⁵⁵
- 2) Official websites must also have an adapted simulation of the electronic voting procedure so that a reading impaired persons can try out the procedures before going to the voting place itself.⁵⁶
- 3) Users shall be involved in the design of eVoting systems, particularly to identify constraints and to test ease of use at each main stage of the development process.⁵⁷
- 4) Consideration shall be given, when developing new products, to their compatibility with existing ones, including those using technologies designed to help people with disabilities.⁵⁸
- 5) The electronic voting machines must have adapted outputs such as large

⁵³ Two French and one Dutch version are available:
http://www.passe-muraille.be/pdf/isoloir/Du_citoyen_a_1_isoloir.pdf
http://www.passe-muraille.be/pdf/isoloir/Du_citoyen_a_1_isoloir_v_bruzelles.pdf
http://www.passe-muraille.be/pdf/isoloir/Du_citoyen_a_1_isoloir_v_bruzelles_nl.pdf

⁵⁴ Accessible versions do include: large print, braille, audio, Daisy (Talking book), tactile materials, internet sites obeying to the Anysurfer guidelines, sign language videos and easy-to-read versions for persons with a cognitive impairment.

⁵⁵ Based on Council of Europe guideline nr 63 and on the GAMAH study

⁵⁶ Based on the Gamah study

⁵⁷ Based on Council of Europe guideline nr 62 and on the recommendations of the European Parliament's Disability Intergroup (Sarah Gull)

⁵⁸ Based on Council of Europe guideline nr 64

characters and a synthetic voice (e.g. with headset)⁵⁹. In order to gain experience the development of experimental accessible voting machines and their testing should be stimulated.

- 6) When producing printed information material (flyers, brochures) related to the elections, authorities should make sure that different accessible formats are available for reading impaired persons and other disadvantaged groups in the community.⁶⁰
- 7) Key access standards must not have the appearance of "optional extras", rather they must be core obligations and this should be reflected in any government order for voting equipment.⁶¹
- 8) Physical access: Impaired voters should have the choice to go to accessible voting places. On a longer time scale administrations should strive to make all voting places accessible. They also must be guaranteed the right to be accompanied in the voting booth by a person of their choice. Sufficient accessible parking places must be planned close to the voting places. Chairs must be available for persons that have to wait before casting their vote. The height of voting screens should be adapted for persons in a wheelchair or, better, should be adaptable⁶²
- 9) Ensure provision of disability awareness training for polling station staff.⁶³
- 10) Ensure to receive feedback from disabled people after the elections and to learn lessons for the next one!

4.2.2 Conclusions

Although access to the voting process for persons with impairment has been organized and studied quite a lot over the past, three major issues are nowadays still very much open:

In the past the fact that a handicapped voter could be accompanied by a third (non-handicapped) person was seen as sufficient. **Nowadays** more and more handicapped people want to cast their vote **completely independently**.

Very little experience with voting machines and even less with internet voting is available. One will have to rely here on existing and future **computer usability standards** developed by groups such as the World Wide Web consortium, and the standardization bodies ISO (global) and ETSI (European).

Voting machines will have to be bought through public tender. The European

⁵⁹ Based on conclusions of the GAMAH study; instead of headsets, GSM based communication (e. g. bluetooth) may be conceived in the future but will probably be much to complicated for modal users.

⁶⁰ Inspired by the Belgian Anti-Discrimination act of 2003 and on DRC guideline 4.2

⁶¹ Based on DRC guideline 3.6

⁶² Based on conclusions of the GAMAH study; incorrect screen height might lead to parallax errors (people touching the wrong buttons)

⁶³ Based on the recommendations of the European Parliament's Disability Intergroup (Sarah Gull)

Commission has given recently a Mandate (#376) to the European standardization bodies (ETSI, CEN & CENELEC) in order to come up with an accessibility requirements list that should be added to all public tender documents. By doing so, accessibility in the future will also become a **tendering criterion** in its own right.

5 Technical Aspects

This section discusses the technical design aspects of an electronic voting system that could be deployed for Belgium. It first discusses the required overall properties of such a voting system, after which the main challenges for electronic voting systems are discussed, to conclude with references to crypto-technically advanced electronic voting systems. This section focuses on the following phases of the voting process: casting the vote and counting the votes. The organizational aspects to prepare the elections, to transport the collected ballots and to publish the aggregated election result are not included in the scope of this section.

5.1 Technical Requirements for Electronic Voting Systems

The following properties must be met by an electronic voting system:

- **Integrity:** No election fraud; only eligible voters are able to vote; no one can vote more than once...
- **Transparency:** Everyone must be able to verify that the election was conducted properly
- **Privacy:** No one learns how the voter has voted
- **Secret ballot:** Voter cannot prove how she voted (note that this is becoming increasingly difficult since a large part of the population possesses a mobile phone with a camera)
- **Incoercibility:** A third party may not force someone to vote in a particular way – this property is related to the previous one.

Transparency is infeasible in principle with modern cryptographic techniques, but this then assumes that the citizen is willing to trust the arguments of the experts. It may therefore be necessary to introduce the following property:

- **Relaxed Transparency:** A substantial number of independent experts must be able to verify that the election was conducted properly.

5.2 Main Challenges for Electronic Voting Systems

There are two main challenges for electronic voting systems: the preparation of electronic voting ballots, and the counting of these ballots. These challenges serve one goal: to speedup the tallying process.

5.2.1 Ballot Preparation

5.2.1.1 Paper Ballots

This is clear and transparent; the problem is that counting paper ballots is time intensive and error prone (even with a scanner). Additional marks could be added (integrity is not protected). Some of the more advanced systems (e.g., Punchscan) may improve the integrity and the counting phase (allow public verifiability) even for paper based votes,

but they are very difficult to combine with the complex voting system used in Belgium.

5.2.1.2 Voting in a Booth on a Voting Machine

If I am using a machine, how can I be sure that the vote recorded is the vote entered in the machine?

- 1) A printed receipt cannot be offered since this would violate the condition to keep the secrecy of voting ballots; one would need a printed receipt that is visible behind glass – if it is wrong, the voter should have a procedure to cancel his vote, and if it is correct it should fall in an urn where it is mixed with other votes. This is in principle feasible, but presents challenges in logistics and reliability.
- 2) The current Belgian system has some checks and balances: the vote is registered on a magnetic stripe and the voter can go to a second (or even 3rd) machine to read and check his ballot. In addition, test votes are used at the beginning and the end of the election period (test votes are essential anyway to make sure that the voter gets the correct list of parties and candidates). This system has the advantage that if there is a problem with the local machine that stores the votes (or with counting later on), one can re-count the magnetic stripes as in the paper ballot setting. One could envisage to enhance this system by printing a vote on the ballot (encrypted with the public key of the election authorities), but this would not solve many problems (and create new ones such as privacy). In order to improve the security, one should encrypt the votes using public key cryptography.

5.2.1.3 Internet Voting

Given the current state of the art of the (in)security of home machines (risks for Trojan horses, viruses, worms and phishing attacks), holding important large scale elections over the Internet is not recommended. This also presents serious problems with the secrecy of the ballot and with coercibility – even allowing for multiple votes, this is only a partial solution since one could force someone to vote in a certain way one minute before the deadline. What is conceivable is to have a limited number of polling stations (e.g., in embassies and consulates) where such a voting scheme is implemented, but in this case the machines would be under control of the administration (e.g., booting from a Live CD). One could consider to implement on this machine a simulation of the voting on the embedded machine (this simulation could also be used to train users), but perhaps it would also be better to have in this case an on-line connection to a central server in Belgium - this would have the advantage that one would not need to ship the voting machines.

5.2.2 Counting the Ballots

The process could be made much more robust than in the current system– by using advanced cryptography one can eliminate a single point of failure (or fraud) without compromising the privacy or integrity of the votes. This document gives some general design suggestions; the detailed architecture is the subject of further study.

The votes would be collected locally on simple USB sticks (since they are encrypted, it

would); they should be signed using the electronic ID card of the chairperson (a simple PC application) or using a dedicated device for this purpose (simple a voting device with a different application software and a smart card interface). Let's call this a file of votes. These files could be brought to a local place, where they could be sent to a central server (over the fixed network or via 3GSM).

The security and robustness of the counting of the votes could be enhanced substantially by using threshold public key cryptography.

If one wants to combine multiple vote files before decrypting them one can mix those using a mix network (one could send a set of votes to at least 3 out of 5 mixes installed in several locations). Mixing has the disadvantage that a re-count requires a recount of a larger number of magnetic stripes.

Encrypted votes are decrypted using threshold decryption: one asks 3 out of 5 servers to perform a partial decryption and combines these partial results (in order to leak votes, one would need to compromise 3 servers; even if 2 servers are down the system will still work). The final votes are then obtained by combiners (which only need to operate correctly). One could have 3 independent combiners who check on each other (an alarm is raised if the 3 combiners do not produce the same output).

Challenges here

- Who will write the source code for the mixes, decryption servers, combiners and finally the code to assign seats
- Who will check that the right code is installed? (the good news is that the servers can add a cryptographic proof that they have decrypted correctly – these proofs could be checked by software written in universities)
- Operational issues – multiple servers and a reliable network

5.3 Technical Guidelines for Electronic Voting Systems

Given the current state of the art, it would probably be better not to use a general purpose PC (since the functionality of such a machine is too large and too hard to control and reuse is very difficult) but to design a dedicated voting device, an eVoting computer that is in line with the following guidelines:

- 1) The eVoting computer consists of an embedded computer system that is designed for only one purpose: electronic voting
- 2) The operating system running on this eVoting computer is open source and fully documented
- 3) The electronic voting application is loaded on the eVoting computer in a secure environment to guarantee that the correct application is installed. The code for this application is
 - a) Open source
 - b) Digitally signed to protect its authenticity
 - c) Made available to the public before the elections

- 4) The electronic voting application depends on configuration files that
 - a) Describe the election type (e.g., that a voter can select one or more preferred candidates, that the election refers to a referendum, etc)
 - b) Are digitally signed to protect their authenticity
- 5) The embedded computer system has its own secure random number generator
- 6) The embedded computer system is made resistant to tampering and is shielded to prevent advanced attacks, e.g., tempest and electromagnetic radiation
- 7) The eVoting computer has external interfaces to connect the screen, light pen, magnetic stripe reader/writer, voter trail viewer/printer, etc.

These dedicated eVoting computers could be in principle very simple and compact (in between the size of a pocket book or a regular hard cover), which would make them easy to store. The design costs of such a machine could be estimated to be at most 2 person year (at most 0.5 million EUR) (perhaps additional costs for certification); the individual cost would be less than 500 EUR. (the total cost of system components is certainly less than 200 EUR).the other auxiliaries (light pen, screen, magnetic stripe reader/writer) are similar to those currently used, except for the equipment used for to produce a paper trail of the vote. Elaborating this proposed system is the scope of the second part of this study.

5.3.1 Analysis of these Guidelines

A system that follows these guidelines meets the technical requirements for secure electronic voting systems:

- 1) Transparency: the eVoting system has only one function
- 2) Transparency: the operating system is available for analysis
- 3) System integrity: the access control mechanism of the eVoting system guarantees that only the Administration can load applications to the eVoting system
 - a) Transparency: the eVoting system is available for analysis
 - b) System integrity: the eVoting application is digitally signed by the Administration, so that the application cannot be altered without invalidating this signature
 - c) Transparency: if this digital signature is published before the election starts, it also becomes possible for a citizen to confirm that the published code corresponds with the eVoting application that was used for the elections
- 4) System integrity & Transparency: the eVoting application is separated from the election-specific information, allowing their individual analysis and certification
- 5) System integrity & Voter anonymity: many electronic voting systems that depend on cryptographic techniques are vulnerable to mathematical attacks if insecure random numbers (e.g., if they are initialized with the computer's system clock) are used
- 6) System integrity & Voter anonymity: the remote observation of an electronic

voting machine may compromise the privacy of the voter. Shielding the embedded computer system so that such information cannot easily be derived from side channels (e.g., electromagnetic radiation and power consumption) improves the trustworthiness in the eVoting system

- 7) System integrity & Transparency: the paper trail allows the voter to verify whether the electronic vote correctly corresponds with his choice. This trail is not used in the calculation of the election result.

5.4 Introduction to Crypto-technical Mechanisms for Electronic Voting

Since 2000 the topic of cryptographically secure electronic elections has become a hot research area in the computer security and cryptography academic circles. These techniques promise to combine the need for universal verifiability of the integrity of the voting process, while maintaining the confidentiality and secrecy of individual votes.

The solutions offered are based on advanced mathematics and proofs, and do not rely on the assumptions that the machines facilitating the process, or the vendors should be trusted. As such they solve the dilemmas about trusting particular vendors or implementations of election systems.

Some key projects and associations in this field:

- International Association for Voting Systems Sciences (IAVoSS), cf. www.iavoss.org
- Caltech/MIT Voting Technology Project, cf. www.vote.caltech.edu

Sources:

- Ben Adida, MIT "Verifying Secret-Ballot Elections with Cryptography", 2005, cf. <http://crypto.csail.mit.edu/~cis/theses/adida-phd.pdf>
- Avi Rubin, Brave New Ballot: The Battle to Safeguard Democracy in the Age of Electronic Voting, cf. <http://www.bravenewballot.org/> provides a good overview of what can go wrong with non-cryptographic election techniques
- Sharon Cohen, MIT "Auditing Technology for Electronic Voting Machines" (working paper #46), cf. http://www.vote.caltech.edu/theses/cohen-thesis_5-05.pdf
- Joy Forsythe, MIT "Encrypted Receipts for Voter-Verified Elections Using Homomorphic Encryption", cf. <http://www.vote.caltech.edu/theses/forsythe-thesis.pdf>
- Tomer Posner, MIT "Application of Lean Management Principles to Election Systems", cf. http://www.vote.caltech.edu/theses/tomer-thesis_12-05.pdf
- Soyini Liburd, MIT "An N-Version Electronic Voting System" (working paper #17), http://www.vote.caltech.edu/theses/liburd_thesis_5-04.pdf

5.4.1 Key Requirements for Secure Elections

Building secure protocols for electronic elections is especially hard. The reason for this is that two, seemingly conflicting, and requirements need to be met: Verifiability versus Secrecy.

One had for the election process to be accepted as legitimate it needs to be audited so that everyone is satisfied that it was performed as expected. This involves parties looking at its processes and making sure that no fraud is performed at any stage. This task is made difficult by the fact that a lot of information about the process is deleted on purpose to ensure the secrecy of the votes.

The problem is even deeper: voters should ideally be in a position to check that their individual votes have been taken into account in the final tally. This is the most extreme form of verifiability. Yet such a mechanism should not allow for voters to prove to 3rd parties the way they voted, since this could lead to attempts of bribery or coercion (this property is often referred to as receipt-freeness.)

The task of building secure electronic election systems is considerably harder than other reliability or security engineering tasks. The banking and financial systems, for example, also have the same requirements for high integrity. There are four aspects of electronic elections that are different from such systems and make them hard to design and engineer:

- 1) The incentives to tamper with a national election are much greater than tampering with any single banking systems. As an example Dr Adida points out that the campaigning budget for winning the US election in 2004 reached \$1 Billion dollars.
- 2) The adversaries against which banking and financial systems need to protect against are, surprisingly, less demanding than for elections. In elections all participants are assumed to be potentially corrupt, including manufacturers of equipment, principals that are in charge of running the election, as well as a subset of voters (who try to sell their votes).
- 3) Failures in typical systems are easier to detect and recover from. Because of vote confidentiality it is difficult to often establish whether there has been any fraud at all. Compare this with failures in traditional systems, where planes crash or bank accounts disappear. Even when fraud is discovered there are few steps possible to re-establish the integrity of the process short of re-running the election.
- 4) The software and hardware systems that are used during an election must be made available to the public for analysis to increase the transparency of the voting process.

5.4.2 A Critique of Traditional Voting Technologies

Traditional voting technologies, from paper ballots and manual counting to the mechanized systems, have matured over the years to minimize fraud but still have some inherent shortcomings.

Firstly voter verifiability can only be achieved by proxy: voters have to trust the election officials for key steps of the process. Some steps can be made publicly verifiable in the

paper world (the tally process can be in public and the ballot boxes can be transparent to ensure no additional votes are inside).

Other steps are not publicly verifiable, such as the secure storage or transport of the boxes. In the case of electronic voting verification is only achieved through the proxy of election officials as well as technical experts that have to check whether the machines operate correctly (such checking is believed to be impossible in principle – see Avi Rubin's book "Brave New Ballot" for details).

Secondly verification (from the election officials) heavily depends on the principles of chain-of-custody. Ballot boxes, or voting machines, need to be followed very carefully from the moment they are initialized to the moment when the election is finally considered over. Any lapse in auditing this chain of events, or tampering at any stage, can throw the election process integrity into doubt. This is an expensive and fragile process.

Finally recovery from any detected errors or fraud is very difficult. The last stage of an election, i.e., the tally of the votes, can be performed multiple times to ensure that it is correct. Sadly no other process in an election can, and detecting fraud or errors in other phases can only be corrected by re-running the election (or establishing that it was not significant).

In an attempt to balance the conflicting requirements of verifiability versus secrecy many systems or jurisdictions are starting to favor verifiability to the detriment of secrecy. Examples include the use of Internet voting (Switzerland, Estonia) that is inherently difficult to protect against coercion, and postal ballots (piloted in the UK – with massive fraud being uncovered). Yet a recent study of the Chilean election data before and after the 1958 election, where the secrecy of the ballot was introduced, found that it has a significant effect on the results of the election as well as subsequent policies.

5.4.3 Basics of Cryptographically Secured Electronic Voting Systems

The aim of cryptographically secure electronic elections is to provide the highest possible level of verifiability, namely public verifiability, and combine it with the highest level of ballot secrecy, namely receipt-freeness. Universal public verifiability means that everyone (election officials, candidates, voters...) can individually check that (1) all ballots cast were taken into account in the final tally (2) the vote they personally cast was recorded correctly and will contribute to the correct tally. yet receipt freeness means that voters cannot convince any other party about the way in which they voted.

A key design principle that has been used in the past to realize complex systems is the "end-to-end principle" (Clarke et al.) The principle states that all complex or sensitive operations should be done at the 'edges of a system' keeping the core of it simple to engineer, cheap and untrusted. This principle can be applied to election systems: rather than completely auditing election machines' code or keeping records about the full chain of custody of each machine one can simply check the process of casting and tallying the votes (the 'edges' of an election system) and check their consistency using mathematical proofs. The need for trusted hardware and audited software is therefore greatly reduced.

The key technical ingredients of any cryptographically secure election system are the following:

- Authentication and signatures are used to ensure that only authorized parties can vote. (Maintaining the register of voters is outside the scope of current research on secure voting.)
- Encryption is used to hide the exact ballot from any third parties, but also the voter him/herself. (This was if the vote is ever decrypted it cannot be used as a receipt!) The encryption is 'probabilistic' meaning that the same vote can have many encrypted representations. This is necessary since in an election there can be few types of votes (the most extreme being a referendum providing only a binary choice.)
- Zero-knowledge proofs are used to prove to the voter that the (hidden) vote corresponds indeed to the vote he intends to cast. Yet these proofs should remain meaningless to any third party to ensure receipt-freeness. Zero-knowledge proofs are mathematical constructs that allow one party to prove properties of hidden or encrypted objects. The purpose of such proofs in election schemes is to convince the voter that the encrypted vote he is about to cast is indeed for the party / choice intended. It is difficult to find equivalents in the physical world for efficient zero knowledge proofs but the principle can be illustrated by the (rather cumbersome but secure) 'cut and chose' protocols. Such a protocol for proving the contents of a particular vote would go as follows: the voting machine provides 10 candidate ballots for the party requested. The voter chooses 9 of them which are decrypted. He checks that all of them were votes for the intended party, and only then he casts the 10th, still encrypted, vote. The machine has only a very small probability of fooling the voter into casting a ballot for another party (since it does not know which ballots the voter will chose to decrypt to verify it), but the voter still does not know the exact plaintext of the vote!
- A bulletin board is used to record all cast votes. The bulletin board is an append-only public record that can be checked by anyone. Making it difficult to erase and available is a difficult task, that has been the subject of extended research. At this point an encrypted record of votes is recorded on the bulletin board.
 - (Option 1) A cryptographic shuffle of all the votes is performed to ensure voter anonymity followed by a threshold decryption and tally of the plaintext votes. Extensive work has been done on verifiable shuffles or mix-nets. These take a list of input ciphertext and output a list of plaintext (after threshold decryption). They also output mathematical proofs that all the input votes were output and that no votes were lost or added.
 - (Option 2) The votes are tallied while being encrypted (using special homomorphic encryption schemes), and only the final results are decrypted using threshold decryption. This is an active field of research.

A Threshold decryption is applied at each stage, meaning that all election authorities involved must participate for the results to be decrypted and retrieved in clear.

5.4.4 Key Systems

We present here some key systems for cryptographically secure electronic voting. The interested reader is provided with pointers for further reference and details.

- VoteHere, mainly designed by Andrew Neff, cf. <http://www.votehere.net/default.php>. They provide the VHTi software acting as a wrapper around other voting systems making them universally verifiable. According to their product description. "It is software that works with any electronic voting system. It monitors the election end-to-end and in real time, enabling independent audit and validation of election results. And voters can take home an optional private receipt to verify their vote was counted properly, while maintaining ballot secrecy throughout." "VHTi is 100% transparent and will, with near certainty, detect if ballots are corrupted, whether maliciously or accidentally."
- Punchscan, mainly designed by David Chaum, cf. <http://punchscan.org>. The punch scan system allows voters to mark with a highlighter pen their preferences on a ballot made of two sheets of paper containing holes. This ensures that markings will appear on both sheets of paper. The two sheets are then separated by the voter, one used to cast the ballot and the other to verify the integrity of the election.
- Secret-Ballot Receipts: True Voter-Verifiable Elections, mainly designed by David Chaum. IEEE Security & Privacy 2(1): 38-47 (2004)

Prêt à voter, mainly designed by Peter Ryan, experimental implementation. The prêt à voter scheme has the advantage to rely on paper ballots. The ballots have two sides and the voter cuts the ballot in half. One half is cast, and the other half can be used to check the integrity of the election.

5.4.5 Key Publications

- Voting Technologies and Trust, Randell, B. and Ryan, P.Y.A. IEEE Security & Privacy, Volume 4, Issue 5, pp 50-56. IEEE Computer Society, 2006, cf. <http://www.cs.ncl.ac.uk/research/pubs/articles/papers/735.pdf>
- Peter Y. A. Ryan, Steve A. Schneider: Prêt à voter with Re-encryption Mixes. ESORICS 2006: 313-326
- David Chaum, Peter Y. A. Ryan, Steve A. Schneider: A Practical Voter-Verifiable Election Scheme. ESORICS 2005: 118-139
- Scratch and Vote, key designer: Ben Adida. Ballots come with areas that can be scratched. Scratching a ballot invalidates it but allows a voter to verify the integrity of the process, while unscratched ballots can be cast. Reference: Ben Adida & Ron Rivest, Scratch and Vote, cf. <http://ben.adida.net/research/AdidaRivest-scratch-and-vote.pdf>
- Olivier Baudron, Pierre-Alain Fouque, David Pointcheval, Jacques Stern, and Guillaume Poupard. Practical multi-candidate election system. In PODC, pages 274-283. ACM, 2001

5.5 Conceptual Problems with Cryptographically Secured Voting Systems

Despite advances in the field of cryptographic voting, these technologies are still very young. As a result there is likely to be great improvement in the future as to their

efficiency and usability. Standards are not yet set, and industry seems reluctant to promote them, when simpler and less secure alternatives are accepted for elections.

A key problem of relying on proofs instead of chain-of-custody security is that people may not understand why they are secure. This is a key problem associated with the legitimacy of elections. Most systems remedy this by ensuring that third parties, which are trusted by the voter, can check the validity of the overall process. The advantage over traditional protocols is that each voter can choose an arbitrary competent party to check the integrity of the process instead of relying on a fixed set of election officials.

The second problem has to do with usability. Even paper based cryptographic voting systems (such as Punchscan, scratch and vote or Prêt a voter) require the user to perform operations that are not familiar: mark the ballot, then split it in two, and choose one part at random to cast as a vote. This may lead to problems for voters that are not accustomed to the process.

The issue of voter trust and acceptance is an important one, and improving them is an active field of research and development. Yet cryptographically secure techniques have to be compared with alternative election technologies: they are often as hard and confusing to use (as the US Florida 2000 election shows) and provide only the weakest form of verifiability. As news of weaknesses of such technologies are becoming commonplace, cryptographically secure election techniques start becoming attractive.

Another mechanism to increase the transparency of cryptographically secured eVoting systems could consist of extended eVoting audit possibilities that would allow any voter to complete the normal eVoting procedure and to cast his vote as any other voter would do, but before submitting the vote, e.g., in the voting urn, or electronically, he indicates that he wants to start auditing this particular vote. This would allow him to determine (i) how this vote was composed, and (ii) how this vote would be taken into account in the election result.

If a voter exercises this audit right, he would clearly compromise the voter anonymity of the audited vote, which is why the procedures should allow him to cast two votes: one that will be audited, but not taken into account in the final tally, and one that will not be audited but that will contribute to the final tally. It is sufficient that only a small fraction of the voters exercises this right to obtain a very high assurance about the correctness of the operation of the voting machines.

6 Legal Aspects

6.1 Introduction

According to the definition provided by the Council of Europe⁶⁴, electronic voting refers to eElections or e-referendum that involves the use of electronic means in at least the casting of the vote. It thus does not only refer to Internet voting but also to the use of electronic voting machines at polling stations mainly used to faster and reduce the error rate during the tallying of the votes. In both cases, the voter has to cast his vote electronically either by using electronic ballots or by casting his vote by Internet. It should be noted that Internet voting includes three different modalities: poll site voting (in which traditional election locations are augmented with Internet technology), kiosk voting (in which Internet terminals would be placed for convenience at non-traditional sites such as malls), and remote voting (in which citizens could vote from virtually any Internet terminal, including at home or work).⁶⁵

Most of the countries surveyed have introduced electronic voting machines at polling stations. These machines do not usually provide Internet access. They are largely implemented in countries such as Belgium, The Netherlands, Germany, the United States, to less extent in France, and are under testing in Ireland. Their implementation does not imply fundamental changes in the electoral voting systems but raise important security, accountability and transparency issues. Their regulation is usually copied from the traditional paper-based procedure and the novelties focused on guaranteeing the security of the machines to avoid hacking, the accountability of the process and the transparency of the procedure as these machines is often compared to “black boxes” and the government blamed for losing part of its control on the voting process.

Belgium, The Netherlands, Germany and the United States⁶⁶ have acquired a valuable experience in eVoting. Tight regulations have been enacted to give confidence to voters in the system guaranteeing that the use of electronic machines fully comply with the fundamental principle of voting elections. However, these countries are facing substantial opposition from some members of civil society as regards the transparency and security of such processes. The claimed security of the machine is highly contested in countries where NEDAP machines are used. In 2006 Dutch researchers have detected a series of flaws in Nedap/Groenendaal ES3B voting⁶⁷, meanwhile in Germany their use have been challenged to the Courts, the plaintiffs missing the transparency of the storage of the votes in the machine and of the possibility to have a recount because the certified machines do not have a paper trail.

Some few countries have gone one step further and started implementing Internet voting

⁶⁴ Council of Europe, Recommendation Rec(2004)11 of the Committee of Ministers to member states on legal, operational and technical standards for eVoting, 30 September 2004.

⁶⁵ <http://www.nsf.gov/od/lpa/news/press/01/pr01118.htm>

⁶⁶ France is not mentioned here because, despite the use of electronic machines has also been introduced in French legal systems very early, in the seventies', the concrete introduction of this alternative means has only begun in 2004, not providing this country with experience.

⁶⁷ We do not trust voting computers foundation, Nedap / Groenendaal ES3B voting computers: a security analysis, available on-line at: <http://www.wijvertrouwenstemcomputersniet.nl/images/9/91/Es3b-en.pdf> (last accessed on 13 April 2007)

as an alternative form of remote voting. In these cases, Internet voting is legally acknowledged to postal voting and as such limited to the cases where this specific form of voting is allowed by electoral law. This is the case in France and the Netherlands where the system is still under testing and limited to expatriates for the elections of the Senate representatives of expatriates for the latter, and for European and Parliamentary elections for the former. Strict formalities have been implemented in order to avoid fraud and guarantee the voters' authentication.

More advanced is the case of Switzerland where Internet voting has been deployed as an alternative to postal voting in order to increase the voter's turnout. Specific rules applying to Internet voting have been introduced into the legislation in order to ensure the respect of the guarantees which should govern any democratic elections on the basis of the recommendations of the Council of Europe on electronic voting.

Finally, the case of Estonia should be mentioned as it has officially and permanently introduced remote Internet voting into its electoral system. The first national elections allowing Internet voting took place in March 2007 without any remarkable incident. The Estonian case is somehow particular as Internet voting is introduced as an alternative advanced voting means with the possibility to change the vote cast by Internet as many times as desired and even to cast the vote traditionally. The last vote is the one which will be taking into account. The possibility of changing one's vote has been considered as a pre-requisite of Internet voting in order to guarantee the freedom of the vote. The system is based on the national eID as means of authentication and on the secure on-line banking system to ensure the required security.

Contrary to the introduction of electronic voting machines which does not introduce major changes in the electoral legislation, Internet voting raises several concerns as regards the respect of basic principles of democratic elections which call for original solutions and safeguards. Principles such as authentication of voters, secrecy of the votes or free expression of the vote are particularly at stake, apart from the habitual concerns related to the use of any technology in election process (security, accountability and transparency).

Before presenting the main principles which should govern any eVoting system and the answers brought by some countries, it should be noted that many scholars argue that the substitution of manual by automatic procedures brings about a deep modification of the electoral system equilibrium.⁶⁸ This position should be highlighted as it appears contrary to the general idea and political treatment of the question which reduce the introduction of new technologies in the voting process to a technical matter and do not take into account the possible consequences on fundamental elections principles. Automatic elections procedures usually lead to derogation to existing rules. Therefore, the adaptation of the procedure does not only raise technical concerns aiming to guarantee the security, accountability and transparency of the process, but also to the meaning and the existing equilibrium of the electoral process itself, as it has been gradually designed.

eVoting is usually argued to reduce the costs of elections, to give more accurate results, to eliminate spoiled votes, to speed up the count procedure, to modernise the electoral system and to improve the voters' turnout. However, the use of new technologies in the

⁶⁸ Bourgaux, A.-E., *Le vote automatisé*, in Proceedings of the Conference "Les élections dans tous leurs états", Brussels, 22-23 September 2000, ed. Bruylant, coll. ULB, 2001, pages 157-245.

democratic voting process at public elections should not lower the safeguards surrounding the election's procedure, condition of their legitimacy. These mandatory safeguards contained in several international instruments⁶⁹ and transposed in national legal systems set up two main principles: non-discrimination and respect of democratic elections. This means that all voters should be treated equally, i.e. they should have the same opportunities to cast their vote, they should be free to vote, without undue influence or coercion of any kind, the vote cast should remain secret, i.e., voters should be able to cast their vote in secrecy and once cast the link between the voter and the vote should be cut, one person should only be able to cast one vote, the ballot box should be uncorrupt, reliable and secure. Finally, the whole voting process should be transparent, i.e., verifiable and able to audit.

In 2004, the Council of Europe has approved the first international set of standards for eEnabled voting.⁷⁰ The legal standards are intended to apply the principles of existing Council of Europe and other international instruments in the field of elections to the circumstances of eEnabled voting.⁷¹ The recommendation on legal, operational and technical standards for eVoting⁷² states that “the right to vote is one of the primary foundations of democracy, and that, consequently, eVoting systems procedures shall comply with the principles of democratic elections and referendums”. Countries willing to implement eVoting procedure have now a frame of reference to adapt their legislations.

As mentioned above, eVoting systems should comply with the principles of non-discrimination and of democratic elections.

The non-discrimination principle implies that ‘every eligible voter can participate in the election process and nobody can be –directly or indirectly- excluded or discriminated’⁷³. Electoral procedure should thus ensure that every voter is equally treated and has the same opportunities to cast his vote. In this sense, specific provisions are being introduced in electoral laws to enable disable, ill and elderly people to cast their votes. Mobile polling stations are usually introduced in order to allow these people to cast their vote. Similar provisions are foreseen for people not able to vote on the Election day because they will not be present. These provisions can vary from advanced voting procedure to proxy-voting. Advanced voting allows voters to cast their votes the days before the Election day, either by dropping their vote off at designated polling stations, or by post. Proxy-voting consists of giving mandate to another voters registered in the same list to cast one's vote.

The Council of Europe recommends that eVoting systems should be universally accessible. As mentioned above, remote Internet voting allows the possibility of casting one's vote from any place provided the voters has a computer and an Internet connection. It is usually acknowledge to postal voting. It however raises the issue of digital divide and equal access to Internet connection. The Estonian case is illustrative in that sense.

⁶⁹ International Convent on Civil and Political rights, Universal declaration of Human Rights, International Convent on the Protection of Human Rights and Fundamental freedoms.

⁷⁰Op. cit.

⁷¹ Council of Europe, op. cit.

⁷² Op. cit.

⁷³ Loncke M., Dumortier J., Online voting: A legal perspective, International Review of law Computers and Technology, Vol. 18, n°1, pages 59-79, March 2004.

The Estonian President refused to sign the Internet voting Act as he argued he would have breached this principle and discriminated voters who do not have access to secured system used for the elections (i.e., in the Estonian case, to online banking systems). The Estonian National Court has however considered there were no discrimination as the vote could be cast by alternative forms.

The second principle, the democratic elections principle means that the election process should guarantee a universal, equal, free and secret suffrage.

Free suffrage means that the 'elector has to be able to cast his vote without undue influence or coercion of any kind for this may distort or inhibit the free expression of his will'⁷⁴. This constitutes one of the most important challenge to Internet voting and perhaps justify the preference of some countries for electronic voting machines where the traditional safeguards of the electoral process guarantee the free formation of the voter's will, protected by the polling booth. The difficulties raised by this principle can be illustrated by the original decision adopted by the Estonian National Court which considered the possibility to replace eVotes by another eVote or paper ballot as a precondition of constitutionality of eVoting. According to this Court, the right to change the eVote is the only way to guarantee the principle of free voting by remote Internet voting systems.

Finally, due to the technical complexity of electronic voting systems, the free formation and expression of the voter's opinion now imply to make sure that the voter has cast the vote he wanted to cast, avoiding technical mistakes. The Council of Europe states that eVoting system should be understandable and easily usable. As the "Australian ballot"⁷⁵ had raised the level of knowledge required to cast one's vote when implemented in the nineteenth century⁷⁶ Internet voting raises the same concern nowadays.⁷⁷ Switzerland legislation is here remarkable as it states that the way in which voters are guided through the eVoting process shall prevent them from voting precipitately or without previous reflection. It further compels the system to guarantee that voters are aware of the fact that casting their vote electronically is a formal act of voting and ask for confirmation before the voter definitively cast his vote. In that sense, the possibility introduced in Belgian legislation for the voter to check that the machine has correctly recorded his vote and if not annul the vote and cast a new one give increased the guarantees given to the voters by the use of electronic voting machines.

Secret suffrage is also related to the necessity of guaranteeing the free formation of the voter's will and justify the actual use of polling booths. The secrecy of the vote is an important barrier to the implementation of Internet voting conceived as remote voting in many countries, e.g. in France where its infringement is punished by the Penal Code. Electronic voting machines present here the advantage of being able to be placed into the traditional polling booth, without any needs of reducing the traditional conception and guaranteed surrounding secret suffrage. However, secrecy should be observed not only during the casting of the vote but also after it and when the vote is transferred and stored into the electronic ballot box. The identity of the voter should be maintain secret and the

⁷⁴ Ibid.

⁷⁵ The Australian ballot refers to the pre-printed ballot-paper actually used in traditional elections. The concept was imported from Australia to European countries.

⁷⁶ Bourgaux, A.-E., op.cit.

⁷⁷ Council of Europe, op.cit.

votes in the electronic ballot box should remain anonymous, not being possible to reconstruct a link between the vote and the voter.⁷⁸ Technical measures should ensure for one part that the voter is who he claims to be and for the other part to anonymise every vote once they are cast.

eVoting systems should comply with the principle of “one person, one vote”, preventing voters to cast their votes from different voting channels but also guaranteeing to voters that their vote will be taken into account. The latter has been managed in The Netherlands by the publication of voters who have cast their vote by Internet. This system allows the voter to check that their votes have been taken into account once the voting period is finished. Other countries have opted for the issuance of a receipt to voter once the vote has been cast.

This principle also raises the problem of voters’ authentication. In traditional procedure this exigency is met by the identification of the voter to the chairman either by his ID or any other means of proof admitted in Electoral law. The progressive introduction and use of eID with authentication functions for eAdministration procedure can be part of the solution. Several experiences have been carried out in this sense in Switzerland in the canton of Neuchâtel where a unique website to all eAdministration procedure have been set up, or in France where Issy-les-Moulineaux’s citizens have been delivered a Daily Life Card⁷⁹ to be used for accessing public services but also to cast their vote electronically.

Voters’ authentication may require the setting up of centralized voters’ registers. In this case, full compliance with data protection legislation is required. This aspect is not taken into account in the Recommendation of the Council of Europe on eVoting but should be mentioned. The case of France is here remarkable as the French data protection authority is playing an important role in the definition of the legal requirements an Internet voting process should meet in order to guarantee the secrecy of the vote and the respect of privacy of the voters.

Finally, in a democratic context, an eVoting system should ensure attributes and properties such as transparency, verifiability, security, accountability, and accuracy. In that sense Breur F. mentions in the Conference report on “eVoting: lessons learnt and future challenges” that “from a legal point of view it is furthermore important to take into account possible scenarios where problems occur in the concrete application of eVoting. The consequences of eVoting results being contested and possible problems with the validity of the election results need to be faced. In this regard, the law can only provide a starting point while more must be done to develop sound observation and auditing practices. If one imagines, however, a legal appeal against election results based on eVoting channels, the judges would be in a rather difficult position as they would have to trust the judgments and opinions of experts. This is why it is important to envisage a full disclosure of the system and the involvement of a variety of experts. Based on this hypothetical example and from a technical point of view, it seems important that all the elements of an eVoting system be accessible to experts who should get the possibility to

⁷⁸ Council of Europe, *op. cit.*

⁷⁹ The Daily Life card is a smart card with authentication based on PKY technology used by local authorities to authenticate their user in public services.

test.”⁸⁰ In this sense, some countries, as The Netherlands and Belgium have opted for the publication of the source code used by the electronic machines on the Internet. Every citizen can check the software used. Moreover, Independent colleges of experts have been established to evaluate the new systems implemented in most of the countries surveyed. In Ireland, the report of the Independent Commission on Electronic Voting (ICEV) has originated the provisional abandon of eVoting system as it has raised doubts over the accuracy of the software used.

This report provides a description of the electoral systems of twelve different States, included Belgium, focusing on how the use of new technologies in the voting process, namely the use of electronic machines and Internet voting, have been fit in, either by its acknowledgement to other means of voting or by the modification of Electoral law and the introduction of specific provisions. Each chapter starts with an introduction describing the electoral system and giving an overview of the state of the art and last developments in electronic voting, as well as the difficulties encountered in the country of reference. A description of the traditional voting systems and the alternative means of casting one’s vote to the ballot paper are commented with specific emphasis on electronic voting such as electronic voting machines or Internet voting. Where appropriate, experiments conducted in the field of non-public elections are presented. This study does not intend to analyse each electoral systems for reasons of time allocated, but to present the state-of-the art in these countries and the way they have introduced electronic voting procedure into their electoral systems. As mentioned above, all these countries have tried to ensure the compliance of electronic voting process with the general principles of democratic elections presented above.

Synoptic table

The table below provides an overview of the current state of electronic voting with focus put on the concerns raised or which could hinder the implementation of electronic voting and the solutions given. When legislation is in preparation, it is simply mentioned in the table.

⁸⁰ Breur F., Conference report on eVoting: lessons learnt and future challenges, Tallin, 27-28 October 2006, available on-line at: http://www.ega.ee/public/27_28.10.06_Report_e_voting_Conference.pdf, p.8

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COUNTRY	EVM ⁸¹	Kiosk voting	Internet voting	Concerns	Solutions
Belgium	X			<ul style="list-style-type: none"> - Transparency, accountability and security of EMV: some court decisions ruled that EMV could create confusion when casting a vote, that the system was not enough reliable and the Ministry of Internal Affairs could not guarantee the independence of the process. - Internet voting under discussion. Two main legal issues should be solved: how to deal with the required secrecy of the vote, as long as postal voting is not allowed, and the obligation to cast one's vote in the municipality where the voter is registered. 	<ul style="list-style-type: none"> - EMV: Detailed legislation which regulates each step of the election procedure. - Certification criteria which should meet EMV and based on basic democratic elections principles - Increased supervision powers given to Independent bodies (College of Experts) - Possibility given to voter to check that the voting machine had correctly recorded the vote he has cast and if not, annul the vote and cast a new one. - EMV with paper trail. - Law on distance voting under discussion at the Parliament.
The Netherlands	X		X	<ul style="list-style-type: none"> -Transparency, accountability and security of EMV: the system has been hacked by independent computer scientists. - Internet voting under testing 	<ul style="list-style-type: none"> - Certification criteria which should meet EMV and based on basic democratic elections principles - Heavy registration procedure in Internet voting public political elections experiments to avoid fraud. - Several systems of Internet voting are being tested. A specific Law regulates these procedures but electoral law mandate that it should be written in correspondence with the traditional paper-based procedure.
France	X		X	- For EMV, strong criticisms	- EMV subject to:

⁸¹ Electronic voting machines

				<p>received as regards the security and transparency of the vote. No paper trail, no possibility for the voter to make sure that the machine has recorded his vote correctly.</p> <ul style="list-style-type: none"> - For Internet voting, strict provisions on the secrecy of the vote, punished by Penal Code. <p>Complexity of the procedure.</p>	<ul style="list-style-type: none"> - Certification procedure by the Ministry of Internal Affairs - List of municipalities authorized to introduce the machines by the <i>préfet</i>. - Internet voting has been experimented in the only case where postal voting is permitted by the Electoral code.
Switzerland			X	<ul style="list-style-type: none"> - Authentication of the voters - Same issues as postal voting (remote voting systems) 	<ul style="list-style-type: none"> - Different systems based on smart card have been implemented in the cantons. Certain convergence with e-government solutions. - The large experience of Switzerland in postal voting have allowed to transpose the issues identified for distance voting in the legislation relative to Internet voting. Specific and detailed rules are introduced into the legislation on the basis of the recommendations of the Council of Europe.
Germany	X			- Transparency of the process	- Certification procedure of the machines
England				<ul style="list-style-type: none"> - Voters central register inexistent. - The Independent Commission on Alternative Voting Methods warned against of introducing alternative voting methods which could render the process more vulnerable. No specific initiative has been taken in the sense of electronic voting. 	
Ireland	X			-Transparency, accountability and security of EMV (NEDAP): the Independent Commission on Electronic Voting raised doubts over the accuracy of the software used in	<ul style="list-style-type: none"> - Certification criteria which should meet EMV and based on basic democratic elections principles - Independent bodies for control (Independent Commission on Electronic Voting) - Detailed regulation of electronic voting approved in

				the system. The commission has recommended that there should now be an independent end-to-end test of the eVoting system and independent parallel test of the system, including where possible in a live electoral context.	2004.
Latvia				- The Electoral Law compels to the physical presence of the voter for the casting of the vote. - Postal voting foreseen only for citizens living abroad.	- Reflections undergoing for the implementation of Internet voting.
Lithuania				- Postal voting foresees in limited number of cases. Strict conditions (impossibility of going physically to cast one's vote).	- After the positive experience of their neighbors, Lithuania is planning to introduce Internet voting for the next Parliamentary elections of 2008, using a similar system to the one used in Estonia. A Draft law has been enacted in 2006 in order to allow Internet voting which provides for online banking systems to be used to register voters and to cast ballots in elections. The prime minister, ordered to institute a working group for creating an eVoting model in Lithuania at the beginning of March, 2007. It is proposed that, because Lithuania does not have an e-signature infrastructure, electronic voting should be based on the principle of electronic banking.
Estonia			X	1.- Free suffrage	- Internet voting conceived as advanced voting. Possibility of electronic re-vote. - Authentication through eID
The United States and California	X			- system design flaws - poorly developed security controls - incorrect system configurations	- Optical scan and direct recording electronic (DRE) systems - In 1990, the Federal Election Commission (FEC) issued a set of voluntary voting standards, which it

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				<ul style="list-style-type: none">- inadequate testing- poor overall security management	revised in 2002 and in 2005.
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6.2 Belgium⁸²

Belgium became an independent nation in 1830. In the following years, Belgium evolved into a country with a federal structure.⁸³ Belgium is also a constitutional monarchy. Currently King Albert II is the constitutional head of state. There are two houses of Parliament: the Chamber of Representatives, whose members are elected for a period of four years, and the Senate or upper house, whose members are elected or co-opted.

The Belgian federal state is characterized by many different divisions.

First of all, Belgium is divided into several “linguistic territories” (“*taalgebieden*”). The two biggest regions are (1) the Dutch-speaking region, and (2) the French-speaking region. In between these two regions, there is (3) the Brussels region, which is considered bilingual (French and Dutch share official status). (4) Next to French and Dutch, there is also a small German-speaking minority (article 4 of the Belgian Constitution).

Secondly, the Belgian federal state is divided into “Communities” (“*Gemeenschappen*”) and “Regions” (“*Gewesten*”) (article 1 of the Belgian Constitution), which each have a certain decision-making power (cf. *infra*). This means that the federal Government and the federal Parliament have no longer the exclusive power to make decisions. The division into Communities and Regions is also largely based on language, but it does not completely coincide with the division of the linguistic territories.

The governments of the Communities are responsible for “person-based matters”, such as language, culture and welfare; whereas the governments of the Regions are responsible for “land-based matters”, such as infrastructure and environment. The concept of a “Region” also pertains to economic interests. “Regions” pursue economic autonomy. To a certain extent they can be compared to the States within the United States of America, de German “Länder” and/or the “Kantons” in Switzerland.

More specifically, Belgium consists of 3 Communities (article 2 of the Belgian Constitution) and 3 Regions (article 3 of the Belgian Constitution): the Flemish Community, the French Community, the German Community⁸⁴, the Flemish Region, the Walloon (French-speaking) Region and the Brussels Capital Region⁸⁵. In Flanders, the Flemish Region and the Flemish Community are fused together and have the same government. All the other Communities and Regions have separate governments.

The Communities and Regions are further divided into 10 provinces (article 5 of the

⁸² This Chapter is an update of Van Oudenhove, B., Schlichting K., Siebald S., Tucholke U., Lévy S., Legale E., Laigneau A., Forsgren O., Ohlin T., Legal issues of cybervoting, for the European project “CYBERVOTE”, June 2001. The original version is available on line at: <http://www.eucybervote.org/reports.html>, last access 29th March 2007.

⁸³ This evolution took place in 5 different state reformations (in 1970, 1980, 1988-89, 1993 and 2001).

⁸⁴ The German Community is situated in the Walloon Region. For land-based matters, this Community falls back on the Walloon Region, in which the German-speaking minority participates.

⁸⁵ The Brussels Capital Region has, unlike the other Regions, no equivalent for a “Community”. The person-based matters in the Brussels Capital are dealt with by either the Flemish Community or the French Community.

Belgian Constitution) and 589 municipalities (article 4 of the Belgian Constitution).⁸⁶ For the elections, the Belgian territory is divided into voting districts, which are established by Law (article 63 § 4 of the Belgian Constitution). There are three voting districts: a Flemish and a Walloon district, and a district of Brussels Capital (article 87 bis Belgian Election Law⁸⁷). These districts consist of administrative districts which are divided into voting cantons (article 87 and 88 of the Belgian Election Law). Each canton has a head station (this is the principal place of each canton), vote tabulation stations (they too are located in the principal place of each canton) and polling stations (article 95 of the Belgian Election Law).⁸⁸

Elections for the Federal Parliament are normally held every four years (article 105 of the Belgian Election Law)⁸⁹. The Community and Regional Parliaments are elected every five years⁹⁰, and their elections coincide with those for the [European Parliament](#). Elections for the members of the Belgian municipal and provincial councils are held every six years^{91, 92}. *In this document, the focus will be on the elections for the Federal Parliament and the (General) Belgian Election Law.* For the elections of the Community and Regional Parliaments and the municipal and provincial councils, there are specific Laws, but the general principles are more or less the same as in the (General) Belgian Election Law.

Electronic voting machines have been introduced in middle of the nineties when a specific law was enacted to make electronic elections possible. Belgium has thus gained a valuable experience in the use of electronic voting systems, which have been monitored, modified and finally generally accepted by the public to generate a reliable voting procedure. This – mainly positive – experience may enhance confidence in the opportunities that an Internet voting system provide.

Today, the Belgian government has not taken any initiative concerning distance voting yet. In general, only preliminary steps have been taken towards online democracy in Belgium. In 2001, two members of the Senate have proposed the enactment of a Law concerning Internet voting. This proposal never passed because the Chambers were disbanded.⁹³ In 2003 however the same enactment was introduced again by one of the two members who proposed the first enactment. The content of this proposal will be integrated in the analysis below.⁹⁴

Belgian election rules provide stringent conditions for conducting public elections. It has to be seen to which extent Belgian lawmakers will be prepared to modify these stringent rules to allow an Internet voting system to be implemented. In the plenary

⁸⁶http://www.belgium.be/eportal/application?origin=hardcodedAboutBelgiumNavTeaser.jsp&event=be_a_portal_framework_internal_refresh&pageid=indexPage&navId=2679;
http://europa.eu/abc/european_countries/eu_members/belgium/index_en.htm.

⁸⁷ (General) Election Law of 12 April 1894, B.S. 15 April 1894 (a consolidated version is available at: http://www.juridat.be/cgi_loi/loi_N.pl?cn=1894041230).

⁸⁸ See also: <http://www.elections.fgov.be/2007/2007NI/Dokunl/aspecten/stemopneming/Cdoku.htm>.

⁸⁹ The next general election will be in June [2007](#).

⁹⁰ The next Community and Regional elections are expected in [2009](#).

⁹¹ The [latest municipal and provincial elections](#) were held in [2006](#).

⁹² http://en.wikipedia.org/wiki/Politics_of_Belgium#Electoral_system

⁹³ Wetsvoorstel tot aanvulling van de wet van 11 april 1994 tot organisatie van de geautomatiseerde stemming om de geautomatiseerde stemming op afstand mogelijk te maken, *Parl. St.* Senaat 1999-2000, 20 april 2000, nr. 2-410/1 (see: http://www.senate.be/www/?MIval=/index_senate&MENUID=12420&LANG=nl).

⁹⁴ Wetsvoorstel tot aanvulling van de wet van 11 april 1994 tot organisatie van de geautomatiseerde stemming om de geautomatiseerde stemming op afstand mogelijk te maken, *Parl. St.* Senaat 1999-2000, 9 september 2003, nr. 3-205/1 (see: http://www.senate.be/www/?MIval=/index_senate&MENUID=12420&LANG=nl).

meetings of the Senate, the possibilities of an Internet voting system and possible pilot projects have already been discussed several times.⁹⁵

6.2.1 Electoral system

It should be noted that the Belgian Election Law describes in great detail how traditional elections are to be conducted. This law was recently modified by the Law of 13 February 2007 concerning several changes in the election procedures. This new law takes into account the introduction of the electronic identity card in Belgium by the Law of 25 March 2003 on the eID.

It is also important to note that voting is mandatory in Belgium.

6.2.2 Traditional voting procedure

6.2.2.1 In general

Every Belgian citizen who is more than 18 years old is eligible to vote (if they are not excluded by one of the exceptions provided by law). Every voter has one vote (art. 61 Belgian Constitution). As stated above, voting is obligatory in Belgium.

The members of the federal Chamber of Representatives are chosen through direct elections. The elections itself have a system of proportional representation (article 61 of the Belgian Constitution). As regards elections to the Senate, In order to safeguard the delicate balance of power between the French and the Dutch speaking population, the electorate is divided into two electoral colleges: a Dutch one and a French one (article 87bis of the Election Law). The composition of the electoral colleges is arranged by Law.

The voting itself also has to be secret (article 62 of the Belgian Constitution).

6.2.2.2 Voting Place

The Belgian Constitution prescribes in article 62 that the election is to be conducted in the municipality. However, a Law may provide for exceptions. The Election Law provides that the election takes place at the municipality where the voter is registered on the voter's list (Article 4 Election Law). People who are enlisted in the voting list of a municipality in the Flemish voting district are part of the Dutch electoral college and people who are enlisted in the voting list of a municipality in the Walloon voting district are part of the French electoral college. People who are enlisted in the voting list of a municipality in the voting district of Brussels Capital belong to either the French or the Dutch electoral college (article 87bis Election Law).

In addition, each municipality is divided in "voting departments". If there are less than 800 voters in one municipality, there is only one single voting department. If there are more than 800 voters in the municipality, the voters will be further divided into several voting departments; comprising at least 150 voters each; with a maximum of 800 voters. If the election is conducted by using a voting system other than the traditional paper ballot, the amount of voters per voting department can go up to 2000 voters. (Article 90 Election Law).

⁹⁵ See: *Hand. Senaat 2005-2006*, 29 June 2006, 3-173; *Hand. Senaat 2005-2006*, 29 25 October 2005, 3-131; *Hand. Senaat 2005-2006*, 20 October 2005, 3-130.

Each voting department generally has its own polling place (art. 91 Election Law).

6.2.2.3 Opening and closing of the election

No later than 15 days before the election, the date of the election and the moment of opening and closing of the polling stations must be published in the Official Publication of Belgian Laws and Statutes. In addition a summons has to be sent to each voter, also no later than 15 days before the election. This task is dealt with by the town council (Article 107 Election Law).

The day before the election, the required ballots are sent to the chairman of each polling station in a sealed envelope. On the envelope the amount of the ballots contained are mentioned, as well as the address of the polling station. The envelope can only be opened in the presence of the election staff of the polling station⁹⁶. The ballots have to be counted immediately and the number is written down in an official record (article 129 Election Law).

On the day of the elections, the voters are allowed to vote from 8 a.m. till 1 p.m. Voters who are present in the polling station at 1 p.m. are still allowed to cast their vote (Article 142 Election Law). However, it should be noted that electronic voting is allowed until 3 p.m.⁹⁷

6.2.2.4 Authentication of eligible voters

Every municipality puts together a voter's list, containing the following information of each voter: first name and surname, date of birth, gender, place of main residence and the national register number (Article 10 Election Law). The national register number was added by the Law of 13 February 2007. The reason why they added the national register number is because of the introduction of the eID. The following data is printed on this card, and can thus be read visually: the cardholders single identification key (i.e., his national register number), the identity card number, the cardholders basic identification data (name, first names, gender, date and place of birth, nationality), a photograph of the cardholder, the handwritten signature of the cardholder and the municipality official, the cards period of validity and the place the card was issued. Information that is likely to change, like marital status and address are no longer displayed, saving the replacement of 10% of the Belgian eIDs each year.⁹⁸ To assure and to simplify the authentication of voters at the polling stations—after the disappearance of the address and the place of main residence on the identity card – the national register number has been incorporated onto the voter's list.

All citizens can, until the twelfth day before the elections, check at the municipality whether they (or someone else) are mentioned on the voter's list and with the correct references (Article 16 Election Law). The municipality is also obliged to give copies of the voter's list to the political parties who request it. The municipality is however not allowed to give out copies of the voter's list to any other persons (Article 17 Election Law).

⁹⁶ A polling station consists in a chairman, four members, four substitute members and a secretary (article 95 § 9 Election Law).

⁹⁷ Koninklijk besluit van 10 april 2003 tot regeling van sommige kiesverrichtingen voor de verkiezing van de federale Wetgevende Kamers op 18 mei 2003, B.S. 18 april 2003.

⁹⁸ S. VAN DAMME, Advanced Applications for eID Cards in Flanders, ADAPID Deliverable D2, Requirements Study, 20 (see: <https://www.cosic.esat.kuleuven.be/adapid/docs/adapid-d2.pdf>).

On the day of the elections, the list of eligible voters is posted at the polling station (Article 112 Election Law).

As indicated above, each eligible voter receives a summons no later than 15 days before the election. This is called an election card. This card states the date of the election, the polling place (where the voter has to vote) and the moment of opening and closing of the polling station. The election card also mentions the first name and the surname, the gender and the main residence of the voter, and if this is the case, also the name of his/her wife/husband and his/her number on the voter's list (Article 107 Election Law).

Voters have to present themselves at the polling station with their election card and identity card. The election staff of the polling station always has to check if the elements on the voter's list correspond with the elements on the election card and the identity card (Article 142 Election Law). His/her name is marked then on the voter's register.

Finally, it's important to mention that it is not allowed to appear at the polling station for another voter, unless you have a mandate (Article 201 Election Law). This is called proxy-voting (Article 147bis Election Law).

6.2.2.5 Presentation of the list of candidates

Once the candidates are determined, the list of candidates has to be posted immediately in each municipality of the voting district (Article 127 Election Law). The ballot itself (with the candidates on it) has to be designed according to a specific model (Article 127 Election Law).

Furthermore, the Election Law provides a lot of details about the ballot: the lists of candidates have to be placed next to one another on the ballot, a voting box and a number has to be placed on top of each list of candidates (at least one cm high and 4 mm wide), as well as the abbreviation or the logo of the political party (at least one cm high and 3 cm wide). The name and first name of each candidate has to be preceded by a serial number, followed by a little voting box⁹⁹ (Article 128 Election Law). The numbering of the candidates is something that was introduced by the Law of 13 February 2007. This is to give the candidates a bigger visibility and to help the voter with his ballot or viewing screen.

6.2.2.6 Publication of the voting procedure

A voter's manual is posted inside the polling station (Article 112 Election Law) and inside the waiting room (Article 140 Election Law). The same manual has to be posted in the municipalities prior to the election (Article 127 Election Law). A copy of the entire text of the Election Law is placed on the table of the polling station. In the waiting room, another copy is placed at the disposal of the voters (Article 113 Election Law).

6.2.2.7 The casting of the vote

The votes are cast at a polling station. This station is composed of a chairman, four members, four substitute members and a secretary (article 95 § 9 Election Law). When electronic voting is being used and there are more than 800 voters for that

⁹⁹ The introduction of a little voting box will not be implemented in the elections of 10 June 2007.

particular polling station, a supplementary secretary and one additional member, as well as one additional substitute member should be present. The supplementary secretary must be experienced in IT (article 14, 2° LOCV).

The chairman of the head station of the canton appoints the chairman and the (substitute) members of the polling station (article 95 § 4, 1° and 4° Election Law). He also has to oversee the election process in his canton (article 95 § 3 Election Law).

Furthermore, the polling places and the voting booths have to be organized according to a special model (Article 138 Election Law). There has to be at least one voting booth per 150 voters (Article 139 Election Law). The chairman of the polling station also has to take the necessary measures to preserve peace and order at the polling place and in the neighborhood of the building in which the election takes place (Article 109 Election Law). Only at the request of the chairman of the polling station, is it allowed to position armed forces in the vicinity of the polling station (Article 109 Election Law). The chairman may also demand the removal of a voter (who will still be permitted to vote later on), when that voter openly expresses approval or disapproval or causes disorder in any sort of way (Article 111 Election Law).

Citizens, who enter a polling station without being eligible to vote at that station, and who are not a candidate or member of the polling station, nor an expert (as indicated by the Law of 11 April 1994 the law which organizes the computerized voting), nor someone who gives technical support, can also be removed from the room on demand of the chairman of the polling station (Article 110 Election Law).

It is important to indicate that eligible voters are not allowed to stay inside the polling area for a longer period than necessary to fill out the ballot and to deposit the ballot into the ballot box (Article 109 Election Law). Also, no one can be forced to breach the secrecy of his/her vote, not even in a judicial enquiry, a dispute, or a parliamentary investigation (Article 114 Election Law). Not even the chairman, the secretary or a member of the polling station, nor any witness is allowed to breach the secrecy of the vote (Article 199 Election Law).

It is not permitted to cause any disturbance on the day of the election (Article 203 Election Law). It is also prohibited to assemble, even if unarmed, in a way that inspires fear in voters or disrupts peace and order (Article 188 Election Law). It is also not allowed to obstruct one or more citizens in the exercise of their voting rights (Article 189 Election Law).

Furthermore, it is forbidden to offer or promise, either directly or indirectly, money, valuables or any advantage or support, in return for a vote, a non-vote or a proxy vote or under the condition the election to have a particular result (Article 181 Election Law). It is also forbidden to accept such an offer or promise.

It is similarly forbidden to use force against a voter, to threaten him/her, or to inspire fear in any way, towards the voter, his family or his property (Article 183 Election Law).

Finally, it is not permitted to give out, offer or promise money or any other valuable under the pretext of a reimbursement of travel or accommodation costs. The same goes for giving, offering or promising food or drink. It is also forbidden to accept such a gift, offer or promise (Article 184 Election Law).

Although there are many restrictions, there are also some things explicitly allowed by the Election Law. For example, the candidates in the election are allowed to appoint a witness to attend the voting process (Article 131 Election Law). Another example is when a voter has damaged his ballot. In this case, the voter is allowed to ask the

chairman for a new ballot. Accordingly, the chairman has to mark in the official record of the election the number of ballots that have been withdrawn (Article 145 Election Law).

6.2.2.8 Transfer of the ballot to the election authority

The voter shows the chairman the properly folded ballot (with the stamp on the outside) and deposits the ballot in the ballot box.

The voter is not allowed to unfold the ballot when leaving the voting booth in a way that the vote becomes public. If the voter does so anyway, the chairman collects the ballot, makes it invalid it, and obliges the voter to vote again (Article 143 Election law).

The voting mark, even if not perfectly filled out, is valid, unless the intention to make the ballot recognizable is clearly present (Article 144 Election Law).

6.2.2.9 Tabulation of the ballots

After the closing of the election, the polling station determines the number of ballots that have been put in the ballot box, the number of ballots that have been withdrawn and the number of ballots that have not been used. Those numbers are written down in the official record of the election (Article 147 Election Law).

The votes are tabulated at a vote tabulation station. This station is composed of a chairman, four members, four substitute members and a secretary (Article 95 § 8 Election Law). The candidates may appoint a witness to attend the tabulating process (Article 131 Election Law).

It is possible that the polling station is also the tabulation station. In that case, after the counting of the ballots is determined, the ballot box is sealed until the tabulation station is installed. When the polling station is not also the tabulation station, the ballots are put in an envelope, which is sealed by the chairman with the seals of all members of the polling station. The number of ballots is marked on the envelope. The same takes place with the withdrawn ballots or the ballots not used and with the official record of the election. They are put in separate envelopes. Accompanied by the witnesses, the chairman or appointed member of the polling station immediately transports all the envelopes to the tabulation station (Article 147 Election Law).

The tabulation station collects the ballots from several different polling stations, but cannot be responsible for the counting of the votes of more than 2.400 voters (Article 149 Election Law). Five days before the election, it is put up for raffle (at random) which tabulation station has to tabulate the ballots of which polling stations (Article 150 Election Law). Tabulation starts when all envelopes are received (Article 154 Election Law). In presence of the members of the tabulation station and the witnesses, the chairman (of the tabulation station) opens the envelopes and counts the ballots, without unfolding them (Article 155 Election Law).

Afterwards all ballots are mixed and unfolded and classified into the following main categories:

- Valid ballots for the first list;
- Valid ballots for the second and following lists;

- Doubtful ballots;
- Blank ballots and non-valid ballots.

After the division into these main categories, the ballots are divided are further (Article 156 Election Law). We will not elaborate on this aspect further. It's only important to mention that the witnesses and the other members of the tabulation station are allowed to investigate this division. Their complaints, along with the advices and decisions of the station are written down in the official record of the tabulation (Art 158 Election Law).

Afterwards, the totals of the ballots of each classification are determined and all ballots are deposited into envelopes according to above division (Article 159 Election Law). An official record is made of these actions, which also contains a table of the result of the tabulation. This table is made up in twofold. The record is signed by the members of the stations and the witnesses (Article 161 Election Law).

It is permitted to use computer programs for the tabulation, but only if the software is recognized by the Minister of Internal Affairs (Article 165 Election Law).

6.2.2.10 Gathering of the totals

The head station of the canton collects the results of the voting in the canton (Article 95 § 3 Election Law). The official record containing the table of tabulation results is brought to the chairman of the station of the canton (Article 161 Election Law).

By using the electronic signature of his eID, the chairman digitally transmits the official record (containing the tables of the tabulation results) to the chairman of the voting district. In the same way, the amount of ballots for each category and the voting number is sent to the Minister of Internal Affairs (Article 161 Election Law).

On the district level, the votes are put through a final tabulation (Article 164 Election Law). Also in this stage of the tabulation, it is permitted to use computer programs for the tabulation, but only if the software is recognized by the Minister of Internal Affairs (Article 165 Election Law).

6.2.2.11 Other important amendments of the Election Law

Some amendments of the Law of 13 February 2007 are already indicated above. Two other important amendments are:

- The adaptation of the calendar of the elections for the federal Parliament;
- The digital transmission of the official records (see below, 2.3.2).

6.2.3 Alternative voting procedure

In Belgium it is not possible to cast a vote by mail, not even for citizens residing abroad. In this section proxy-voting (Article 147bis Election Law).

The following voters are allowed to give a mandate to another voter to vote for them:

- Voters who are unable to go to the polling station due to illness or disability;
- Voters who, due to their profession or service:

- reside abroad, as well as the members of his family;
- are unable to go to the polling station;
- Voters who are seamen, market vendors or fair travelers (and their family);
- Voters who are in custody;
- Voters who cannot go to the polling station due to their religion;
- Students who cannot go to the polling station;
- Voters who temporarily reside abroad and therefore cannot go to the polling station (Article 147bis § 1 Election Law).

With regards to the last instance a new procedure has been elaborated by the Law of 13 February 2007. In most of all these cases, the voter who gives proxy has to be able to prove his condition with a certificate (attestation).

The voter can appoint any other voter, who is eligible to vote, as a proxy. A proxy can only receive one mandate (Article 147bis § 2 Election Law). The mandate has to be written down in a form, which is, according to a model, available at the municipal secretary. The form mentions the election, the first name and surname, date of birth and address of both the voter who extends and the voter who receives the proxy. This form has to be signed by both voters (Article 147bis § 3 Election Law).

In order to be able to vote by proxy, the authorized voter has to give to the chairman of the polling station (at which the voter who has given the mandate, would ordinarily have voted) the above mentioned form, the above mentioned certificate, his identity card and his election card. On the election card, the chairman notes: “has voted by mandate” (Article 147bis § 4 Election Law).

6.2.4 Electronic voting

The organization and evaluation, both practically and legally, of the computer automated voting systems might be important for assessing the requirements for and limitations of an Internet voting system. Therefore, and since Belgium has a profound experience in using computers for conducting public elections, the evaluation of the Belgian automated voting systems will constitute a substantial part of the present report.

The Law of 11 April 1994 provides the possibility for voting districts, voting cantons or municipalities to conduct elections using automated voting systems (Article 1 of the Law concerning the organization of the computerized voting, hereafter: the LOCV) . “Automated voting systems” employed by polling stations are made up of: (1) an electronic ballot box and (2) one or more voting machines, which include a screen, a unit to read and register, a magnetic card and an optical pen. On canton level, one or more electronic systems for the tabulation of the votes exist (Article 2 § 1 LOCV).

Electronic voting systems and electronic tabulation systems must in all instances guarantee reliability, security and vote secrecy. This is why the systems have to be in conformity with the approval conditions, determined by Royal Decree. The Minister of Internal Affairs has to confirm this conformity (Article 2 § 2 LOCV).

The municipalities have to buy the systems, which become their property (Article 3 § 1 LOCV). The Minister of Internal Affairs (or his proxy) provides the election software, the safety-codes, the individual magnetic cards and the boot-discs (Article 3

§ 4 LOCV).

After a selection procedure in 1992, two systems have been found suitable for automated voting: the DIGIVOTE-system (of the company Steria) and the JITES-system (of the company Stesud).¹⁰⁰ For a full description of both systems, we refer to the reports of the College of Experts of 1999 and 2000 en 2003 (see: *infra*). The selection of these two systems does not mean that other suitable systems may not be approved in the future. The municipalities have the freedom to choose which system they prefer. Since both systems are not compatible however, a problem arises if the municipalities within one canton use different systems. The source software is kept in a deposit box which can only be opened with specific passwords. The sources are verified by an expert before its installation.¹⁰¹

As from April 2007, it is possible to consult the federal portal of Belgium (www.verkiezingen2007.belgium.be) for a simulation of the electronic voting.¹⁰²

6.2.4.1 Procedure

The day before the election takes place, the chairman of the polling station receives two sealed envelopes (Article 17 § 3 LOCV). The first one contains a unique password for the polling station, the second one a floppy disc that activates and operates the hardware (the voting machines and the ballot box).¹⁰³

The floppy disc is a boot-disc that can only be used in combination with the correct password. The combination of the password and the code on the boot-disc constitutes the encryption key for the further operations. This key is used for example to calculate the control figure which guarantees the integrity of the software and the data. Alterations in the program or the lists of candidates, caused for example by a virus, can be detected in this way. The boot-disc is first used to activate the electronic ballot box. The chairman has to introduce the password, which is also copied on a magnetic card. That magnetic card is then imported into the voting machine (which does not have a keyboard). The voting machine is booted with the boot-disc. After the voting machines have been booted, the boot-disc is again imported into the electronic ballot box. The votes cast on the magnetic cards will be introduced in the electronic ballot box and registered on the boot-disc.¹⁰⁴

Voters who present themselves at the polling station receive a magnetic card on which the voting computer will register the votes cast. However, first the magnetic card has to be initialized. This initialization is done with the magnetic card writer that is inside the electronic ballot box (Article 7 § 1 and 2 LOCV). After this, notwithstanding certain exceptions, the numbering of the candidates, as well as the abbreviation or the logo of the political party of the lists of candidates appear on the screen. The voter uses an optical pen to cast his vote on the computer screen (Article 7 § 3 LOCV). After his vote, the voter is asked to confirm his/her choice. After the confirmation, the vote is definite (Article 7 § 4 LOCV).

¹⁰⁰ Doc 51 0041/001 (Kamer), 3-7/2 (Senaat).

¹⁰¹ Van Riet, Dallemagne, Report to the Senate on the evaluation of the Law concerning the organization of the computerized voting, , doc n° 2-553/1, 15 May 2001

¹⁰² See also: <http://www.elections.fgov.be/2007/2007NI/Dokunl/aspecten/elektronischstemmen/Cdoku.htm>.

¹⁰³ http://www.elections.fgov.be/2007/2007NI/Dokunl/onderrichtingenformulieren/onderrichtingen/geaut_wetg_kamers.pdf.

¹⁰⁴ http://www.elections.fgov.be/2007/2007NI/Dokunl/onderrichtingenformulieren/onderrichtingen/stembureau/2007_ks_n_digivote_stembur_tech%20richtl.pdf.

In order to enhance voter's confidence in the system, the Law has been modified in order to allow the voters to reinsert the magnetic card in the voting computer and to control the card's content, after they have cast their vote and collected their magnetic card (Article 8 and 8bis LOCV).

After the casting of the vote (and possibly after checking the card's content), the voter has to give the magnetic card to the chairman or to one of the other members of the polling station, so he can check whether the card is not damaged. After this, the voter puts the magnetic card into the ballot box computer, where it remains until the vote on the card is properly registered. This registration happens at random (Article 8 LOCV).

The magnetic card reader registers the vote onto the boot-disc, after having verified whether or not the magnetic card is valid. This verification is based on the control number that is registered on the magnetic card, both when initializing the card and when the vote is cast on the voting computer. The control number is calculated based on the content of the vote cast and based on the encryption key. The ballot computer recalculates this control number. If this number does not correspond with the control number on the magnetic card, this indicates that either the vote has been altered after the registration of the vote by the voting computer, or the control number has been calculated with another encryption key than the key of the polling station.¹⁰⁵

After the closing of the election, the chairman terminates the voting activity and the machines are turned off. The software on the ballot box computer has automatically tabulated the votes for each list of candidates and for each candidate. The information is registered on the boot-disc and on a back-up copy in encrypted form (Article 10 LOCV).

The magnetic cards remain inside the sealed ballot box computer until after the elections are declared valid. The ballot box computer is not opened unless a recount is necessary (Article 13 LOCV).

The chairman places the boot-disc (on which the votes have been registered) and the back-up copy in a sealed envelope (Article 11 LOCV) and takes it to the canton head station (Article 13 LOCV). The totals of the votes are gathered at this station.

The chairman of the canton head station inserts the boot-discs in a computer that gathers and calculates the totals. The back-up disc is used when there is a problem with the boot-disc. If neither disc is readable, the chairman is to claim the ballot box computer in order to register the votes. (The ballot box computer is sealed until after the elections are declared valid and is normally not opened unless a recount is necessary¹⁰⁶) (Article 18 LOCV).

The magnetic cards will then be recounted and registered. This would not be necessary with the JITES-system: when using particular software, it is possible to recover the content of the memory of the ballot computer and register it on a new disc.

6.2.4.2 Audit of the election process by experts

In 1998, it was considered necessary that the use and functioning of the system of automated voting would be controlled and surveyed by experts. It was argued that it was necessary, in a democratic society, to be able to control the elections: the democratic parties have to be able to control the reliability of the machines, the

¹⁰⁵ *Ibid.*

¹⁰⁶ Article 13 LOCV.

software and other carriers that are part of the automated voting system.

Since 1998, the Chamber of Representatives, the Senate and the regional legislative bodies are allowed (but not obliged) to designate experts to control the elections. Together, they form the College of Experts (Article 5bis § 1 LOCV). They can control the reliability of electronic voting machines' software, the exact recording of issued ballots on the magnetic card or on the polling station's ballot box memory, the exact recording of the memory from the polling station on the one made for the total count of the ballots, the optical reading of issued ballots and the control system of computerized voting by printing out the ballots (Article 5bis § 2 LOCV).

The College of Experts has already reported on the elections of 13 June 1999, 8 October 2000, 18 May 2003 and 13 June 2004.¹⁰⁷

The findings of the experts will be summarized under the evaluation of the automated voting system.

In addition, each political formation that is represented in either Chambers of Parliament by at least two representatives may designate an IT-specialist. Prior to the elections, these IT-specialists receive the source codes of the voting software of the various voting systems from the Ministry of Internal Affairs. They are also to be provided with any additional information they might need to exercise proper control over the voting software (article 5ter § 1-2 LOCV).

Both the members of the College of Experts as well as the IT-specialists designated by the political formations are bound by a duty of professional confidentiality (art. 5, § 3 LOCV).

6.2.4.3 Evaluation

The automated voting system as described above has been subject to some critiques and evaluations by the public (press, university, etc.), jurisprudence, the Belgian government itself and the experts.

General

The *University of Brussels* (VUB) has done a study on the subject, which shows that electronic voting does not have any influence on the result of the election. Nevertheless a few differences are found, inter alia that the number of abstentions has diminished with 50%. This is explained by the fact that, although it is still possible not to cast a vote, it is no longer possible to cast an invalid vote. Furthermore, the study shows that the position of the candidate's name on the screen of the voting computer is important. The study also remarks that electronic voting has proven not to have any influence on voter turnout.

The *Belgian press* has referred to a number of court-decisions about electronic voting. One court acknowledged that confusion is possible when a list of candidates is shown on three consecutive screens instead of on one screen. In another case, the judge decided that the system of electronic voting was insufficiently reliable and the Ministry of Internal Affairs was reproached that it could not guarantee its independence concerning the system and its control. These judgments resulted in a modification of the Law¹⁰⁸ and a reinforcement of the procedure of control.

¹⁰⁷ See: http://www.senate.be/www/?MIval=/index_senate&MENUID=12420&LANG=nl.

¹⁰⁸ Law of 11 of March 2003 on control of automatic vote, B.G. 28 March 2003.

Additional safeguards have been introduced such as the possibility of printing the results and certification of the machines, the possibility for the voter to control that the vote he had cast is correctly recorded by the electronic ballot box and in case it is not to annul his vote and cast a new one, an increasing of the supervision control given to the experts.

Report of Parliament

In 2000, the Chamber of Representatives drafted a report concerning the evaluation of automated voting and tabulation systems.¹⁰⁹

The report sums up the main positive aspects and guarantees of the automated system: the end of manual tabulation, the speed of the distribution of the results, the simplification and modernization of the voting procedure, etc.

The main critique concerns the lack of reliability, in spite of existing control mechanisms that have been instituted to enhance the voter's confidence in the system. The Minister of Internal Affairs' main concern was the lack of transparency towards the voter due to the fact that his/her vote is registered on floppy discs and magnetic cards in invisible, magnetic fields.

When questioned, the experts found that the electronic voting systems are certainly no less reliable than the traditional way of voting. They argue that an absolute guarantee for the security of a system does not exist. Fraud cannot be excluded, not even with a traditional voting system. The experts conclude that an automated voting system has to achieve a level of reliability which is at least as high as in a traditional voting system.

In 2001, the Senate also drafted an evaluation report.¹¹⁰ In this report, the Senate makes several recommendations. The most important ones are the following:

- The Commission for Internal and Administrative Affairs asks to establish a stand still for computerized voting;
- To make computerized voting more transparent and reliable, the Senate suggests a system of tickets and optical reading;
- The Senate also stresses the need for sensibility campaigns.

Jurisdiction: "Arbitragehof"

The "Arbitragehof"¹¹¹ is the Belgian court charged with adjudicating violations of the principle of equality and the principle of non-discrimination. In June 2000, a complaint was filed arguing that undue discrimination is caused between those voters who are able to vote traditionally (and whose votes are counted by randomly appointed neutral citizens) and those voters who had to vote electronically (and whose votes are counted by an anonymous, virtual system which can not be controlled by the voter). Unfortunately, due to procedural aspects, the case was dismissed without the Court ruling on the merit of the case.

¹⁰⁹ Evaluatie van de geautomatiseerde stem- en stemopnemingsystemen, *Parl. St.* Kamer 1999-2000, nr. 0834/001.

¹¹⁰ Evaluatie van de toepassing van de wet van 11 april 1994 tot organisatie van de geautomatiseerde stemming, *Parl. St.* Senaat 2000-2001, nr. 2-553/1.

¹¹¹ www.arbitrage.be.

In 2003, the “Arbitragehof”, dealt with two other complaints¹¹². These complaints have resulted in minor modifications of the Law concerning the Organization of Computerized Voting which do not really affect nor change the system established.

Jurisdiction: “Raad van State”

The “Raad van State”¹¹³ provides all natural and legal persons with the possibility of an effective appeal against irregular administrative acts. The “Raad van State” is also acts as “judge of cassation” for the appeals against rulings by lower administrative jurisdictions.¹¹⁴

Recently, the “Raad van State” dealt with a request to reject the validation of the election of the Community and Regional Parliaments in Ixelles¹¹⁵, based on the non-respect of the procedure installed by the Law. This judgment shows that the safeguards set up by the legislation to guarantee the transparency of the voting process play a fundamental role in the legitimacy of the process. After examining the arguments of the plaintiffs and the explanation given by the president of the canton polling station relative to the practical application of the obligations stated in the Law, the Court considered that the procedure has not been violated and validated the elections.

Experts Report

Every election the College of Experts has reported on their findings and have made some recommendations. In what follows below, you find the main recommendations of the previous reports and the main recommendations of the last report of 2004, specifically related to the electronic voting.

Recommendations of previous reports:

- *User friendliness.* The system could be more friendly to the user: requiring a double confirmation could avoid accidental confirmation of the vote, voters should be able to revote without having to ask for a new magnetic card, larger screens, etc.;
- *Technical improvements.* The computers are not able to handle more than one task at a time. This causes the ballot computer to freeze up when a magnetic card is initialized while another card containing a vote is inserted in the computer. The ballot computers should also be secured against a power breakdown (emergency supply);
- *Transparency and verifiability for voters.* Voters should be able to control the vote registered on the magnetic card. This recommendation has led to a modification of the Law: today the voter is able to visualize his vote cast by reinserting the magnetic card in the voting computer. Also the source code should be released, in order for everybody to be able to verify the election system. The Ministry of Internal Affairs released the source code after the election of 13 June 1999. Another problem is that voters can not verify, after

¹¹² Arbitragehof nr. 30/2003 of 26 February 2003 and Arbitragehof nr. 73/2003 of 26 May 2003.

¹¹³ www.raadvst-consetat.be.

¹¹⁴ http://www.raadvst-consetat.be/En/home_en.htm.

¹¹⁵ R. v. St. nr. 167.711 of 12 February 2007.

the magnetic card has been inserted into the ballot computer, that the content of the card corresponds with the content on the memory of the ballot computer (the floppy disc). Therefore, the experts think it's advisable to allow other companies to develop tabulation software in order to allow a recount with other software;

- *Independence.* The audit has shown that the Ministry of Internal Affairs is fully dependant on the suppliers of the voting systems. Therefore, the experts recommend the Ministry to create its own department with specialized computer engineers;
- *Procedure.* The experts recommend that a stringent procedure should be developed for last-minute modification of the software. Such modifications should be restricted to what is absolutely necessary and should only be allowed through a transparent procedure;
- *External audit.* The experts are convinced of the necessity of their independent and external audit. The independent audit of an election is a basic condition for democratic elections.

Recommendations of the report of 2004

- *The reliability and the compatibility of the voting system.* The experts insist on a thorough analysis of the voting systems before making any changes to the software or the hardware. This analysis should investigate the compatibility between the various voting systems and the applicable Laws;
- *Information to the public and the media.* A few days before the elections, the College of Experts saw and read many misassumptions and inaccuracies about electronic voting in the media. Therefore, it is important that the government herself gives the correct information about electronic voting to the public and the media.
- *The distribution of the source code.* Very soon after the elections, the source code is published on the website of the Ministry of Internal Affairs. The comments in certain parts of the source code are erased. The experts recommend that comments or remarks that are important to understand the functioning of the source code, cannot be left out. This is crucial for the transparency of the source code.

6.2.5 Proposal for a Law on Distance Voting

Introduction

The proposal of 20 April 2000 (2-410/1) was designed to modify the Law on computerized voting in order to legitimize distance voting. As already stated earlier, this proposal never passed because the Chambers were dissolved.¹¹⁶ In 9 September 2003 however, the same proposal (3-205/1) was introduced again by one of the two members who proposed the first enactment. The content of this second proposal is practically the same as the first proposal.

The goal of the proposal is to enable the voter to cast a vote through the Internet. The

¹¹⁶ http://www.senate.be/www/?MIval=/index_senate&MENUID=12420&LANG=nl.

submitters consider Internet voting to be a way of enhancing citizen's interest in politics.

The proposal considers the advantages and tries to look forward to the potential problems of an Internet voting system.

Advantages

- *Facilitate the casting of the vote and increase the number of voters.* In Belgium voting is compulsory. However, in the 1999 elections, 9.4% of the eligible voters did not cast their vote. The Internet would constitute an additional means for citizens to fulfill their voting duty and would therefore facilitate citizen's participation;
- *Facilitate disabled voters to vote.* People who are disabled (for instance people who are in hospital or have a handicap) will be enabled to vote through the Internet instead of being discriminated against because they are not able to go to a polling station;
- *Facilitate voters residing abroad to vote.* Citizens who reside abroad today have to fulfill formalities which take a lot of time and which are quite expensive. They could however be allowed to vote directly from a PC of their choice or from a PC in the consulate or embassy. This would make the casting of the vote a lot easier and cheaper;
- *Enhanced processing of the results.* The advantages are the same as for the automated voting;
- *Enhancing the development of the use of Internet.* The development of the Internet is considered to be of absolute priority in Belgium, considering its importance for the economy and the employment. Enabling Internet voting would serve this goal.

Potential problems

The Belgian Constitution prescribes in article 62 that voting is obligatory, that the voting itself has to be secret and that the election is conducted in the municipality (article 62 of the Belgian Constitution). This raises two problems for distance voting:

- *The vote has to be cast in the municipality in which the voter is registered.* As already said before, this is prescribed by the Election Law (Article 4 Election Law) and by the Constitution. The proposal wants to insert an exception which allows voters to cast a vote using a PC, regardless the geographical position of the voter;
- *The vote is secret.* The submitters consider vote secrecy and undue pressure and influence not to be an actual problem, because Belgian citizens generally accept the principle of vote freedom, even within the family. In addition, the submitters argue that a lot of democratic countries do not require absolute secrecy at the moment of the casting of the vote, for instance countries where voting by mail is possible (for instance in France and Spain).

Technical aspects

Technically, the following conditions have to be taken in consideration:

- The voting is only valid, when the provided technology is safe and reliable and when the data (of the voting) can be controlled;
- Secondly, the voting has to be democratic. This means that if a specific voter votes, the system has to be sure it is that specific voter who voted and that he only votes one time. This can be realized by using an electronic signature. In Belgium this is organized by the Law of 20 October 2000 and the Law of 19 July 2001;
- The voting also has to be confidential. The technology has to make sure that hacking the system is impossible;
- Finally, it has to be possible to control and to verify the voting. It is for instance necessary to check if the number of votes cast corresponds with the number of the voters.

As a practical matter, the proposal suggests to give each voter an individual access code which will be sent to him in the same way he receives his secret codes for banking purposes, which would make electronic identification possible. This access code would give the voter automatic access to the list of candidates. After voting, the voter transmits his vote electronically. Because voting has to be secret, his name and his vote have to be encrypted. The name of the voter and his actual vote are sent to two different electronic voting boxes. This system would allow the use of electronic signature technology.

6.3 The Netherlands¹¹⁷

The Dutch Parliament is bicameral and known as the States General (Staten Generaal). The upper chamber, the Senate (Eerste Kamer or First Chamber) comprises 75 members indirectly elected by 12 provincial assemblies. The lower chamber, the House (Tweede Kamer or Second chamber) consists of 150 members, directly elected for a four years term through a system of proportional representation in a single nationwide constituency without a threshold, little amended after its introduction in 1917.¹¹⁸

The overall system for managing elections is decentralized, giving local administrations substantial discretion as to how elections are conducted in their municipalities. There is thus considerable diversity, enhanced by voting process experiments permitted by law.

Electronic voting has been introduced in the early nineties and has become the method of balloting for 90 percent or more of the electorate. In 1999, the Dutch Minister for Urban Policy and Integration of Ethnic Minorities has started a project “Distance Voting”. This project investigates if elections could be made more accessible by applying modern information and communication technologies. The aim of the project is to modernise the elections and to make them more attractive, to lower the barriers to vote and to enhance citizens’ involvement in the democratic process.¹¹⁹

Electronic voting machines, whose primary supplier in The Netherlands is Nedap (the same supplier for Ireland) were introduced without controversy in 1998. They have been widely used in local and national elections ever since. As The Netherlands has used digital voting machines (the previous-generation systems with little-to-no software) since the 1990s, Dutch citizens are comfortable with the idea of using technology for voting. Therefore, the security and reliability issues of the new generation of machines were not an issue at the time of their introduction, much like their adoption by other governments in the late 90s.

The Dutch parliament is conducting experiments with Internet-based voting. It is believed that such system will increase voters’ turnout because voting is relatively inconvenient today. Currently, Dutch citizens must take time off to vote because polls are open only during extended business hours (8am to 8pm) for a single day of the work-week and each individual must vote in a particular location near their home, which might be far from their workplace.¹²⁰

The Second Chamber of the Dutch Parliament started on 2003 discussing a bill for an experiment in distance voting in 2004, allowing Dutch citizens abroad to use the internet to cast their vote in the elections to the European Parliament. This proposed bill has already started to spark controversy, with opponents to the scheme issuing a

¹¹⁷ This Chapter is an update of Van Oudenhove, B., Schlichting K., Siebald S., Tucholke U., Lévy S., Legale E., Laigneau A., Forsgren O., Ohlin T., Legal issues of cybervoting, for the European project “CYBERVOTE”, June 2001. The original version is available on line at: <http://www.eucybervote.org/reports.html>, last access 29th March 2007.

¹¹⁸ OSCE, ODHRE, The Netherlands Parliamentary elections, Elections assessment report, 22 November 2006

¹¹⁹ The evolution of the Dutch “Distance Voting” project can be followed on www.minbzk.nl

¹²⁰ Kiniry, J., Electronic and Internet Voting in the Netherlands, June 2004, available on-line at: http://secure.ucd.ie/~kiniry/papers/NL_Voting.html

warning over security issues.¹²¹

As a consequence, European Elections of June 2004 have allowed "Remote Voting" via the Internet and telephone for expatriates, and only after explicit registration.¹²² The main obstacle consisting of the prescription of Electoral Law to cast one's vote at a polling place voting could have been override thanks to the possibility opened by this Act to prescribe additional rules for voting without paper ballots. The Online Voting Experiments Act entered into force in December 2003. It contains interim rules for experiments conducted with few facilities enabling voters to vote in any polling station of their choice within their municipalities of residence, and enabling voters abroad to cast their votes "with the help of information and communication technology, in a manner other than by post". The Act is of an interim nature and will expire on 1 January 2008. It is expected that it will be replaced by "permanent" law.¹²³

6.3.1 Electoral system

The Constitution of the Netherlands enshrines the principles of universal and equal suffrage. Pursuant to Art. 59 of the Constitution, all specific issues pertaining to the right to vote and to elections in general are regulated by Act of the Parliament.

The current Elections Act was adopted in 1989 and largely revised and amended in 1998 and 2005. It governs elections at all levels in the Netherlands. However, it does not cover all aspects of the electoral process. It provides for detailed regulation of voting with paper ballots, leaving beyond its scope other methods of voting. As mentioned above, the Online Voting Experiments Act of 2003 provides rules for experiments enabling voters to vote in any polling station of their choice within their municipalities of residence, and enabling voters abroad to cast their votes by Internet, telephone or by mail.

These two laws are supplemented by secondary legislation. Voting with electronic voting machines is regulated by the Election Decree of 19 October 1989 establishing new regulations for implementing the Elections Act. In addition to electronic voting, the Election Decree regulates some minor aspects of voting with paper ballots that are not covered by the Election Act.¹²⁴

The Members of the House are elected through a proportional list system without a threshold. The Netherlands is divided in 19 electoral districts. Provincial councils may divide these electoral districts into more electoral districts for an election of their members. For elections to municipal councils, each municipality shall form a single electoral district.(Section E1 of the Elections Act) which may be divided into polling districts. One polling station serves a maximum of 2000 voters. This is a purely technical division – the Netherlands has proportional representation, not a single-member district system. For the entire entity, proportionally to the votes cast for the respective electoral subjects on the basis of the quota method, with subsequent allocation of possible residual seats through the method of d'Hondt. Only those lists

¹²¹ Press release, EDABC, Dutch and Spanish parliaments discussing eVoting, 20 June 2003, <http://ec.europa.eu/idabc/en/document/1428/343>

¹²² Kiniry, J., Electronic and Internet Voting in the Netherlands, June 2004, available on-line at: http://secure.ucd.ie/~kiniry/papers/NL_Voting.html

¹²³ OSCE/ODIHR Election Assessment Mission report on The Netherlands, Parliamentary elections, 22 november 2006, Warsaw, 12 March 2007.

¹²⁴ OSCE/ODIHR Election Assessment Mission report on The Netherlands, Parliamentary elections, 22 november 2006, Warsaw, 12 March 2007.

that have received at least as many votes as the value of the electoral quota are eligible for allocation of seats.¹²⁵

The electoral system is characterized by a strong majoritarian element as each voter votes for a particular candidate. It is only through the candidate of choice that a vote is attributed to the respective electoral subject. Thus, voter's choice could prevail over political parties' personal policies as reflected by the order of the names on the respective candidates' list. A candidate who obtains at least 25 percent of the electoral quotient is declared elected automatically regardless of his or her number on the list.¹²⁶

The members of the electoral committee are appointed by the executive of the municipality concerned. Every time elections are held, a principal electoral committee is appointed to add together the results from the different polling stations. In provincial elections, the principal electoral committee is located in the provincial capital. In national elections, they are located in the provincial capitals and a number of other major cities.¹²⁷

6.3.2 Traditional voting procedure

The following analysis is based on the Dutch Election Law and on the Definition Report Distance Voting of the Expert Centre. The different steps in the voting procedure are described and the requirements in Dutch Voting Regulations are investigated. The traditional Dutch voting procedure is based on voting at a polling station, with paper ballots.

Voting is not compulsory in the Netherlands.

6.3.2.1 Voting place

The voter has to cast his vote in a designated polling station, which is located in the municipality where the voter is registered (Article J3 and J5 Election Law). Voters who cannot attend their local polling station may arrange to vote elsewhere, by applying to the mayor for a voter's identity card which enables them to vote anywhere in the area for which the election is being held.¹²⁸

The Law also prescribes that as many polling stations as possible are positioned and equipped in a way adapted to disabled voters (Article J4/2 Election Law).

6.3.2.2 Opening and closing of the election

In due time before the beginning of the election, the ballot box is closed, after it is clearly stated that the box is empty (Article J18/2 Election Law). Before the election begins, the number of ballots is determined (article J23 Election Law). The chairman of the polling station has the key of the ballot box, which he opens at the beginning of the election.

¹²⁵ OSCE/ODIHR Election Assessment Mission report on The Netherlands, Parliamentary elections, 22 november 2006, Warsaw, 12 March 2007.

¹²⁶ OSCE/ODIHR Election Assessment Mission report on The Netherlands, Parliamentary elections, 22 november 2006, Warsaw, 12 March 2007.

¹²⁷ http://www.kiesraad.nl/uk/collectie_homepage/preventing

¹²⁸ Keesraad, Elections in The Netherlands, http://www.kiesraad.nl/uk/collectie_homepage/elections_in_the

¹²⁸ http://www.kiesraad.nl/uk/collectie_homepage/preventing

The Election Law provides (Article J 12 Election Law) that during the whole time of the election the chairman and two members have to be present at the polling station. The chairman might be obliged, due to a certain disrupt of the election process, to temporarily close the ballot box.

When the election period is finished, no new voters are allowed inside the polling station. Only those voters, who are inside the station at that moment, are allowed to cast their vote (Article J 30 Election Law). After that, the chairman closes the ballot box.

6.3.2.3 Authentication of eligible voters

Registration of voters in the Netherlands is automatic. As a rule, registration as a voter is permanent and is done via the computerised population register known as the GBA.¹²⁹ This register is not public for privacy reasons. This closed system prevents from manipulating voting rights or any threshold to registration as a voter. The municipality sends a polling card to each person on the roll at least two weeks before polling day. That is how a voter can discover that he is not registered and then he should take swift action to ensure they receive a card on time.¹³⁰

Since one voter can only vote in an election in which he is eligible to participate, the person who presents at the polling place has to be able to be identified with a certain degree of reliability.

The voter presents at the polling station with his election card (Article J 24 Election Law), which he has received at least two weeks in advance of the election (Article J 7 Election Law). This card mentions *inter alia* which election the voter has access to.

The voter then hands over his election card to the chairman (Article J 24/1 Election Law). The election authority subsequently determines the correspondence between the information on the election card and the content of the voter's register. This register contains the identities of all eligible voters for a particular polling station. Finally, he notes that the voter has handed in his polling card.

It is remarkable that the Dutch Election Law does not require the voter to be unequivocally identified. It is argued that this is not necessary because of the limited number of voters per polling station is limited (1500 to 2000) and the fact that the voter's register contains a few biometrical indicators (sex, nationality, age), which have to be judged by the members of the polling station.

The Election Law does however provide that the chairman can ask the voter to identify him/herself (Article J 24 Election Law). But the Law does not prescribe how this identification has to be done.

6.3.2.4 Publication of the voting procedure

The voter has to know how he has to cast his vote, in order to prevent a voter to lose his voting right due to formal mistakes. The members of the polling station inform the voter which procedure has to be followed, and they make sure the voter has understood.

A copy of the legal prescriptions concerning the election has to be present at the polling station (Article J17/2 Election Law). In each voting booth lies a manual for

¹²⁹ *ibid.*

¹³⁰ *ibid.*

the voters. A model is provided by a Regulation of the Minister (Article J16/3 Election Law).

6.3.2.5 The casting of the vote

Article 53 of the Constitution provides that the elections are organised with secret vote. The polling station has to be organised in a way that guarantees voting secrecy (Article J 15 Election Law). The polling station is provided with one or more voting booths (Article J16/1 Election Law).

The voter receives the ballot and goes to the voting booth in which he casts his vote, by colouring red the white bullet next to the candidate of his choice (Article J26/1 Election Law). It is not allowed to mark the ballot other than marking the bullet next to a candidate. If a voter makes a mistake when completing his ballot paper, he shall return it to the chairperson. The latter shall then provide him once, at his request, with a new ballot paper. The returned ballot papers shall be immediately rendered unusable by the chairperson. (Article J27 Election Law).

It may not be possible to connect a certain ballot with an identifiable voter (Article N7 Election Law). Disabled voters who need help are allowed to be accompanied (Article J28 Election Law).

The table of the members of the polling station has to be placed in a way that voters can see their actions (Article J16/4 Election Law). Within the polling station, no activity is allowed which intends to influence voters (Article J36 Election Law). No political propaganda is allowed inside the polling place (Article J35 and J36 Election Law). The members of the polling station are not allowed to express their political preference during the execution of their task (article J14 Election Law).

The chairman is responsible for the maintenance of peace and order during the election and to the prohibition of political advertisement (Article J37 Election Law). The voter has to be able to correct his choice, before handing over his choice to the election authority. Article J27 provides the possibility for the voter to receive a new ballot once. The chairman immediately makes the old ballot invalid.

The Election Law provides that an observer is allowed to be present in the polling station during the whole time of the election (Article J39 Election Law). The voters are allowed to orally object if they think the election process doesn't comply with the Election Regulations (Article J35/2 Election Law). The chairman notes the number of ballots issued.

6.3.2.6 Transfer of the ballot to the election authority

After the voter has cast his vote, his choice is transferred to the election authority and the connection between voter and vote is cut. The ballot is folded before the voter leaves the voting booth (Article J26/2 Election Law). The election authority at the polling station sees to it that the voter puts the ballot in the ballot box (Article J26/3 Election Law). It is marked on the voter's register that a voter has executed his voting right.

6.3.2.7 Tabulation of the ballots

At the end of polling day the polling officers count the votes and draw up an official

record containing the result and an account of how the day has gone. The polling cards, voter's passes, certificates of authorisation and extracts from the electoral roll are kept in sealed packets after voting has ended.

After the end of the election, the polling station determines and informs the voters present of:

- The number of voters who have presented at the polling station;
- The number of ballots distributed;
- The number of voters who refused to put the ballot in the ballot box;
- The number of returned and invalidated ballots;
- The number of ballots not used.

The voter's register, the ballots not used, the returned and invalidated ballots and the election cards are put together and sealed (Article N1 and N2 Election Law).

After this, the chairman of the polling station opens the ballot box and the ballots are removed. The chairman makes sure all the ballots are removed (Article N3 Election Law). The ballots are counted manually and the number is compared with the number of voters who participated in the election (Article N4 Election Law).

The members of the polling station subsequently control if the ballots are valid (Article 7-N8 Election Law). The chairman has to inform the voters present with the reason of invalidity. The voters present are allowed to see the ballot concerned and to orally object. The invalid votes are put together and sealed and the name of the community and voting district, as well as the number of ballots in the package is marked (Article N9/2 Election Law).

If a ballot is not valid, this is recorded and the vote is not counted. If a ballot is valid, the vote is recorded under the corresponding candidate (Article N6). The valid ballots are put together and sealed and the name of the community and voting district, as well as the number of ballots in the package is marked (Article N9/1 Election Law).

The total of the votes per candidate and per list is determined. Finally, an official record is made, which *inter alia* contains all objections and which is signed by all members of the polling station.

6.3.2.8 Gathering of totals

This step only occurs if the votes for the same election are cast at multiple geographical locations (different polling stations). There are four levels: polling station, municipality, head polling station and central polling station.

The official records and the ballot-packages are gathered on municipality level. The totals are put together per candidate. The total on municipal level per candidate is again written down in an official record.

Dependent on the kind of election (municipality, province, national, European), the official record is sent to a higher level, in which the above explained is repeated.

6.3.3 Alternative voting procedure

The Dutch Election Law provides for a number of particular voting procedures: voting at a polling station of choice, mobile polling stations, voting by proxy, voting

by mail and voting without paper ballots. In this section, the specific provisions which apply to voting with electronic machines and the experiences carried out as regards remote voting by phone or Internet will be discussed.

6.3.3.1 Voting at a polling station of choice

If requested, a voter can vote in a particular polling station of his choice, as long as he remains in the area of the organ for which the election is organized (article K1 Election Law). The request can be done in writing, at the latest 14 days before the beginning of the election (Article K6). The voter has to use a form, which he can find at the municipal secretary.

Election card is received, at the latest 5 days before the beginning of the election. The permission is marked on the election card and the voter receives a voter's passport.

The voter can only participate in the election with this passport (Article K4 Election Law). On the voter's register, the word "passport" is marked (Article K5 Election Law). When the voter presents at the polling station, he has to hand over his voting pass to the chairman. On the voter's register is marked that the voter has presented.

6.3.3.2 Mobile Polling Stations

The election law provides for the possibility to install so-called "Mobile Polling Stations" (Article K13 Election Law). These stations, which are supplementary to traditional polling stations, are intended to provide disabled and elderly voters, for whom the traditional polling stations are hard to reach or not adapted to their needs, the possibility to vote. These people have to ask for a special card (which is different than the voter's card for voting at a polling station of choice).

During the election, the station can be moved from one to another place. During transportation, the ballot box is locked and the key is kept by the chairman. The ballot box is opened again in the presence of the voters present.

6.3.3.3 Proxy-voting

Voters who expect not to be able to personally participate in the election can vote by giving proxy to another voter. The voter can authorise another voter in the same electoral district to vote on their behalf by using his polling card. The certificate of authorisation must be signed by the voter and the proxy. A voter can only accept two mandates at the same time.

The voter can request to vote by proxy in writing or orally. With the former, the mandate has to be requested free of charges by using a particular form. With the latter, the election card has to be signed and given to the other voter. This voter receives a proof of the mandate. The mandated voter has to be eligible to vote in the region for which the election is held. The name of the voter who gave proxy is marked with the word "proxy" on the voter's register (Article L13).

To prevent abuse, the mayor may limit the availability of authorisation's forms (section L 8, subsection 1). Bribing or putting people under pressure to apply for authorisations is also an offence (section Z 4, subsection 1; the penalty is six months in prison or a third category (€4500) fine). Such activities were reported to the Public Prosecution Service by the mayor of Oudewater during the 2002 municipal elections. After investigating the report, the Public Prosecution Service prosecuted the person

concerned and secured a conviction. This was in fact the only known case of such abuse in 2002.¹³¹

6.3.3.4 Vote by mail

Voters living abroad, and only them, may apply to vote by post in parliamentary and European Elections, since a procedure with mandates would become too complicated. During the law-enacting procedure, the Second Chamber has insisted on enlarging the number of people who are allowed to vote by mail. The proposition was finally not accepted, due to a negative advise of the Election Council and the VNG. Mainly the argument that voting by mail would be very sensitive to fraud (letters could easily be intercepted) convinced the Election Council to give their negative advice.

Voters who reside outside the Netherlands have to request (in writing) to be registered as eligible voter (Article D3 Election Law). The other voters are registered automatically when they become eligible to vote (Article D1 Election Law).

In order to be able to vote by mail, voters residing abroad have to request a “vote-by-mail”- certificate, together with their request for registration (Article M3/1 Election Law). The other voters have to request (written) such a certificate at their municipality. If the voter complies with one of the conditions mentioned above, he receives a ballot, an envelope, the certificate and an instruction manual. He does not receive an election card.

The voter has to fill out the ballot correctly. The voter has to fold the ballot in a way that the names of the candidates cannot be seen. The voter has to sign a declaration on the certificate that he has filled out the ballot personally. The voter then mails all this to a polling station, which is appointed to particularly count the mailed-in ballots.

At this polling station, first of all the correspondence of the signature on the certificate with the signature on the request form, is controlled by a first member of the polling station. The ballot, which is still folded, is then given to another member of the polling station, who puts the ballot, still folded, in the ballot box (Article M10 Election Law).

6.3.4 Electronic voting

6.3.4.1 Electronic voting machines

Voting without paper ballots is allowed only when a certified system is used. Eighty per cent of Dutch municipalities use electronic voting machines, approved on the basis of technical tests on five models of the same type from the supplier’s stock. These tests are carried out by the Netherlands Organisation for Applied Scientific Research (TNO); final approval is given by the Minister for Government Reform and Kingdom Relations.¹³²

A system is only certified, if at least the following conditions are fulfilled:

- The secrecy of the vote is guaranteed, also if the voter does not want to make a choice;
- The material of the system has to be sound, the system has to be easy to use

¹³¹ *ibid.*

¹³² *Ibid.*

and has to be able to operate without the risk of disturbances or inadequate functioning;

- The lists of candidates, the number of each list and the indication of the political party have to be clearly indicated;
- The voter may not be able to cast more than one vote;
- The voter must have the opportunity to correct a mistake.

The Election Law provides that other Regulations can prescribe additional rules for voting without paper ballots. These rules have to be determined in correspondence with the prescriptions of the Election Law concerning traditional voting by paper ballot. The Election Regulation and the Regulation Conditions and Approval Voting Machines of 1997 provide such other rules.

When a voting machine or a voting computer is used, the votes cast are stored electronically in the memory of the machine or computer. Subsequently, a printout is made of the totals of votes per candidate. The result is written down in an official record. The official records and the "PC-memories" are gathered on municipality level. The memories are read in particularly designed software and the totals are put together per candidate. The total on municipality level per candidate is again written down in an official record.

Before the polling stations open at 07.30 on polling day, the chief polling officer has to test the voting machine and give the go-ahead for its use. The aim of testing the machines is to ensure that votes remain secret. The chief polling officer runs a test programme that shows whether the machine is registering votes in the proper way.¹³³

As regards the counting of the votes, the use of electronic machine involves pressing a single button, which means that the public nature of the count has no added value. All there is to see is a paper emerging from the machine with the result of that particular polling station. What can be checked of course is whether the number of polling cards and authorisations handed over corresponds to the number of votes cast and serial numbers handed out.¹³⁴

6.3.4.2 Internet voting

In the 2003 a specific Act introduced the possibility for voters living abroad to cast their vote by telephone. In 2004, the Ministry of Internal Affairs has organised an experiment with "remote voting" (via web and telephone) for the election of the European Parliament on 10 June 2004. Participation was intended only for Dutch living abroad. Internet voting is thus currently acknowledged to postal vote. Currently there are two ongoing initiatives in the Netherlands concerning voting via the web or via phone: Internet voting for the elections of public management water authorities and for the European Elections organized by the by the Ministry of Internal Affairs.

6.3.4.2.1 Ministry of Internal Affairs¹³⁵

For the election of the European Parliament on 10 June 2004, Dutch living abroad,

¹³³ Ibid.

¹³⁴ Ibid.

¹³⁵ Description of this experience is extracted from: Security-in-society, Electronic voting in The Netherlands, available at: <http://www.sos.cs.ru.nl/research/society/voting/main.html> (last access on 30 March 2007).

who had the option to vote by mail before, had the option to cast their vote by telephone or Internet. It is typically used by 20-30 thousand people, of the about 600.000 potential participants.

Voters register by ordinary "snail" mail, and choose their own access code as password. In return they receive a vote code as "login", together with a list of candidates, each with his/her own candidate code. There were 1000 different lists in the experiment.

5,000 Dutch voters living outside the Netherlands cast their vote electronically over the Internet. The system is part of a wider remote voting program that also encompasses a telephone-based voice solution.

6.3.4.2.2 Public management water authorities¹³⁶

Public management water authorities are regional government bodies. Its officials are elected via ordinary mail, but the voter participation for these elections is typically fairly low. In the last quarter of 2004, 2.2 million citizens were called to elect the boards of the 'waterschappen' (public water management authorities) of Rijnland and Dommel by Internet voting and regular postal mail. A total of 403,279 votes were cast for the two elections, of which 280,848 (70%) were received by postal mail and 122,431 (30%) were sent through the Rijnland Internet Election System (RIES). Other water boards organised postal mail elections in the same timeframe and had a comparable turnout. According to the organisers, these elections represented the world's largest formal Internet elections so far. In addition to being able to cast their votes through the Internet, all voters had the opportunity to verify the counting of their votes in the final outcome and to validate the election results.

The system used is called RIES, and was developed by Rijnland in cooperation with the company Mullpon. By clever use of hash functions, the system is simple as well as reasonably secure. Whereas the hashes of all possible votes are public, it is impossible to deduce valid votes from them without the required voter key. Of course, the relation between voter and voter key should not be stored anywhere.

The RIES system allowed more than 99% of users to vote via the Internet without having to make any changes to their existing PC environments, performing with a negligible number of complaints by voters and processing all Internet and postal mail votes without a glitch. The two water boards expressed their satisfaction with the election system and said they considered the RIES technology to be fully operational. The system will be made available for all Dutch water boards for their 2008 elections. Meanwhile, the Rijnland water board will use RIES for a re-election to be held in the Amsterdam district in April 2005.

RIES, for which international patents have been applied, is based on the so-called DES Virtual Ballot System (DVBS). The idea behind DVBS is the use of a symmetrical cryptographic algorithm, instead of public key algorithms used in most electronic voting systems. A small script file is automatically downloaded to the computer used by the voter when he or she accesses the election's welcome page on

¹³⁶ Description of this experience is extracted from: Security-in-society, Electronic voting in The Netherlands, available at: <http://www.sos.cs.ru.nl/research/society/voting/main.html> (last access on 30 March 2007) and IDABC, World's largest Internet election successfully conducted in the Netherlands, 28 March 2005, available at: <http://ec.europa.eu/idabc/en/document/4059/341>, last access on April 11th.

the Internet. The script ensures that the voter can enter secret codes (received by postal mail to enable them to take part in the elections) without disclosing these codes to any other system or party, including the election server. The script then converts the voter's choice for a candidate into the proper anonymous cryptographic vote, i.e. the actual 'DES Virtual Ballot Form'. Finally, the voter receives a confirmation that the vote has been successfully delivered.

This system allows for the use of a mix of different electoral technologies, like Internet, GSM and postal mail.

After the elections a document with all received votes is published. This allows for two important verifications: a voter can verify his/her own vote, including the correspondence to the chosen candidate, and anyone can do an independent calculation of the result of the elections, based on this document and the reference table published before the elections. If your vote has been registered wrongly, or not at all, you can detect it. And if the result is incorrect given the received votes, you can detect it as well.

6.4 France¹³⁷

France is a Republic consisting of 25 regions (including extra-metropolitan regions). At a lower administrative level, France comprises 100 provinces [*Départements*] and 36,680 municipalities. France has a centralized government, although its regions, provinces and municipalities may derive benefits from the central government while maintaining a certain degree of autonomy.

In 1998, the State Council (Conseil d'Etat) announced that there are no specific laws applicable to the Internet and other networks and that there is no need for specific laws, since the Internet is considered only to be a new media on which current laws should be applicable. The law could however be subject to modification regarding for instance, the security of transactions and the rapid evolution of the standards. Since 1998, different programs have been put in place in order to strengthen the legislative and regulative actions of French Government in the field of Information Society.

At the moment, the French Electoral Code authorises the use of electronic voting machines on the condition that absolute secrecy and security of votes can be preserved. Since 2004, several municipalities have opted for introducing electronic voting machines in order to reduce the costs of the Elections. During the presidential elections of 2007, voting machines were used in about 60 French municipalities, compared to 18 during the previous eVoting trial held during the European elections of June 2004. While certain municipalities equipped most of their voting stations with electronic machines, many cities conducted only a limited experiment. Some of the French eVoting experiments were legally binding (e.g. in the city of Antibes Juan-les-Pins), while others did not have legal value. eVoting operations were carried out smoothly and there are no reports of incidents or technical glitches.

A remote Internet voting process in France is faced with a major obstacle, being the outlawing of postal voting systems. Due to the fact that voting from home (or any place which is not a polling place) is assimilated to a postal voting, French laws have to be modified in order to authorise this kind of voting processes. Postal voting has been banned since 1975 from almost all kind of public elections compelling to a previous modification of electoral law before the introduction of Internet voting. Experimentations has been carried out already for some minor elections where postal voting is allowed, but always as a complementary means to other forms of ballot. However, few people have opted for this alternative means of voting due to the complexity of the procedure.

The French data protection authority, the CNIL, is playing an important role in the definition of the security measures regarding Internet voting as long as most of them imply the creation of personal data processing and thus requires its previous authorization.

The debate relative to Internet voting have been re-launched by the CNIL on 23 May 2006 through a document on the state of the art of eVoting focusing on the main factors bearing upon its development.¹³⁸ It briefly analysed the experience of

¹³⁷ This Chapter is an update of Van Oudenhove, B., Schlichting K., Siebald S., Tucholke U., Lévy S., Legale E., Laigneau A., Forsgren O., Ohlin T., Legal issues of cybervoting, for the European project "CYBERVOTE", June 2001. The original version is available on line at: <http://www.eucybervote.org/reports.html>, last access 29th March 2007.

¹³⁸ CNIL, *Internet voting in political elections, points of debate [Le vote par internet aux élections politiques, les éléments du débat]*, 23 May 2006, available on-line at

electronic voting in several countries, distinguishing between the ones which had decided to go on with the processus as Estonia or Switzerland and the others which have decided to make a stop as the United Kingdom and Spain. This document intends to launch the public debate advocated by the Forum of Internet Rights in 2003.

Following the eVoting operations conducted during the referendum, the French government is expected to present a bill amending the electoral code in order to enable the use of networked voting machines, to organise the verification process for these machines and the control of voting operations. Ex-Prime Minister Jean-Pierre Raffarin expressed his wish to have a large-scale deployment of eVoting by 2009. In a wider reference to e-democracy, Mr Raffarin said that “in 10 years we will be able to live the net democracy”. Stressing that “regional and local experiments have showed that progresses are possible”, Mr Raffarin said that “the Internet should become a political space”, particularly for helping young people make their voice heard across society.¹³⁹

6.4.1 Electoral system

The entire voting procedure is regulated in the French electoral Code, from the registration on the electoral rolls to the count of the ballots. The Electoral Code is divided into a Legislative Part and a Statutory Part.

The French electoral system has different types of elections which all offer their own characteristics: municipal, parliamintarian, presidential, European and the referendum procedure. All are based on a universal direct scrutiny and on two-round ballot in single member constituencies except municipal elections in municipalities with more than 3500 inhabitants where the ballot is two-rounds, proportional with closed-lists.

National Assembly elections (lower House) take place every 5 years. However, it can be dissolved by the President of the Republic and thus originate anticipated elections. 577 deputies are elected (one deputy for every electoral constituency) through a two round ballot in single member constituencies. The constituencies are defined according to the population. First, the 577 seats are distributed between the 100 provinces, with a minimum of two deputies by province. The number of deputies is theoretically proportional to its population. This operation is repeated inside the provinces. A constituency should respect the limits of cantons.

Every 5 years, 78 European Deputies are elected on a preferential one-round list voting. Since 2004, they are elected from 8 electoral constituencies.

6.4.2 Traditional voting procedure

This part defines the French voting process for public elections, which is based on the French Constitution of 1958 and on the Electoral Code. The traditional voting process is based on voting at a polling place with paper ballots. Vote is not mandatory. The voting period only lasts one day (Art L54). The vote takes place on a Sunday (ArtL55).

http://www.cnil.fr/fileadmin/documents/approfondir/dossier/e-administration/Note_vote_internet_VD.pdf.

¹³⁹ Press release, IDABC, eVoting used in French and Dutch referendums, 6 June 2005, available at: <http://ec.europa.eu/idabc/en/document/4353/341>

6.4.2.1 Voting Place

Municipalities are divided in polling stations which usually do not exceed 800 to 1000 voters. Voters cast their votes in a predetermined place which generally is the county town. However, according to the number of inhabitants, several public places (like schools for example) can be used as polling places (Article R40 of the Electoral Code).

Polling stations are opened from 8 a.m. to 6 p.m. However in big cities, the polling stations are opened until 8 p.m.

6.4.2.2 Authentication of eligible voters

After its registration on the voter's register, the voter receives an election card. This card gives him the right to vote. During the election day, when the voter enters the polling place, he has to show his election card to the election official in charge. (Article L62) Voters living in municipalities with more than 5.000 inhabitants also have to show to prove their identity¹⁴⁰. (Article R60).

Each polling station is composed of a chairman, four assessors and one secretary. The election officials have to assure that all the rules are obeyed (Article R42). The voter has to present at the polling station with his/her electoral card (and his identity card for municipalities of more than 5.000 inhabitants). Article R58 provides that the right to vote is conditioned by the identification of the voter.

When he/she enters the polling place, the voter has to hand over his election card to the Chairman who verifies the correspondence of the card's content with the content of the identity card.

6.4.2.3 The casting of the vote

Voting is secret (Article L69).

After the voter is identified by the election staff, he/she has to take an envelope and one (or more) ballot(s). Subsequently, he/she goes to the polling booth in order to cast his/her vote in absolute secrecy (Article L62). After the ballot has been put in the envelope, the voter shows the chairman he only has one envelop. The Chairman observes the envelop without touching it. Finally, the voter introduces the envelop in the ballot box (Article L62). The places of the vote and its technique should be accessible for disable persons (Art. L62-2).

During the whole electoral period, a copy of the voter's register, which is certified by the Mayor, is placed on the voting authority's table. This copy constitutes the attendance sheet and is signed by the voter (with his/her hand-written signature) (Article L62.1).

The French Electoral Code reserves a significant role for polling booths in the election process: the integrity of the electoral process is based on the polling booths. Actually, polling booths allow voters to cast their vote secretly: no one can see the choice they make and no one can influence that choice.

Polling place Internet voting could preserve this vote secrecy by requiring the voting computer to be placed inside a polling booth. Today, article L62 of the French

¹⁴⁰ French law allows citizens to prove their identity by any means. For public elections, a provincial decree defines the means of proof admitted.

Electoral Code compels voters to cast their vote in total confidentiality. Nobody can see the voters putting their ballot into the envelop. Moreover, at each polling site, one polling booth per 300 voters has to be provided. This article constitutes a real problem for implementing a remote Internet voting system, because polling booths are actually a basic requirement for conducting any public election. It is impossible to ensure that voters, who would be allowed to cast their votes from a home or office computer, will cast their vote anonymously, out of anyone's sight.

6.4.2.4 Counting procedure

The counting procedure starts as soon as the ballot is finished. It is done by scrutinizers at counting tables under the supervision of polling station's members. Candidates' delegates and voters can be present.

The procedure includes the following steps :

- Polling stations' members count signatures. The ballot box is opened and the number of envelops and ballots papers without envelops are counted and verified. If the number of signatures and ballot papers does not match, this should be noted in the minute.
- Envelops with ballot papers are put in packets of 100 and put in a specific envelop (so-called 'century envelop' – envelope de centaine) which are closed. The chairman of the polling station and at least two members representing lists or candidates sign the envelops. This step is not necessary when less than 100 voters had cast their vote.
- The century envelops are distributed around the counting tables and opened by the scrutinizers.
- Scrutinizers open each envelop, unfold the ballot paper and gives it to another scrutinizer who reads it loudly. Names on ballot papers are written down on specific forms by at least two scrutinizers. Any other procedure could annul the counting.
- Scrutinizers sign the checklists and give them back to the polling place, together with ballot papers and envelop with doubtful or disputed validity. The polling station will decide on their validity.
- The total number of ballots, the number blank and invalid ballots and the number of votes obtained by each candidate or list should be counted for each polling station.
- The minute guarantees the respect of the procedure and is elaborated by the secretary of the polling station at the polling place, immediately after the counting in the presence of voters. It indicates the number of voters on the list, the number of voters who cast their vote, the number of ballots, the number of votes for each candidate or list, the number of voters which have not taken their electoral cards, any claims made by voters or candidate's delegate and the decisions of the polling station related to the incidents which have occurred. It should be signed by all the members and counter-signed by candidates' delegate and issued in two copies.

6.4.3 Alternative voting procedure

French Law provides for only one alternative voting procedure: proxy-voting. Postal voting has been banned in 1975 before of several cases of fraud, except in elections of the Assembly of French citizen living abroad. This prohibition can hinder the implementation of Internet voting in France.

Voting machines are gradually implemented in municipalities and some pilot experiments have been carried out in the elections of representatives of French living abroad of June 2006.

6.4.3.1 Proxy-voting

Voting by proxy refers to the procedure in which a voter is permitted, on the day of the election, to be represented at the polling station by another voter of his choice to whom he gives mandate to vote in his place.

French law is particularly restricting regarding the vote by proxy (Article R72, R73). This system is not allowed for all eligible voters, but only for:

- Voters who can prove that their profession prevents them from going to the polling place on the day of the election;
- Voters who are not able to go to the polling place due to medical reasons, to a handicap or because of the assistance brought to ill or disabled persons;
- Voters who are not present in their municipality because of training activities, of holidays or because they do not reside in this municipality any more.
- Voters put on detention pending trial and convicted with electoral rights.

The mandated voter has to be registered in the same municipality. Section III of the Statutory Part of the Electoral Code provides all the requirements for issuing a mandate.

6.4.4 Electronic voting

6.4.4.1 Electronic voting machines

Since 1969, the French Electoral Code authorises the use of voting machines for private or public elections. The decree of the 27th December 1972 allowed municipalities of at least 30.000 citizens to use electronic voting machines. In 1988, this number was lowered to 3.500 citizens. A Ministerial decree of 2003 has updated the provisions on voting machines and has introduced a procedure of certification. The machines should meet the following requirements to be authorized by the Ministry of Internal Affairs and (Art. L.57-1):

- to allow the voter to cast his vote in secrecy
- to allow handicapped to cast their vote anonymously.
- to allow elections of different types within the same day
- to allow the recording of blank votes
- to guarantee that each voter cast only one vote

- to count the total number of voters on a measuring instrument which should be able to be read during the voting operations.
- to count the votes obtained by each list or candidate and white votes on a measuring instrument which should be able to be read only after the closing of the election day.
- to use two different keys in such a way that during the voting process, one remains in power of the vote office president and the other in power of the designated Member.

When using electronic machines, the president of the voting polling stations should make sure, before the beginning of the vote and publicly, that the machine works and all the measuring instruments are at naught (Art. L 63). Finally, the counting process on a voting machine should be done by making visible the ballots measuring instrument, in order to allow its reading by the member of the polling station, the candidate's delegates and the voters. The president should read the results which appear on the machine (Art. L65).

Article L57-1 of the Electoral Code prescribes that, in order to be authorised, an electronic voting machine must be certified by the Home Office and satisfy the security standards and guarantee the secrecy of the vote.

However, it is only since 2004 that municipalities have started to implemented electronic voting machines. Today around 60 towns has bought such machines and will use them for the Presidential elections. More than one millions of voters are concerned. 1200 machines have been placed in more than 800 polling stations.¹⁴¹ There is still a limited experience.

While the municipalities were allowed to use three of the four types of eVoting machines currently accredited by the Ministry of the Interior, about three quarters of local authorities decided to choose the Nedap Powervote voting machines. According to a survey by online news provider 01net, French municipalities tempted by a switch to eVoting are however often deterred by the financial costs involved. A number of municipalities that had previously successfully tested an eVoting system decided not to renew the experience during the referendum due to funding issues, 01net said.¹⁴²

E-Poll¹⁴³, an electronic polling system for remote voting operations, was also tested during the French referendum by a small sample of residents of Issy-les-Moulineaux. Unlike the other voting machines used during the referendum, the E-Poll machines identify voters with smart cards and can be networked, therefore potentially making it possible to enable people to vote in any voting station and to consolidate results very easily.¹⁴⁴

¹⁴¹ Dimitri T., Arrivée du vote électronique en France, 13 February 2007, available on-line at : <http://www.generation-nt.com/actualites/24174/vote-electronique-arrive-arrivee-debarque-debarquement-france/>, last consultation 19 March 2007

¹⁴² <http://ec.europa.eu/idabc/en/document/4353/341>

¹⁴³ The E-Poll concept was originally developed between September 2000 and November 2002 as an IST research project under the EU's Fifth Framework Programme for Research and Development, and is now being further developed and piloted as an eTEN project. Its aim is to develop a complete eVoting service that is easily adaptable to different legislations in European countries

¹⁴⁴ Ibid

6.4.4.2 Internet voting

In 2003, two acts¹⁴⁵ have introduced the possibility of using Internet voting for the elections of the senate representatives of French citizen residing abroad and for the elections of professional orders (Bar Associations, etc.). These Acts follows the publication of a Recommendation¹⁴⁶ by the Forum of Internet Rights [*Forum des droits sur l'Internet*] in 2003 in which it suggested a progressive implementation of Internet voting in France, and conceives electronic voting in any case when distance voting is allowed, as a complementary means of exercising one's right to vote. According to this body, electronic vote can not be used as an exclusive means of casting a vote because of the citizen equality principle. Regarding political elections, it recommends the launch of a previous and large public debate before the launching of the first phases of implementation. Moreover it assesses the question of technical features in order to guarantee a secured and reliable vote.

In 2004, a first experimentation has been carried out for the election of the Members of the Chamber of Commerce of Paris, Grenoble, Bordeaux, Nice and Alençon. The voters could cast their vote through a specific website after its authentication through an identifier and a password. In 2005, several Bar Associations (Paris, Lyon, Marseille) have adopted also Internet voting.

In June 2006, French citizens living abroad have been able to vote through Internet for the elections of their representative's Assembly. This Assembly counts 155 members and is in charge of assessing the government with regards to projects and questions interesting French citizens and to the development of French presence abroad. Its members are elected for a period of 6 years and are half-renew every three years through universal direct ballot by the French citizen registered in consulate lists.

French citizen living abroad are almost 800.000. However, the voters' turnout has always been extremely low (around 20%) partly because of material difficulties. It should be mentioned that postal voting is allowed for these specific elections.

The Decree of 13 March 2006¹⁴⁷ has defined the modalities of Internet voting. The voter should inform his consulate of his decision to use this alternative means by mail or e-mail at the latest six weeks before the Elections day. Three weeks after, he receives the devices allowing its authentication conformed to the security requirements defined by the Ministry of External Affairs. After casting his vote, he receives a receipt which confirms everything went well.

For these elections, two new data processing were created:

- the voters' register recorded on a support sealed, un-rewritable and which should guarantee the inalterability of the content in order to be able to be produced on a trial if necessary.

¹⁴⁵ Act n° 2003-277 of 28 March 2003 relative to electronic remote voting of French living abroad for the elections of their representative [*tendant à autoriser le vote par correspondance électronique des Français établis hors de France pour les élections du Conseil supérieur des Français de l'étranger*], J.O. of 29 March 2003] and Art.19 of Act n°2003-591 of 2 July 2003, [*Loi habilitant le Gouvernement à simplifier le droit*], JORF of 3 July 2003.

¹⁴⁶ Forum des droits sur l'Internet, Which future for electronic voting in France? [*Quel avenir pour le vote électronique en France?*], Recommendation of 26 September 2003, available at <http://www.foruminternet.org/recommandations/lire.phtml?id=651>

¹⁴⁷ Décret n° 2006-285 du 13 mars 2006 relatif au vote par correspondance électronique des électeurs inscrits sur les listes électorales consulaires des circonscriptions électorales d'Europe et d'Asie et Levant pour les élections de 2006 à l'Assemblée des Français de l'étranger, JORF du 14 mars 2006.

- the electronic ballot box which counts the votes cast by Internet and do not provide any links allowing the identification of the users.

An electronic polling station, presided by the General Secretary of the Assembly of French citizens living abroad, 4 to 8 Members and their substituting, is in charge of controlling the whole Internet voting procedure and the counting of the votes. This polling station is assisted by a technical committee whose members are named by ministerial decree (from the Ministry of External Affairs). It has to ensure the smooth functioning of the vote process, the security devices established to guarantee the vote's secrecy, its integrity, the confidentiality of the voter census, the electronic ballot box's encryption, its distinction from the voter census, the conservation of different information backing and their conditions of security and data confidentiality during and after the ballot. It has to check the number and quality of person authorised to access to every data processing.¹⁴⁸

However, the results of these experiments were moderate, since few voters opted for these procedures because of their complexity.

6.4.5 Data protection rules

In France, private life protection is ensured by the Data Protection Act¹⁴⁹ adopted in 1978 and revised in 2004 in order to adapt its provisions to the Data Protection Directive. The French Data Protection Authority, the Commission Nationale de l'Informatique et des Libertés (CNIL), ensures the compliance of data processing with the provisions of the Act. The French Data Protection Act applies to all controllers whether they are Public Authorities or companies from the Private sector. Therefore, the processing of voters' data by public agencies or public companies will have to comply with the data protection principles described above. Art 27-II.(4°) states that an order or, in the case of a processing carried out on behalf of a legal entity governed by public law or a legal entity governed by private law that manages a public service, a decision of the authority in charge of their organisation, taken after a reasoned and published opinion of the CNIL shall authorise: processing carried out by the State or legal entities mentioned in Section I in order to make available, to the users of the service, one or several on-line e-government services, if the processing relates to data containing the registration number of individuals ("NIR") in the national register for identification or any other identifier of individuals. The CNIL should therefore be consulted before the approval of any voting system which implies personal data processing.

In 2003, the CNIL has issued a recommendation¹⁵⁰ relative to the security measures of electronic voting systems. It defines the technical features which guarantee the respect of data protection provisions, especially vote secrecy.

The use of electronic voting, particularly when electronic means are used to authenticate the voter, implies the creation of new databases, mainly a centralized voters' register, as mentioned above. In this case, the CNIL has been consulted and its

¹⁴⁸ Press release, Les Français de l'étranger pourront voter par Internet, 15 March 2006, available at : http://www.worldgovforum.com/article.php3?id_article=601, last consultation on 19 March 2007.

¹⁴⁹ Act n°78-17 of 6 January 1978 on Data Processing, Data Files and Individual Liberties.

¹⁵⁰ Délibération n° 03-036 du 1er juillet 2003 portant adoption d'une recommandation relative à la sécurité des systèmes de vote électronique

opinion published together with the decree allowing the electronic voting.¹⁵¹

6.5 Switzerland

Switzerland has been a federal state since 1848 with three different political levels: the Confederation, the cantons and the communes. Its population is currently of 7,300,000 inhabitants.

It consists of 26 cantons. Each canton has its own constitution, parliament, government and courts. The size of the cantonal parliaments varies between 58 and 200 seats, while the cantonal governments have 5, 7 or 9 members. Direct democracy in the form of the “Landsgemeinde”, or openair people’s assemblies, is now confined to Appenzell Innerrhoden and Glarus. In all other cantons the people cast their votes at the ballot box.

All the cantons are divided into communes, of which there are currently 2,758. Their number is in decline due to amalgamations. Around one-fifth of these communes have their own parliament; in the other four-fifths, decisions are taken by a process of direct democracy in the local assembly. In addition to the tasks entrusted to them by the Confederation and the canton – such as the population register and civil protection – the communes also have their own competencies in the areas of education and social affairs, energy supply, road building, local planning, taxation, etc. To a large extent these powers are self-regulated. The degree of autonomy granted to the communes is determined by the individual cantons and therefore varies considerably.

Switzerland has adopted a bicameral system compound by the States Council (the Senate) with 46 Members, and the National Council (Lower House) with 200 Members. The national Council represents the overall population and the Council of States, the member states of the Confederation, i.e. the cantons. Every canton has two representatives at the State Council (20 cantons are represented by two members while the six former half-cantons each send only one) and a floating number depending of its population size at the National Council. They both form the United Federal Assembly. The members of the government are elected by the Federal Chamber. Both chambers are directly elected by the people: the National Council, is elected in accordance with federal rules and the Council of States according to provisions differing from canton to canton. In both cases, the cantons form the constituencies.

Switzerland has adopted a semi-direct democracy which means that Swiss citizens are called to vote on a regular basis (at least four times a year), not only for the election of their local, cantonal and federal representatives, but also for giving their opinion on a series of laws and for the ratification of certain international treaties, or when it is requested by 50.000 voters in a period of 100 days after its publication. However, the voters’ turnout is very low, between 30% and 40%, which had motivated the introduction of postal voting in the nineties and nowadays the progressive introduction of Internet voting. Postal voting does not solve the problem of the low turnout rate of voters below 40 years, residing abroad and with a disability. Actually, 95% of the ballots are cast through postal voting, except when Internet voting is allowed. In Geneva, the possibility of casting a vote by Internet has raised the voters’

¹⁵¹ CNIL, Délibération n° 2006-042 du 23 février 2006 portant avis sur le traitement de données à caractère personnel mettant en oeuvre un dispositif de vote électronique pour les élections à l'Assemblée des Français de l'étranger du 18 juin 2006, J.O n° 92 du 19 avril 2006.

turnout by 20%.¹⁵²

The first experimentation has been carried out in 2004 when four municipalities of the Canton of Geneva have offered to their citizen the possibility of casting their vote through Internet. Only 22000 voters were concerned and 21,8% had chosen to use this alternative. The counting of ballots has last 13 minutes and no technical problems have occurred.¹⁵³ Further experiences were carried out in the Cantons of Neuchâtel and Zurich with different approaches. The Canton of Geneva conceives Internet voting as postal voting and bases the system on a specific smart card which authenticates the voters not only for casting the vote but also eAdministration services. The canton of Zurich has developed a specific application allowing Internet voting either by Internet or by mobile phone (SMS). Finally, Neuchâtel canton tries to integrate eAdministration and eVoting through a sole website and based on a contract signed between the Administration and the user. After its authentication, the citizen will be able to access any public service and to cast his vote. The first eVoting experience in this canton took place on the 25 September 2005 where 1178 voters participated.¹⁵⁴

Internet voting has been fully incorporated into the Swiss legal framework, as an alternative means to cast votes, according to the standards set up by the Recommendation of the Council of Europe¹⁵⁵. However this incorporation, still at the stage of experimentation, has been subject to a previous and deep analysis by the Federal administration and in particular regarding to the risks it could create. It has been concluded that electronic vote did not make appear new risks regarding the existing ballots. All the risks linked to the use of Internet have their equivalent in traditional ballot modes and are introduced on a preexisting legal basis. In most of the cases, judicial sentences exist creating examples of action of the authority in such cases. This study concluded that far from creating a new challenge, Internet voting is in line of practice and the preexisting frameworks. It showed that political and legal risks linked to the implementation of electronic voting are under controlled.

If the results of the different experiences are positive, the parliament should fully introduce Internet voting into the Swiss electoral system and create a complete legal basis, apart from working on a solution for voter register and on further developments and testing.¹⁵⁶

6.5.1 Electoral system

Article 34 of the Constitution of 19 April 1999 guarantees political rights which consists of the free formation of the citizen will and its exact and certain expression. This implies, according to Art. 8 of the Federal Act on Political Rights (LDP):

- An easy vote procedure
- Control of the identity of the voter
- Prevention from abuses

¹⁵² State Council, Report to the Grand Conseil on electronic voting project pf Geneva, 24 May 2006.

¹⁵³ Press release, Officiel: le vote en ligne réduit l'abstention, 2ç September 2004, available at : <http://www.journaldunet.com/0409/040929ivotesuisse.shtml> (Last access 11 April 2007)

¹⁵⁴ Braun eVoting:Switzerland's project and their Legal framework in their Legal context, Bregenz, 7-9 April 2004.

¹⁵⁵ Council of Europe, Recommendation Rec(2004)11 of the Committee of Ministers to member states on legal, operational and technical standards for eVoting, 30 September 2004.

¹⁵⁶ Braun eVoting:Switzerland's project and their Legal framework in their Legal context, Bregenz, 7-9 April 2004.

- Counting of every ballots
- Respect of the secrecy of vote.

The Supreme Court considered that these elements form an inseparable whole (ATF 121 I 187-195).

The legal framework regulating the voting procedure at federal level is formed by the Political Rights Act of 17 December 1976¹⁵⁷ (LDP) and the Ordinance on Political Rights of 24 May 1978¹⁵⁸ (ODP). Specific provisions are foreseen for Swiss living abroad¹⁵⁹.

Swiss citizen are called to vote for the election of representatives at local, cantonal and federal level and for public consultation regarding certain laws. Elections to the Council of States are not organized at federal level, they are governed by cantonal provisions, as well as local elections and public consultation.

Deputies are elected for four years through party-list proportional voting. Every canton forms a constituency. The method used to distribute the vote is the quota method.

States Council's representatives are also elected for a period of four years depending on cantonal regime, on a two-rounds single member constituency voting system.

6.5.2 Traditional voting procedure

The traditional Swiss voting procedure is based on voting at polling station with paper ballots. However, since 1994, electronic ballots delivered by cantons for the computerization of the ballots are acknowledged to paper ballots (Art. 5.1 LDP).

The elections should take place on certain Sundays defined by the Ordinance. The Elections' dates are published every year by the Federal Chancellery in the month of June on the previous year to the voting (Art. 2a ODP). The elections of the representatives of the National Council takes place the next to last Sunday of October (Art. 19 ODP). However, cantons can foresee anticipated vote during the 2-4 days prior to the Election Day (Art.7 LDP). The canton should define whether the voter can cast his vote to the polling station or also allow advanced voting (the voter introduces his vote in a sealed envelop and drop it off at a designated public office).

Each canton is in charge of the organization of the elections (Art. 7a ODP).

6.5.2.1 Voting Place

The voter has to cast his vote at the polling station of the municipality where he resides (Art. 3 LDP). However, individuals living out of their regular residence during the week for professional reasons, such as students, and husbands and wives who reside out of the common domicile can vote at this municipality with the agreement of his/her wife/husband or the judge (Art. 1 ODP).

¹⁵⁷ RS 161.1

¹⁵⁸ RS 161.11

¹⁵⁹ Federal Act of 19 December 1975 and Ordinance of 16 October 1991 on political rights of Swiss living abroad, RS 161.5 and 161.51.

6.5.2.2 Information previous to the Election Day

Voters should receive at the soonest four weeks before the Elections day but at the latest three weeks before this date, the documents which will enable them, according to cantonal rules, to express their vote (paper ballots, voter's card, electoral envelop, control stamp, timestamp, etc.). If the vote regards a specific Act, voters should also receive at least the text of the Act; a brief and objective explanation and the opinion of minorities. These information should be published in Internet as well (Art. 11 LDP).

Moreover, cantons should send to the voters, at the latest 10 days before the Elections day a complete set of the paper-ballots. Cantons which have opted for electronic ballots (*bulletin de saisie*) should send to the voters the information relative to all candidates, the name of the lists and the joint list (Art. 33 LDP).

6.5.2.3 Closing of the election

After the closing of the polling day, cantons have to established a minute of polling stations which contain (Art. 39 LDP):

- Number of voters registered and the number of voters
- Number of valid, annulled and blank votes.
- Number of votes obtained individually by candidates of each list
- Number of complementary votes of every list.
- Total of nominative and complementary votes of every list
- For joint list, the total number of votes obtained by lists' group
- Total number of blank votes.

6.5.2.4 The casting of the vote

The ballots can be pre-printed with the name of the candidates or not. In the first case, the voter should write the name of the candidate(s) and the name of a list or the number which have been assigned to this list. When the ballot is printed, the voter should strike off the list the name of candidate or add candidates form other lists. He can strike off the number assigned to the list or its denomination, or even substitute the print order or name of the list by another. The voter can also write twice the name of a candidate on a ballot. (Art. 35 LDP).

If the voter cast its vote for fewer candidates than required, its vote is assigned to the member of the same list (Art. 37).

Votes can be annulled because of the following reasons (Art.12 LDP), without prejudice of cantonal provisions:

- If they are not at the official format
- If they are fulfilled otherwise than by hand
- If they do not express clearly the will of the voter.
- If they are marked or contained remark harmful for honor.

6.5.2.5 Counting procedure

No specific provisions are contained in the Federal legislation on the counting procedure. It only compels polling stations' chairman, after the closing of the elections, to elaborate a minute which should indicate the total number of voters in the list, included Swiss living abroad, the number of voters, the number of blank, invalid and valid ballots and the number of voters who has approved the project and the ones who have rejected it.

The minute is transferred to the cantonal government which recapitulates the provisional results for the Canton. It further communicates them to the Federal Chancellery and publishes them in an official form within 13 days after the elections day.

Cantons should transfer the minutes and when required, the ballots, within 10 days after the end of the prescription period to the Federal Chancellery. After the elections validation, ballots are destroyed (Art. 14 LDP).

6.5.3 Alternative voting procedure

Postal voting is allowed. The cantons which opted for this kind of vote procedure should guarantee the identification of the voters, a complete counting of the votes issued, the secrecy of the vote and prevent abuses. Voters can cast their vote as soon as they have received the official documents to do so (Art. 8 LDP).

6.5.4 Electronic voting

In 2002 a specific provision has been introduced into the LDP in order to allow the first experimentations of electronic voting. The National Council should give his previous agreement (Art. 8a LDP).

The Ordinance of 1978 has been modified in order to specify the requirements these experimentations should comply with (Section 6a). It is allowed to derogate to provisions relative to postal voting and paper-ballots. Art. 12 LDP expressly specifies that the provisions it contains relative to nullity of votes are not applicable to electronic voting. Proxy voting is forbidden (Art. 27a ODP).

The provisions described below apply not only to federal elections but also to referendum petitions or federal popular initiatives (Art. 27q ODP).

The experimentation should include all ballots and elections taking place the same day in the territory of the municipality (Art. 27 ODP). The system of electronic voting proposed by the cantons should guarantee (Art. 27d ODP):

- that only registered voters can cast their vote (control of the identity of the voter)
- the uniqueness of the vote (every voter is able to cast his vote only once)
- the content of the vote (the will of the voter should be guaranteed)
- the secrecy of the vote
- every vote will be counted and taken into account
- impossibility of systematic fraud

When the canton opts for the use of an access code, an access right or an electronic

signature, it should guarantee that:

- third parties can not intercept, modify or divert them on a systematic basis
- third parties can not use fake electronic signatures or stole access code or rights of access on a systematic basis
- security measures exclude any risk of target and systematic fraud

The canton should guarantee it has the sufficient technical and staff and financial infrastructures to carry out the experimentation

A series of provisions intend to guarantee the free formation of the will (Art. 27e ODP) and specify the following:

- The way how voters are guided during the process should not induce them to vote rashly nor flecklessly
- Voters should be aware of the fact that casting their vote electronically is a formal act of voting. The system should ask for confirmation before the voter cast his vote.
- Non manipulative nor systematic message should appear in foreground during the process
- Voters should be able to change their vote before the definitive cast of their vote and to interrupt the procedure
- The device used by the voter should warn him of the correct reception of the message
- The encryption of the data should prevent the counting of a vote which would have been manipulated

In order to guarantee the secrecy of the vote, several principles are introduced (Art. 27f and g ODP):

- Regarding encryption:
 - Electronic casting of votes should be rendered completely anonymous preventing any form of tracing.
 - The transfer of electronic voting documents, authentication, the record in the voters' register that the voter had cast his vote, and the deposit of the vote in the electronic ballot box should be conceived and organized in such a way that makes impossible to identify the voter.
 - The ballots should be encrypted from the very beginning of the transfer and into the device the voter uses to cast his vote. Safeguards should be implemented against any targeted or systematic spying of electronic ballots.
 - Personal data can only be decrypted during the counting .
- No link should be established between the ballot and the voter
- Electronic ballot software should be clearly separated from other applications
- When the electronic ballot box is opened any action on the system or on one of its components should be done by at least two persons, be recorded on a minute and be controlled by representatives of the competent authority.

- All measures should be taken to ensure that none of the required information for the processing can be used to violate the secret of vote.
- During the vote, no external interference could occur on the server and the electronic ballot box.
- The ballots should be randomly stored in the ballot box in order to prevent any the reconstruction of the order they were cast.
- The voter's manual should indicate how ballots can be deleted on the memory of the device
- The ballot should disappear from the screen from the moment the voter has validated his ballot. The ballot can not be printed out.

The voter should prove its identity before casting his vote (Art. 27i ODP) and should not be able to vote more than once (Art. 27j ODP).

Technical measure should guarantee that any ballot can be definitively lost in case of failure of the system or break down. The control of the development of the procedure and the counting should not be compromised.

Before any vote is cast, the competent authority should evaluate the hardware, software used, as well as the organization and the good course of the procedure. An external and independent body recognized by the Chancellery should validate the system, every time it is changed.

The electronic ballot box and the ballot server should be protected against attacks. Only authorized individuals in charge of some aspect of the procedure (verification of voter's identity, of the uniqueness of the vote, the recording and storage of the votes) should only be allowed to access the server and data.

It is forbidden to make any intermediate counting of ballots before the closing of the electronic ballot box. The counting should start immediately after the closing of the election and be done in conditions defined by the cantonal Law. Representative of voter are allowed to be present for the counting. Once counted, electronic ballot can be added to ballots casts through other means. Counting of Electronic ballots should be registered. In case of irregularity, contested electronic votes should be identified and numbered and the recounting should be possible (Art. 27n ODP).

The Federal Chancellery defines the general conditions of research on the typology of individuals using this form of voting and should evaluate the efficiency of such experiments.

6.6 Estonia

Estonia is an independent and sovereign democratic republic. Legislative power is vested in the Parliament, which is a unicameral parliament with 101 members elected in general elections, by secret ballot, according to the principle of proportional representation. Only Estonian citizens may participate in parliamentary elections. The Parliament chooses a president, who can be in office for a five year period for a maximum of two terms. A party must gather 5% of the votes in order to become part of the Parliament. As a rule, the President asks the party leader who has collected the most votes to form the new government.¹⁶⁰ The units of the local governments in Estonia are districts (municipalities) and towns. All local issues are resolved and regulated by local governments. The representative local government bodies are town and municipality councils, which are elected. Administrative division counts 15 counties, 47 towns and 207 rural municipalities.

Several amendments have been made to the Riigikogu (Parliament) Elections Act since 2003 parliamentary elections. The amendments include provisions for electronic voting by Internet, changes the campaign financing, and a prohibition on political outdoor advertising during the campaign period.

Legislation enabling remote voting by Internet in local elections was originally passed in 2002. The President of Estonia refused to promulgate the law. He referred the issue to the Constitutional Court. The President's challenge was based on the argument that permitting voters who voted electronically to change their vote put them in a situation of inequality compared to voters who voted only by paper ballot, as the latter could not change their votes. The Constitutional Court, supported by an opinion of the Chancellor of Justice, found that since all voters have the possibility to vote electronically, the law did not violate the equality of voters. The Estonian National Court has also considered that the possibility to replace the eVote with another eVote or paper ballot is a precondition of constitutionality of eVoting, as without the right to change the eVote, the principle of free voting cannot be guaranteed by remote Internet voting.¹⁶¹ The Estonian National Court also made reference in its decision to Recommendation Rec(2004)11 of the Council of Europe of 30 September 2004 to member states on legal, operational and technical standards of eVoting, and explained that the right to change the eVote is in accordance with the Recommendation as well. This was the only legal challenge to remote internet voting in Estonia.

A system enabling internet voting was developed and used in the 2005 local elections on a nationwide scale. Use of the internet voting system was relatively low – some 9,287 voters cast valid ballots using the system (1.85 per cent of valid votes cast). There were no reports of significant disruptions in the functioning of the system, although voting was interrupted for a brief period. No official complaints were made regarding the system after the local elections.

The success of these elections has been the basis for the extension of Internet voting to Parliament elections of 4 March 2007.

¹⁶⁰ http://www.estonica.org/eng/lugu.html?menyy_id=411&kateg=73&alam=75&leht=2

¹⁶¹ Breur F. , Conference report on eVoting: lessons learnt and future challenges, Tallin, 27-28 October 2006, available on-line at: http://www.ega.ee/public/27_28.10.06_Report_e_voting_Conference.pdf (last access 31 March 2007)

6.6.1 Electoral system

Three different Acts regulate the electoral procedure: the Riigikogu Election Act of 12 June 2002¹⁶², the Local Government Council Election Act of 27 March 2002¹⁶³ and the European Parliament Election Act.

Voting rights are extended to Estonian citizens aged of 18 and older, which have not been divested of legal capacity. Person convicted of a criminal offence and serving a sentence of imprisonment do not have the right to vote. Estonian citizen permanently or temporarily staying in a foreign state may vote. All voting in foreign states is conducted in advance of election day. In general, these voters may vote by paper ballot in person at Estonian embassies and consulates, by post, or by Internet. Voters registered as permanently residing outside Estonia may also vote in Estonia by advance voting at a designated polling division or by Internet.¹⁶⁴

Estonia provides for a wide range of voting methods for voters. In all paper voting methods, the voter writes the registration number of his/her preferred candidate on the ballot. Voters in Estonia may vote by paper ballot on election day at the polling division where they are entered on the voter list, or they can apply for supervised home voting. Voters in Estonia may also vote in advance of election day by paper ballot. Advance voting is held from 13 to 9 days before the election day at the polling division designated by the respective CEC (country and city election committees), and from 6 to 4 days before elections at all polling divisions and at custodial institutions. Voters may vote in advance at polling divisions outside their assigned polling division and outside their constituency, and advance home voting for voters outside their polling division may be conducted through application.¹⁶⁵

Elections are organized by different Electoral Committees (National Electoral Committee, County electoral Committee and division committees) which are in charge of verifying voting results and elections.

The Riigikogu is a unicameral Parliament, composed of 101 seats. Members are elected from 12 multi-seat constituencies for four-year terms through a proportional, open-list system. Members of the Riigikogu are elected by secret ballot on the basis of a general, uniform and direct right to vote. The general elections are based on the system of proportional representation.

Municipal councils and other local authorities are directly elected by the population and in turn establish municipal governments responsible for matters such as the provision of public service such as education and social welfare. Election results shall be verified on the basis of proportional representation (Art. §1 (3) Local Government Council Election Act). Councils shall be elected for three years. Council elections shall be held on the third Sunday in October in an election year (Art. §2 Local Government Council Election Act). A council shall form one electoral district in the territory of the rural municipality or city (Art. §8 Local Government Council Election Act).

¹⁶² Riigikogu Election Act, 12 June 2002, RT I 2002, 57, 355

¹⁶³ Local Government Council Election Act, 27 March 2002, RT¹ I 2002, 36, 220, English version available at: <http://www.legaltext.ee/text/en/X60031K1.htm>

¹⁶⁴ OSCE, Needs for assesment report 15-17 January 2007, Republic of Estonia, Parliamentary elections 4 March 2007, Warsaw, 31 January 2007.

¹⁶⁵ OSCE, op cit. 6.

6.6.2 Traditional voting procedure

6.6.2.1 Voters

Voters should be registered in the population register. The Chief processor of the population register organises the sending of polling cards to voter no later than on the twentieth day before the elections day. Polling lists should be printed for each polling division on the basis of the information held in the information register and shall be delivered to divisions committees no later than by the seventh day before the elections day.

6.6.2.2 Voting Place

Polling divisions are formed in the territory of an electoral district by a regulation of the rural municipality or city government. They are permanent. Voting is held in the same polling divisions for Riigikogu and local government council elections and referendums, unless the rural municipality or city government determines otherwise in case of the first ones.

A voter shall vote in the polling division where he or she is entered in the polling list, excepted in the cases of using advanced polls, home voting, electronic voting.

6.6.2.3 Voting procedure

Before voting opens, the division committee shall inspect and seal the ballot box. Ballot boxes sealed before the start of advance polls shall be used for advance polls only. The opening of a ballot box is covered. It is opened only to deposit a ballot paper in the box (Art§42 Riigikogu Election Act).

A polling place shall have places for the distribution of ballot papers, voting booths and a ballot box. In a polling division where voters can vote outside the polling division of their residence, the polling place shall have a separate voting booth and ballot box for voters voting outside the polling division of their residence during advance polls. The consolidated list of candidates in the electoral district shall be posted in the polling place (Art.§40.2 Riigikogu Election Act).

A voting booth shall enable voting to be secret. There shall be a table and a writing instrument in a voting booth. The consolidated list of candidates in the electoral district shall be posted on the wall of the voting booth.(Art§41 Riigikogu Election Act).

6.6.2.4 Time of voting

Voting on election day shall open at 9 a.m. and close at 8 p.m. (Art.38 Riigikogu Election Act).

Advance polls shall be held (Art§44 Riigikogu Election Act):

- from the thirteenth day to the ninth day before election day in a polling division designated by the county electoral committee, included voting in custodial institutions. Voting shall open at 12.00 a.m. and close at 8 p.m.;
- from the sixth day to the fourth day before election day, in all polling division and by electronic means. Voting shall open at 12.00 a.m. and close at 8 p.m.;

Votes can be submitted using electronic means on a twenty-four hour basis.

6.6.2.5 Authentication of the user

In order to obtain a ballot paper, a voter shall present an identity document to the division committee. The voter shall sign the polling list against the receipt of the ballot paper.

6.6.2.6 Closing of the election

A division committee shall open the ballot boxes on election day after the close of voting. More than one-half of the members of the division committee shall be present at the opening(Art. 54 Riigikogu Election Act).

Before the ballot boxes are opened, the division committee shall:

- count and cancel all ballot papers that were not issued to voters and all spoiled ballot papers returned by voters. Ballot papers shall be cancelled by cutting off a corner of the ballot paper.
- use the polling lists to verify the number of voters entered in the lists and count the signatures in the polling lists given in receipt of a ballot paper to verify the number of voters who were given a ballot paper, and shall enter these numbers in a standard format record.

When a ballot box is opened, the condition of the impression of the seal on the box shall be inspected.

The seal of the division committee shall be affixed to the outside of ballot papers of home voters, and the ballot papers shall be placed among the ballot papers of voters who voted at the polling place.

The inner envelopes which contain the ballot papers of voters who voted outside the polling division of their residence shall be opened, the seal of the division committee shall be affixed to the outside of the ballot papers and the ballots shall be placed together with the ballot papers of persons who voted at the advance polls among the ballot papers of persons who voted on election day.

On the basis of the ballot papers in the ballot box, the division committee shall verify the number of persons who participated in the voting, the number of invalid ballot papers and the number of votes cast for candidates, political parties and election coalitions, and shall enter these numbers in a standard format record.

6.6.2.7 Invalid ballots

A ballot paper is deemed to be invalid if (Art§54.8 Riigikogu Election Act):

- it does not bear two seals of the division committee
- no candidate registration number or more than one candidate registration number has been written on the ballot paper;
- the candidate whose number is written on the ballot paper is not standing in the electoral district;
- the candidate registration number written on the ballot paper has been changed;

- the candidate registration number written on the ballot paper is illegible.
- If no candidate registration number has been written on a ballot paper but the will of the voter is clear and unambiguous, the ballot paper is deemed to be valid.
- A standard format record shall be prepared concerning the verification of the voting results. The chairman of the committee shall sign the record. The date and time of preparation of the record shall be indicated therein.
- After verification of the voting results, valid ballot papers shall be packed by candidate and invalid ballot papers, ballot papers which were not issued to voters and spoiled ballot papers returned by voters shall be packed separately. The polling division from which the ballot papers originate and the type and number of ballot papers in the pack shall be marked on the pack. The chairman of the division committee shall sign the label.
- Ballot papers, polling lists, records concerning voting results and any dissenting opinions of members of the committee shall be promptly delivered to the rural municipality or city electoral committee.
- Voting results shall be verified in a division committee in public.

6.6.2.8 The casting of the vote

A voter shall vote in the polling division where he or she is entered in the polling list. The voter shall complete the ballot paper in a voting booth.

The voter shall write the registration number of the candidate in the electoral district of his or her residence for whom he or she wishes to vote in the designated space on the ballot paper.

The voter shall complete the ballot paper himself or herself. If he or she is unable to complete the ballot paper himself or herself due to a physical disability, another voter, but not a candidate in the election district of his or her residence, may do so at his or her request and in his or her presence.

If a voter spoils the ballot paper, he or she has the right to be given a new ballot paper by the division committee. In such case the voter shall return the spoiled ballot paper to the division committee.

After completing the ballot paper, the voter shall fold the ballot paper and hand it to a member of the division committee who shall affix the seal of the division committee to the outside of the folded ballot paper.

The voter shall deposit the ballot paper in the ballot box himself or herself. If he or she is unable to deposit the ballot paper in the ballot box himself or herself due to a physical disability, another voter may do so at his or her request and in his or her presence.

6.6.3 Alternative voting procedure

6.6.3.1 Advance polls

On advance polling days, voters may vote outside the polling division of their residence in a polling division designated by the county electoral committee, or the

rural municipality or city government. (Art§40 Riigikogu Election Act)

The division committee shall keep the ballot box and voting documents on advance polling days and the following days such that only members of the division committee have access to them.

If a voter who wishes to vote outside the polling division of his or her residence is unable to vote at a polling place located in a polling division due to his or her state of health or for another good reason, he or she may, until 4 p.m. on the last day of advance polling, submit a written application to vote at his or her location to the rural municipality or city government of his or her location or to a division committee prescribed in subsection 41 (2) of this Act. The division committee shall register the application. The rural municipality or city government shall register the application and forward it to the corresponding division committee.(Art43 Riigikogu Election Act).

6.6.3.2 Home voting

If a voter is unable to vote at a polling place due to his or her state of health or for another good reason, he or she may apply to vote at home (Art. 46 Riigikogu Election Act).

In order to vote at home, a voter shall submit a written application to the rural municipality or city government or to the division committee of his or her residence by 4 p.m. on Election Day and the division committee shall register the application. If the application is submitted to the rural municipality or city government, the rural municipality or city government shall register the application and forward it to the appropriate division committee.

A home voter shall sign the list of home voters against the receipt of a ballot paper.

6.6.4 Electronic voting

Estonia is the only country in Europe where access to the internet is a constitutional right. The first consequence is a high rate of Internet penetration at citizen home.

According to Estonian election legislation eVoting takes place from 6th to 4th day before Election Day. On advance polling days, voters may vote electronically on the web page of the National Electoral Committee. A voter shall vote himself or herself.

6.6.4.1 Identification

A voter shall identify himself or herself using the certificate entered on his or her identity card which enables digital identification. A public key infrastructure enabling secure electronic personal authentication using digital signatures and ID-cards has been created.¹⁶⁶

6.6.4.2 Casting of the vote

After identification of the voter, the consolidated list of candidates in the electoral district of the residence of the voter shall be displayed to the voter on the web page. The voter shall indicate on the web page the candidate in the electoral district of his or

¹⁶⁶ National Commission Committee, eVoting System Overview, Tallin, 2005

her residence for whom he or she wishes to vote and shall confirm the vote by signing it digitally using the certificate entered on his or her identity card which enables digital signing.

A notice that the vote has been taken into account shall be displayed to the voter on the web page.

6.6.4.3 Possibility of electronic re-vote

Voter may change his or her electronic vote during the advance voting period from 6th to 4th day before Election Day by voting electronically or by voting in polling station. An eVoter can cast his/her vote again and the previous vote will be deleted. Even though usually multiple voting is considered a crime (Penal Code, § 165), in this case it is a measure against vote-buying – the voter who was illegitimately influenced can cast the vote anew once the influence is gone. Electronic “re-vote” cannot thus be considered “multiple voting” as the system will only take into account one vote (the one given last). The priority of traditional voting – should the voter go to polling station on advance voting day and cast a vote, his or her electronically cast vote shall be deleted.

The results of electronic voting shall not be disclosed before the close of voting on election day.

The system is designed to protect the anonymity of the voter through a “double envelope,” in which the content of the voter’s electronic ballot is not decrypted until it is separated from the voter’s identity, after the expiration of the electronic voting period.

The internet voting system was originally developed by a private company through a public tender process. The system was tested prior to the local elections by the NEC, but there has been no subsequent separate testing. There is no provision for certification of the system. Prior to the local elections an individual expert contracted by the NEC reviewed the source code developed by the contracting company.

The security was not questioned. Since electronic voting is conducted only in advance of election day, the denial of service attacks would not disenfranchise voters living in Estonia.

In the absence of a paper record, it is unclear how a recount could be conducted in the event of challenge. The Election Act permits the NEC to invalidate the electronic voting before elections day and to invite voters to vote at their polling stations, although it does not specify the grounds for invalidation. In general the NEC has the right to invalidate the election if a violation significantly affected or could have significantly affected the voting results. 167

¹⁶⁷ OSCE, op. Cit.

6.7 Germany¹⁶⁸

Germany is a bicameral federal state which consists of a central federal government and 16 federal states (Länder). German citizens are represented at the Bundestag (Parliament) which counts 598 seats. The system is often referred to as personalized proportional representation because the parliament's makeup is determined by both votes for direct candidates and those on the state party lists, which are voted for on the basis of the party rather than the candidate. The Bundesrat (Senate) represents the federal states and as such is made up exclusively of representatives of the federal state governments.

The constitution of the Federal Republic of Germany, the Basic Law, stipulates in its Article 20, Paragraph (2) that all public authority emanates from the people. It shall be exercised by the people through elections and referendums and by specific legislative, executive and judicial bodies. These principles are irrevocable (Article 79, Paragraph (3)). According to Article 28, Paragraph (1), the people must also be represented by an elected body in the Länder (states), counties and municipalities.¹⁶⁹

The Federal Election Law of 1956¹⁷⁰ was adapted in 1975 to allow the use of mechanical- and electronic voting machines. In 1998, NEDAP voting machines were tested for the first time in Cologne. The tests were evaluated by the City Council as very successful and one year later, the elections for the European Parliament in Cologne were carried out exclusively with (600) NEDAP voting systems. In the following years, other cities followed: in the elections for the Bundestag of 22 September 2002, 29 Municipalities used the NEDAP electronic voting machines.¹⁷¹

The number of communities that use a voting machine is steadily growing. A number of large cities (Köln, Düsseldorf) have used voting machines for quite a number of elections. It is the decision of local governments to introduce and finance voting machines. Only machines authorised by the Minister of Interior are permitted and the market is dominated by one system, the voting machine of NEDAP. Furthermore, there is little debate on the use of voting machines, even about the two topics that caused some stir elsewhere namely, the secret source code and the lack of a voter verified audit trail.

The “i-vote” project was initiated in early 1998 by Internet-Voting, a German research organization dedicated to applying Internet technology to the election process. Since then, the project has extended in scope through a partnership in 1999, and sights were set on designing a system capable of supporting a major election. The first prototype of the system was implemented at a student parliament election at the University of Osnabruck, Germany, in February 2000. In June 2000, a second test was conducted at an internal election held by the Department of Information and Statistics in Brandenburg, Germany. The new system will be used in a local community

¹⁶⁸ This Chapter is an update of Van Oudenhove, B., Schlichting K., Siebald S., Tucholke U., Lévy S., Legale E., Laigneau A., Forsgren O., Ohlin T., Legal issues of cybervoting, for the European project “CYBERVOTE”, June 2001. The original version is available on line at: <http://www.eucybervote.org/reports.html>, last access 29th March 2007.

¹⁶⁹ Introduction to German Federal Law system, <http://www.iuscomp.org/gla/literature/introbwg.htm>

¹⁷⁰ Federal Electoral Law, 7 May 1956 (Federal Law Gazette I, p. 383)

¹⁷¹ Irish Commission on electronic voting, Second report on the Secrecy, Accuracy and Testing of the Chosen Electronic Voting System, July 2006.

election from July 9 to July 12, 2001, in Esslingen, Germany.¹⁷²

A specific Working Group is in charge of suggesting the legal modifications and the essential specifications of the technical systems necessary for implementing online elections on a broad scale. Another objective of the network is to inform the general public, politicians and public administrators about the technical options and in this way to foster acceptance of electoral innovations. In addition to developing Internet election systems, Internet voting by shareholders planned for AGMs by some major German companies will also be monitored. The Baden-Württemberg section of the Bündnis 90 / Die Grünen party has conducted the first virtual party congress in Germany. The subgroup will support the various projects and inform the federal government about the legal modifications and other measures that are necessary.

However, at the moment there are several lawsuits in court against the use of electronic voting machines in Germany. One of these will go to the highest German court in 2007. The plaintiffs are missing the transparency of the storage of the votes in the machine and of the possibility to have a recount because the certified Nedap machines do not have a paper trail.¹⁷³

6.7.1 Electoral system

With regard to elections for the German Bundestag (Federal Parliament), the Basic Law contains only a few principles. The choice of the electoral system and the actual procedure are regulated not by the constitution but by an ordinary law, the Federal Electoral Law. Article 38 of the Basic Law states that the Members of the German Bundestag shall be elected in general, direct, free, equal and secret elections, that they shall be representatives of the whole people and they shall not be bound by any instructions, only by their conscience. The modalities of the vote are regulated through the Federal Elections Act.

Any German has attained the age of 18 is entitled to vote, anyone of majority age is eligible for election. The franchise has been extended to German nationals living abroad. Germans residing in a member state of the Council of Europe are now entitled to vote in elections held in the Federal Republic of Germany irrespective of how long they have been living abroad. Germans who live in other countries may vote during the first ten years from the time they leave the Federal Republic, provided they resided continuously in the federal territory, for at least three months prior to leaving the country.

Characteristic features of ballot box elections include the ties to fixed polling stations with authenticity checks (list of electors, identification), polling booths and ballot boxes.

Voting is not mandatory in Germany.

Half the 598 seats in the Bundestag are allocated by means of the parties' state lists (the second vote) and the other half by the direct election of candidates in the 299 constituencies (the first vote).

There is a total of 299 constituencies which comprises some 250,000 inhabitants of

¹⁷² Press release, German Region Implements First Online Voting Solution Built on BEA WebLogic Server,
http://www.bea.com/framework.jsp?CNT=pr00607.htm&FP=/content/news_events/press_releases/2001

¹⁷³ Wikipedia, eVoting, www.answers.com

German nationality.

Each German is allowed to cast two votes, a first vote to be cast for a Member of Parliament representing a constituency and a second vote to be cast for a Land list. (Art.4) The first vote, which is for direct candidates running in each of the constituencies determines half of the parliament's total composition, ensuring that each district is represented. The second vote determines the Bundestag's majority, as the overall proportion of "aye" ballots each party gets in the second vote determines how many candidates from that state list will be granted seats in the Bundestag.

Under German election law, parties must obtain a minimum of 5 percent of the second vote.

Under this system, each eligible person has two separate votes that can be cast independently of each other. One, the first vote, is cast for one of the candidates in his constituency, the other, the second vote, for one of the party lists in the federal state concerned. It is possible to vote for different parties.

In the constituencies, the candidate who polls most first votes is the winner.

The second vote is given for one of the lists put up by the parties in each of Germany's 16 federal states. The sequence of the candidates on the lists is fixed by the parties themselves beforehand and cannot be changed by the voter.

The Federal Electoral Committee establishes the number of seats each party is to receive on the basis of the second votes, which are therefore decisive for the election result.

Seat distribution is based on the method developed by a German mathematician (Niemeyer). It ensures that the distribution of seats corresponds exactly to the proportional distribution of votes.

The seats are distributed among the parties in proportion to the total number of second votes polled by them in the whole area (upper distribution). Only those parties that have polled at least five per cent of the second votes in the entire country or who have won at least three constituency seats on the basis of first votes can be considered. The purpose of this safety clause is to exclude splinter parties, thus ensuring that parliament can function properly and providing a basis for stable government.

A second calculation is made, again according to the Niemeyer method, to determine the total number of seats for each party at federal level to be distributed among their Land lists (lower distribution). Any seats which a party has already won directly in the constituencies are deducted from the number of seats for its Land lists. The remaining seats are filled by the candidates on the Land list in the order determined before the election. It is possible for a party to have what are known as "overhang" seats when it wins more seats in the constituencies on the first vote than it is entitled to according to the result of the second vote calculation.¹⁷⁴

6.7.2 Traditional voting procedure

When Germans go to their polling stations, often in schools or other public buildings, they select candidates for parliament with marks on a multiple-choice ballot.

The election day must fall on a Sunday or on a statutory public holiday (Art. 16).

¹⁷⁴ Description of the system is extracted from Introduction to German Federal Law system, <http://www.iuscomp.org/gla/literature/introbwg.htm>

6.7.2.1 Voting Place

Only such persons as are entered in a voters' register or have a polling card shall be permitted to vote. Anyone entered in a voters' register may only vote in the polling district of the voters' register in which he or she is entered (Art. 14).

However, a person entitled to vote who is prevented from casting his or her vote in the polling district of the voters' register in which he or she is entered, or has not been entered in the voters' register for reasons outside his control, shall be issued with a polling card on application.(Art. 17).

6.7.2.2 Ballot papers

Art. 30 defines the content of the ballot paper and states that:

- for the constituency elections, the names of the candidates of the accepted constituency nominations; additionally, in the case of constituency nominations by parties, it shall show the names of these parties as well as any shortened form of their names if such form is used by them, while in respect of other constituency nominations it shall, moreover, bear the distinctive code name.
- for elections by Land lists, the names of the parties and any shortened form of their names if such form is used by them, as well as the names of the first five candidates on the Land lists accepted.

Votes are deemed invalid in the following cases (Art. 39):

- 1) the vote has not been handed over in an official voting envelope,
- 2) it has been handed over in a voting envelope which evidently differs from the other envelopes in a manner endangering the secrecy of the ballot, or which contains a distinctly tangible object,
- 3) has not been officially manufactured or is valid for another constituency,
- 4) it shows no marking,
- 5) it does not reflect the voter's intent beyond any doubt,
- 6) it contains any addendum or reservation.

In the cases mentioned under Nos. 1 to 4, both votes shall be invalid.

6.7.2.3 Opening and closing of the election

The actual polling is organized by the local authorities and independent electoral bodies. The members of such bodies are pledged to officiate impartially and to observe secrecy.

In and at the entrance to the polling centre no one may attempt to influence voters. Votes are cast in secret. Polling is public, as is the counting of votes and the establishment of the result. (Art. 31)

6.7.2.4 Authentication of eligible voters

Before each election, each local authority prepares a list of eligible voters for each electoral ward on the basis of the population register for that municipality. This

voter's register lists eligible voters in numerical order according to street and house number of their principal domicile.

Once the certificate has been issued to the voter, an entry to that effect is made in the voter's register so that the voter is barred from voting in his polling station. The voter's certificate entitles the voter to participate in postal voting, or to personally submit his vote in the electoral district for which the certificate was issued.

The usual way of voting is personal voting: The day of the election the voter goes to the assigned polling station and presents his official notification and – in case he/she is not personally known to the scrutineers - his passport or identity card. After the identification of the voter the ballot paper is handed over to the voter. The voter casts his vote in a shielded polling cabin and puts his ballot paper in a ballot box.

6.7.2.5 The casting of the vote

Measures shall be taken to ensure that the voter cannot be observed while marking his or her ballot paper and placing it in the envelope. Ballot boxes for the reception of the envelopes must be such that they ensure the preservation of the secrecy of the ballot. However, a voter who is illiterate or who is prevented by a physical handicap from marking the ballot paper, from placing it in the envelope, from handing the envelope over to the Electoral Officer or from placing it into the ballot box himself or herself, may be aided by another person (Art. 33).

Votes shall be cast by using official ballot papers in official envelopes. The voter shall cast his or her first vote by marking the ballot paper with a cross or other sign clearly indicating for which candidate the vote is intended, and cast his or her second vote by marking the ballot paper with a cross or other sign clearly indicating for which Land list the vote is intended (Art. 34).

6.7.3 Alternative voting procedure

6.7.3.1 Voting in Special Electoral Districts

In addition to normal electoral districts, the Federal Election Regulations allows the erection of special electoral districts where holders of voter's certificates may submit their votes (Section 48 and 49). These special districts include hospitals, senior citizen homes, nursing homes, recuperation centres and similar institutions with a significant number of eligible voters who are unable to attend a polling station outside the particular facility. Any voter with a valid voter's certificate for the electoral district in which the facility is located may submit his vote in a special electoral district. The polling station and times must be notified to such voters by the management of the respective institution.

The election officer of a special electoral district, or his deputy and two lay assistants, may also enter a patient's room, taking with them a separate sealed ballot box, the requisite ballot papers and ballot envelopes. There they receive the voter's certificates from patients and enable bed-ridden voters to fill out their ballot papers unobserved and to place them in the ballot envelope. The electoral procedure is thus detached from the voting place, since it allows ill or disabled voter in institutions to vote outside the traditional polling station.

Certificates must be taken – without delay – to the polling station for the special electoral district, where the ballot box must be kept under the supervision of the

election officer until normal voting has ended. Its contents are then added to the ballot papers in the normal ballot box and counted.

In smaller institutions and prisons, voting before a mobile election committee is permitted. The latter is comprised of the electoral committee for the electoral district in which the institution is located. The voting procedure and determination of the election results is the same as in special electoral districts.

6.7.3.2 Postal ballot

Postal voting was first introduced in 1956, also with the specific aim of achieving maximum electoral participation. At the same time, it is the most practical and to a considerable extent the only feasible way that Germans living abroad can exercise their voting rights. It replaces the option of voting in embassies, as is common practice in some European countries. The basic aim is to enable all those to vote who are unable to do so in their electoral district. The number of voters making use of this exception to the rule of ballot box voting has risen continuously.

The legislature has largely left it to the postal voter himself to ensure that secrecy of elections and electoral freedom are upheld in his personal sphere. Compared to ballot box voting in a polling station, the normal case in electoral law, postal voting is an exceptional form, a privatised electoral act. Detailed regulations, violation of which is punishable under criminal law in some cases, provide adequate guarantees that the principles of electoral law are not infringed.³⁴

When having applied for postal voting, the voter receives the voter's certificate and the ballot paper enabling him to cast his vote by mail. Postal voters mark the ballot paper personally and enclose it in the official ballot envelope. They sign the attestation about postal voting, pre-printed on the voter's certificate, adding the date and place. Then the voter places the official ballot envelope and the voter's certificate into the official postal voting envelope, seal the latter and send it by post to the election officer of the district for which the ballot paper was issued (Art. 34).

The postal votes must be received by the local authority that issued the voter's certificates by 6 p.m. on the elections day, otherwise they are invalid. Postal ballot letters may be posted as standard mail without any special form of dispatch, free of charge, if contained in official election envelopes (Art.34). If the sender chooses a special form of dispatch he must pay the amount in excess of the otherwise applicable letter rate. A postal vote may also be handed over to the local authority during the same period. Once received by the authority, the postal vote may not be returned to the voter.

The votes of all these eligible voters are assigned to the voters' home electoral district for which the respective voter's certificate is issued.

6.7.4 Electronic voting

In order to facilitate the casting and counting of votes, voting machines equipped with independent registers may be used instead of ballot papers, envelopes and ballot boxes.(Art. 36). In some municipalities or electoral districts, respectively, ballot boxes are replaced by voting machines, i.e. by a mechanical or electronic device. However, these kinds of devices are always located within a polling station.

The usability and reliability of these voting machines has had to subject of a firm technical inspection and, as the result of this, a certification of each single apparatus.

The Federal Ministry of the Interior shall be authorized to issue detailed regulations by statutory ordinance not requiring the approval of the Bundesrat (Länder chamber) concerning (Art. 36):

- the conditions for the official licensing of the design of voting machines as well as for the withdrawal and the revocation of the licence,
- the procedure governing the official licensing of the design,
- the procedure governing the examination of a voting machine as to the type corresponding to the officially licensed design,
- the public testing of a voting machine prior to its use,
- the procedure governing the official approval of the use as well as the withdrawal and the revocation of the approval,
- the particularities contingent upon the use of voting machines in relation to the election.

In Germany, the BSI-Bundesamt für Sicherheit in der Informationstechnik and the PTB-Physikalisch Technische Bundesanstalt are the authorities responsible for the technical inspection and certification of voting machines.

6.8 The United States

The United States government is a federal government, with elected officials at three levels: federal (national), state, and local.¹⁷⁵ The elections are regulated by both federal and state law.

The most important federal sources of regulation are:

- U.S. Constitution
- The Uniformed And Overseas Citizens Absentee Voting Act (1986)¹⁷⁶
- The Voting Rights Act (1965)¹⁷⁷
- Voting Accessibility for the Elderly and Handicapped Act (1984) (VAA)¹⁷⁸
- The National Voter Registration Act (1993)¹⁷⁹
- The Help America Vote Act (2002)¹⁸⁰

These regulations have left the States with a fairly great deal of responsibility in administrating the elections. Many of the State regulations contain common requirements with regards to the election procedure. These requirements include:

- certification or approval of voting equipment or systems;
- ballot design requirements;
- signature and witnessing requirements with regards to absentee ballots;
- deadlines for submission of registration forms/ballot applications and voted ballots.¹⁸¹

6.8.1 Electoral system

The United States has a presidential system of government, and the Executive and Legislature are elected separately.¹⁸²

In federal elections, candidates are first selected through the organization of primary elections (“primaries”) and caucuses. Primaries are elections organized by political parties at a state level in which registered voters of the jurisdiction select a political party’s candidate for a later election.¹⁸³ Caucuses also nominate candidates for later election, but take the form of meetings that occur at precincts and involve the discussion of political issues. Only eleven of the states use caucuses as a way to nominate candidates.¹⁸⁴

¹⁷⁵ http://en.wikipedia.org/wiki/Elections_in_the_United_States

¹⁷⁶ Uniformed and Overseas Citizens Absentee Voting Act, 42 U.S.C. 1973ff et seq.

¹⁷⁷ Voting Rights Act, 42 U.S.C. § 1973 aa.

¹⁷⁸ Voting Accessibility for the Elderly and Handicapped Act, 42 U.S.C. § 1973ee et seq.

¹⁷⁹ National Voter Registration Act, 42 U.S.C. §1973gg

¹⁸⁰ Help America Vote Act, 42 U.S.C. 15301.

¹⁸¹ Federal Voting Assistance Program, Department of Defense, “Voting over the internet – Pilot Project – Assessment report – June 2001”, available at: www.fvap.gov/services/voireport.pdf

¹⁸² http://en.wikipedia.org/wiki/Elections_in_the_United_States

¹⁸³ http://en.wikipedia.org/wiki/Elections_in_the_United_States

¹⁸⁴ http://en.wikipedia.org/wiki/Elections_in_the_United_States

Presidential elections

The President and Vice President of the United States are chosen every four years, by a majority vote of presidential Electors.¹⁸⁵ Each State is allocated a certain number of Electors which is determined by the number of its U.S. Senators (always 2 per State) plus the number of its U.S. Representatives (which varies according to the State's population).¹⁸⁶

In each State the political parties (or independent candidates) submit a list of individuals pledged to their candidate ("Slate of Electors"). Individual voters in each State then cast their votes for the Slate of Electors representing their choice for President and Vice President.¹⁸⁷ The presidential election is thus indirect: the winner is determined by adding up the votes that were cast by Electors of the United States Electoral College.¹⁸⁸

Congressional elections

Congressional elections are organized every two years. The United States Congress is divided into two chambers: the House of Representatives and the Senate. The House of Representatives currently has 435 members, who are elected for a two-year term through a plurality vote held in the congressional district in which they are candidates.¹⁸⁹ The Senate has 100 members, who are elected for six years, with one-third being renewed every two years.¹⁹⁰

Logistics of the vote

Both the Presidential elections and Congressional elections are held on the Tuesday after the first Monday in November of the election year. The Constitution provides that this day shall be the same throughout the United States (Art. II, Sect. 1).¹⁹¹ There is therefore one uniform election date. However, individuals voting by way of an absentee ballot (cf. *infra*), of course do not send in their vote on the election date itself.

Both federal and local elections are administered by the States.¹⁹² The federal government does however exercise supervision and assistance through legislation and institutions such as the Federal Election Commission and the Election Assistance Commission.¹⁹³ The number of polling stations varies per state. Counting of the votes occurs either in the individual voting precincts of the States, or at a central location

¹⁸⁵ http://frwebgate.access.gpo.gov/cgi-bin/getdoc.icgi?dbname=106_cong_documents&docid=f:hd216.106

¹⁸⁶ William C. Kimberling, "The Electoral College", available at http://www.eac.gov/election_research/elec_coll.pdf

¹⁸⁷ William C. Kimberling, "The Electoral College", available at http://www.eac.gov/election_research/elec_coll.pdf

¹⁸⁸ http://en.wikipedia.org/wiki/Elections_in_the_United_States

¹⁸⁹ http://frwebgate.access.gpo.gov/cgi-bin/getdoc.icgi?dbname=106_cong_documents&docid=f:hd216.106

¹⁹⁰ <http://usinfo.state.gov/usa/infousa/politics/legbranc/abtcong.htm>

¹⁹¹ http://frwebgate.access.gpo.gov/cgi-bin/getdoc.icgi?dbname=106_cong_documents&docid=f:hd216.106

¹⁹² E. FISCHER, "Voting Technologies in the United States: Overview and Issues for Congress", in X., *CRS Report RL30773*, March 21, 2001, available at <http://usinfo.state.gov/usa/infousa/politics/voting/rl30773.pdf>

¹⁹³ See <http://www.fec.gov> and <http://www.eac.gov>.

within the election jurisdiction (or both).¹⁹⁴ The votes may be counted by a machine, by human inspection, or both.¹⁹⁵

Voting is not mandatory in the United States. Individuals who want to vote must therefore register to vote in their state of residence prior to elections. The National Voter Registration Act (NVRA)¹⁹⁶ greatly enhanced the opportunities for individuals to register to vote. Prior to the act, voter registration was only possible at State offices. The NVRA requires States to provide registration opportunities at the time of driver's license application or renewal and through all offices that provide public assistance. The NVRA also requires States to accept "mail-in" voter registration.¹⁹⁷

6.8.2 Traditional voting procedure

The traditional U.S. voting procedure is based on voting at a polling station, with paper ballots. In recent years however, five different kinds of voting technologies have been in use in the United States: hand-counted paper ballots, mechanical lever machines, computer punchcards, optical scan (marksense forms), and direct recording electronic systems (DRE).¹⁹⁸

Since the Help America Vote Act (HAVA)¹⁹⁹ of 2002, it is likely that mechanical lever machines and punchcards will become obsolete as a voting technology. The HAVA requires States to replace punch card or lever voting systems by adopting a system that permits the voter to verify the votes selected before a ballot is cast and counted and also provides the voter with the opportunity to change the ballot or correct any error before the ballot is cast and counted.²⁰⁰

The use of internet voting is currently largely limited to demonstration projects. In the November 2000 elections, voters in several counties in California cast nonbinding votes online, from online voting machines placed in central locations.²⁰¹ In the same election, a limited amount overseas military personnel cast their actual votes via the Internet through a small pilot project run by the Federal Voter Assistance Program (cf. *infra*).²⁰² Also, in Arizona the Democratic party integrated internet voting in their primary elections of 2000.²⁰³

¹⁹⁴ E. FISCHER, "Voting Technologies in the United States: Overview and Issues for Congress", in X., *CRS Report RL30773*, March 21, 2001, available at <http://usinfo.state.gov/usa/infousa/politics/voting/rl30773.pdf>

¹⁹⁵ E. FISCHER, "Voting Technologies in the United States: Overview and Issues for Congress", in X., *CRS Report RL30773*, March 21, 2001, available at <http://usinfo.state.gov/usa/infousa/politics/voting/rl30773.pdf>

¹⁹⁶ National Voter Registration Act, 42 U.S.C. §1973gg

¹⁹⁷ http://www.eac.gov/register_vote.asp

¹⁹⁸ E. FISCHER, "Voting Technologies in the United States: Overview and Issues for Congress", in X., *CRS Report RL30773*, March 21, 2001, available at <http://usinfo.state.gov/usa/infousa/politics/voting/rl30773.pdf>

¹⁹⁹ Help America Vote Act, 42 U.S.C. 15301.

²⁰⁰ http://www.eac.gov/mission_statement.asp?format=none (see Section 301 HAVA).

²⁰¹ E. FISCHER, "Voting Technologies in the United States: Overview and Issues for Congress", in X., *CRS Report RL30773*, March 21, 2001, available at <http://usinfo.state.gov/usa/infousa/politics/voting/rl30773.pdf>

²⁰² E. FISCHER, "Voting Technologies in the United States: Overview and Issues for Congress", in X., *CRS Report RL30773*, March 21, 2001, available at <http://usinfo.state.gov/usa/infousa/politics/voting/rl30773.pdf>

²⁰³ See <http://archives.cnn.com/1999/TECH/computing/12/09/arizona..e.vote.idg/index.html>

6.8.2.1 Voting Place

Voters generally cast their vote in designated polling places. Each State determines which locations will serve as polling stations.

The federal Voting Accessibility for the Elderly and Handicapped Act of 1984 (VAA)²⁰⁴ generally requires polling places across the United States to be physically accessible to people with disabilities for all federal elections. Where no accessible location is available to serve as a polling place, a county must provide an alternate means of casting a ballot on the day of the election.²⁰⁵

6.8.2.2 Opening and closing of the election

As indicated above, there exists one uniform election date for U.S. federal elections (the Tuesday after the first Monday in November of the election year). The Constitution requires that this day shall be the same throughout the United States (Art. II, Sect. 1) (cf. *supra*).

6.8.2.3 Authentication of eligible voters

Authentication of eligible voters occurs primarily at the moment of voter registration. Pursuant to Section 303 of the Help America Vote Act, individuals registering to vote in federal elections must provide their driver's license number or state identification number on the affidavit of registration. If an applicant does not possess a current and valid driver's license, he/she will be asked to provide the last four digits of his/her social security number. In the event the applicant possesses neither a valid driver's license, nor a social security number, the State shall assign him/her a unique number, which shall serve to identify the voter for registration purposes.²⁰⁶

In certain States, the local election authority proceeds to issue registered voters a "voter identification/registration card", which they are to bring with them when going to the polling station.²⁰⁷ Other States require a particular form of identification when an individual is voting in a particular precinct for the first time (restrictions as to approved forms of photo- or non-photo id).²⁰⁸

In the case of absentee ballots, authentication is conducted by checking the absentee ballot signature against the signature that is on file for that voter.²⁰⁹

6.8.2.4 The casting of the vote

The manner in which the vote is cast depends largely on the technology at hand:²¹⁰

²⁰⁴ 42 U.S.C. § 1973ee et seq.

²⁰⁵ <http://www.dos.state.pa.us/voting/cwp/view.asp?a=1194&q=442998>

²⁰⁶ http://www.ss.ca.gov/hava/compliance_manual/chpt7_voter_identification_requirements_final.pdf

²⁰⁷ See e.g. the State of Oklahoma (<http://www.ok.gov/~elections/voterreg.html>).

²⁰⁸ See e.g. the State of Pennsylvania (<http://www.hava.state.pa.us/hava/cwp/view.asp?a=1189&q=442291&havaNav>). For an overview of the practices among the different states visit: <http://www.ncsl.org/programs/legismgt/elect/taskfc/voteridreq.htm>

²⁰⁹ D.M. Elliot, "United States: Examining Internet Voting in Washington", available at <http://aceproject.org/ero-en/topics/elections-and-technology/internetvotingdc/>

²¹⁰ E. FISCHER, "Voting Technologies in the United States: Overview and Issues for Congress", in X., *CRS Report RL30773*, March 21, 2001, available at <http://usinfo.state.gov/usa/infousa/politics/voting/rl30773.pdf>

- Paper ballots: voters obtain printed ballots containing the names of the candidates.
- Voters mark their choice(s) on the ballot and proceed to place it in the ballot box.
- Lever machines: voters enter the voting booth and choose their candidate listed on a posted ballot by pulling a lever for each candidate choice.
- Punchcards: voters punch holes in appropriate locations on a paper computer card that is later fed into a computer reader to record the vote.
- Optical scan: voters receive a paper form and an appropriate writing instrument, and proceed to fill in a box or oval corresponding to each candidate choice. The completed ballot is then read by a computerized device that senses and records the marks.
- Direct recording electronic (DRE) systems: rather than marking a paper ballot, voters exercise their choice(s) by either pushing a button, touching a screen, or using a similar device.

6.8.3 Alternative voting procedures

6.8.3.1 Voting by mail

Since 1986, all States must allow members of the Uniformed Services and merchant marine, their family members, and United States citizens residing outside the United States to register and vote absentee in federal elections (Sect. 102 UOCAVA).²¹¹

To register to vote and request an absentee ballot, UOCAVA citizens must obtain a “Federal Post Card Application” (FPCA). If the FPCA is properly completed and returned, the individual voter will be sent an absentee ballot by their local election official.²¹² Traditionally, UOCAVA citizens have had to request their FPCA via regular mail. Recently however, the Federal Voting Assistance Program has made available an on-line version of the Federal Post Card Application (OFPCA).²¹³ The OFPCA allows individuals to download their FPCA application, but it does not allow them to submit their application this way. A limited amount of States do allow for electronic submission (fax or e-mail) of the FPCA. Only very few States allow for electronic submission of the completed ballot.²¹⁴

6.8.3.2 Proxy-voting

Several of the States allow individuals other than the prospective voter to act on the voter’s behalf to register the voter and/or request an absentee ballot in his/her name. However, under no circumstance may a person cast a ballot on behalf of another

²¹¹ See the Uniformed and Overseas Citizens Absentee Voting Act (UOCAVA) (42 U.S.C. 1973ff et seq.).

²¹² Federal Voting Assistance Program, Department of Defense, “Voting over the internet – Pilot Project – Assessment report – June 2001”, available at: www.fvap.gov/services/voireport.pdf

²¹³ Visit <http://www.fvap.gov/pubs/onlinefpc.html>

²¹⁴ In most instances where electronic submission of the completed ballot is allowed, the ballots are only accepted by fax. North Dakota allows voters to return the voted ballot by e-mail provided a scanned copy of the voted ballot is attached.

person in U.S. federal elections.²¹⁵

6.8.4 Electronic voting

In the United States *today*, electronic voting systems fall into two primary categories: optical scan and direct recording electronic (DRE) systems.

Optical scan

In the *November 2004* general election, optical scan was the predominant voting method.²¹⁶ An optical scan voting system consists of computer-readable ballots, appropriate marking devices, privacy booths, and a computerized tabulation device. The ballots are tabulated by “optical-mark-recognition equipment”, which counts the ballots by sensing or reading the marks on the ballots. The ballots are counted either at the polling place, or at a central location.²¹⁷

Direct Recording Electronic Systems

DRE voting systems capture votes electronically without the use of paper ballots. There are two basic types: pushbutton or touchscreen. To cast their vote, voters press a button or the screen next to the candidate or issue, and the button or screen then lights up to indicate the selection. When voters are finished making their selection, they make their vote definitive by pressing a final “vote” button or screen.²¹⁸

The votes can be counted in different ways. Some DREs contain removable storage media that can be taken from the voting device and transported to a central location to be tabulated. Others can be configured to electronically transmit the voting data from the polling place to a central location.²¹⁹

DRE technology was first introduced in the 1970s. The optical scan systems became available for use in voting in the 1980s.²²⁰ Incentives to introduce electronic voting systems were primarily prevention and correction of voter errors on the one hand, and

²¹⁵ http://www.fvap.gov/pubs/vag/pdfvag/chapter_2.pdf

²¹⁶ R.C. Hite, “Elections – All Levels of Government Are Needed to Address Electronic Voting System Challenges”, in X., *Testimony before the Subcommittee on Financial Services and General Government Committee on Appropriations, House of Representatives*, March 7, 2007, available at: <http://www.gao.gov/new.items/d07576t.pdf>

²¹⁷ R.C. Hite, “Elections – All Levels of Government Are Needed to Address Electronic Voting System Challenges”, in X., *Testimony before the Subcommittee on Financial Services and General Government Committee on Appropriations, House of Representatives*, March 7, 2007, available at: <http://www.gao.gov/new.items/d07576t.pdf>

²¹⁸ R.C. Hite, “Elections – All Levels of Government Are Needed to Address Electronic Voting System Challenges”, in X., *Testimony before the Subcommittee on Financial Services and General Government Committee on Appropriations, House of Representatives*, March 7, 2007, available at: <http://www.gao.gov/new.items/d07576t.pdf>

²¹⁹ R.C. Hite, “Elections – All Levels of Government Are Needed to Address Electronic Voting System Challenges”, in X., *Testimony before the Subcommittee on Financial Services and General Government Committee on Appropriations, House of Representatives*, March 7, 2007, available at: <http://www.gao.gov/new.items/d07576t.pdf>

²²⁰ E. FISCHER, “Voting Technologies in the United States: Overview and Issues for Congress”, in X., *CRS Report RL30773*, March 21, 2001, available at <http://usinfo.state.gov/usa/infousa/politics/voting/rl30773.pdf>

facilitation of vote counting on the other hand.²²¹ However, several concerns have also been raised with regards to electronic voting systems in the United States. The main issues are:

- inadequate (national) voting system standards;
- system design flaws;
- poorly developed security controls;
- incorrect system configurations;
- inadequate testing;
- poor overall security management.²²²

Because both federal and state elections are administered on a local level, there is no uniform voting system in place throughout the United States. Although Congress has enacted certain legislation affecting the administration of election, the States remain responsible for regulation of important aspects of the election process, including the choice of voting systems, testing of the systems, ballot access, voter registration procedures and vote counting.²²³ In 1990, the Federal Election Commission (FEC) issued a set of voluntary voting standards, which it revised in 2002. However, critics still claimed the voting standards did not contain requirements sufficient to ensure secure and reliable voting systems, primarily because the standards do not comprehensively address voting technology issues.²²⁴ Similar criticism has been directed against the *Voluntary Voting System Standards* issued by the Election Assistance Commission (EAC) in 2005. It has been recommended that the EAC collaborate with the National Institute of Standards and Technology (NIST) in order to address these issues.²²⁵

In 2004, the EAC published the first-ever Election Day Survey, requesting voting and elections information from election officials throughout the country. This survey contains, among other items, a detailed study of voting equipment usage and malfunctions in the 2004 elections.²²⁶

6.8.5 The possibility of Internet voting in the

²²¹ See ²²¹ E. FISCHER, "Voting Technologies in the United States: Overview and Issues for Congress", in X., *CRS Report RL30773*, March 21, 2001, available at <http://usinfo.state.gov/usa/infousa/politics/voting/rl30773.pdf>

²²² R.C. Hite, "Elections – All Levels of Government Are Needed to Address Electronic Voting System Challenges", in X., *Testimony before the Subcommittee on Financial Services and General Government Committee on Appropriations, House of Representatives*, March 7, 2007, available at: <http://www.gao.gov/new.items/d07576t.pdf>

²²³ R.C. Hite, "Elections – All Levels of Government Are Needed to Address Electronic Voting System Challenges", in X., *Testimony before the Subcommittee on Financial Services and General Government Committee on Appropriations, House of Representatives*, March 7, 2007, available at: <http://www.gao.gov/new.items/d07576t.pdf>

²²⁴ R.C. Hite, "Elections – All Levels of Government Are Needed to Address Electronic Voting System Challenges", in X., *Testimony before the Subcommittee on Financial Services and General Government Committee on Appropriations, House of Representatives*, March 7, 2007, available at: <http://www.gao.gov/new.items/d07576t.pdf>

²²⁵ R.C. Hite, "Elections – All Levels of Government Are Needed to Address Electronic Voting System Challenges", in X., *Testimony before the Subcommittee on Financial Services and General Government Committee on Appropriations, House of Representatives*, March 7, 2007, available at: <http://www.gao.gov/new.items/d07576t.pdf>

²²⁶ This study is available at: http://www.eac.gov/election_survey_2004/intro.htm

United States

All information regarding the VOI Pilot Project has been taken from the report of the Department of Defense: Federal Voting Assistance Program, Department of Defense, “Voting over the internet – Pilot Project – Assessment report – June 2001”²²⁷

The Federal Voting Assistance Program (FVAP) of the federal government continually works to enhance the ability of UOCAVA citizens (cf. *supra*) to vote absentee. In the November 2000 election, the FVAP collaborated with the Department of Defense to organize a Voting Over the Internet (VOI) Pilot Project. This was the first time that binding votes were cast over the Internet for general elections.

The principal finding of the project assessment was that within a small-scale, tightly controlled demonstration, it is possible to maintain the integrity of the process for remote registration and voting; but that further development is needed before Internet remote registration and voting can be provided effectively, reliably and securely on a large scale.

The VOI process was designed to mirror the absentee by-mail process (cf. *supra*) as much as possible. All local election official sites were provided with VOI system hardware and software. In order to register to vote and request an absentee ballot, participating UOCAVA citizens needed to install VOI software on their computers and obtain a digital certificate developed by the Department of the Defense. One of the principal concerns of the VOI was to be able to identify and authenticate voters with a high degree of certainty. The issuing procedure for the digital certificates required the recipient to appear in person before an issuing authority and present official photo identification. The participant then received a certificate document, which enabled him to access a particular web page and download his/her certificate to a floppy disk. The participant also had to assign a password to his/her digital certificate.

Once the participant downloaded the digital certificate, he/she was able to access the FVAP server to request an Electronic Federal Post Card Application (EFPCA).

Once approved, local election officials proceeded to upload E-Ballots to the server, which could be accessed by participants using their digital certificate and password. In many instances, the participants were informed via e-mail that his/her E-ballot was ready.

The VOI system also contained a “check status”-feature, which allowed voters to access the system and inquire about his/her status (e.g. registration received, registration approved, ...).

The submitted E-ballots were examined and validated by the local election officials. Once approved, the contents of the E-Ballots were transcribed on to blank (regular) absentee ballots. These replacement ballots were grouped with the other valid absentee by-mail voted ballots and tabulated together.

The evaluation of the VOI Pilot Project was largely positive. The organizers felt that the Pilot was able to maintain the integrity (authentication, secrecy...) of the electoral process, and enhanced enfranchisement of participating UOCAVA citizens. The most significant setbacks of the project were that the VOI system increased the workload of local election officials and that many participants experienced some difficulty in using the digital certificates. The organizers of the VOI project also stressed that

²²⁷ Report available at: www.fvap.gov/services/voireport.pdf

implementing the VOI process on a larger scale would introduce additional security concerns. The VOI project was limited in scope and not widely publicized. It may be assumed that if the system were to operate on a larger scale, it would become a far more attractive target for individuals with malicious intent.

It is worth noting that on a federal level, there appear to be no statutory or constitutional restrictions which would inhibit the introduction of online voting on a large scale. In fact, the organizers of the VOI Pilot were able to ensure compliance with all federal and state relevant legal requirements.

6.9 California

The State of California is part of the United States federal government. The California State constitution separates the powers of its government into three main branches: Legislative, Executive, and Judicial (art. III, sect. 3 Cal. Const.). Elections are organized for all three branches of government. These elections are governed mainly by the State Constitution and the California Elections Code.²²⁸

The government of the State of California is further divided into geographical and political subdivisions. These subdivisions also have elected officials, but the positions do not always coincide with elective positions on the State level. Four “levels” of government may be discerned:

- state;
- county;
- municipal;
- district.

The analysis of the California electoral system will be conducted primarily with regard to the elective positions that exist on the state level.

6.9.1 Electoral system

As is the case for federal elections, there is a distinction between nominating elections and general elections. In California, nominating elections take the form of primaries, in which registered voters in each political party choose the nominee who will run against the other political parties’ nominees in the general election.²²⁹ Primaries are organized both for legislative and executive offices, but not for positions in the judicial branch as the candidates in the latter run on a non-partisan basis.

Elections for the Executive branch

All the elected officers of the Executive branch serve four-year terms, and are limited to serving a maximum of two terms in the same office, with an exception for the position of State Insurance Commissioner, which is not term-limited (art. V, sect. 2 and sect. 11 Cal. Const.). Every elected executive officer is subject to recall and impeachment.²³⁰

At the State level, there are eight different elective positions in the Executive branch:

- Governor;
- Lieutenant Governor;
- Attorney General;
- State Controller,
- Secretary of State;

²²⁸ Available at <http://www.leginfo.ca.gov/const-toc.html> and <http://www.leginfo.ca.gov/cgi-bin/calawquery?codesection=elec&codebody=&hits=20>

²²⁹ http://www.ss.ca.gov/elections/primary_vs_general_web_site_info_7_04.pdf

²³⁰ http://www.guidetogov.org/ca/state/overview/state_exec.html.

- State Treasurer;
- State Insurance Commissioner;
- State Superintendent of Public instruction.²³¹

Elections for the Legislative branch

The California State legislature has two houses: the Senate and the Assembly. Legislators are elected by district. There are 40 Senate districts and 80 Assembly districts; each district providing one legislator.²³² California State senators may serve two four-year terms. Members of the State Assembly may serve three two-year terms (art. IV, sect. 2a Cal. Const.). All 80 Assembly seats and half of the 40 Senate seats are up for election every even-numbered year.²³³

Elections for the Judicial branch

The election process for members of the Judicial branch is different depending on whether the position is for trial courts or appellate courts.

Trial court judges are generally elected through non-partisan races held in June and November of even numbered years. Both municipal and superior court judges serve six year terms (art. VI, sect. 16 Cal. Const.).²³⁴

Justices of the Supreme Court and the Courts of Appeal serve twelve year terms, and they are only on ballot when a governor is being elected. At the expiration of their term, the choice of the voters is limited to whether or not a particular Justice or judge will continue in office or not. If the vote is negative, the governor will appoint a replacement who will not be on ballot until the next elections for governor. The appointments made by the governor must however be approved by the Commission of Judicial Appointments (art. VI, sect. 16 Cal. Const.).²³⁵

Initiative measures and referenda

In addition to the opportunity to participate in the regular elections, the California constitution also gives voters the right to take initiative measures and to petition for referenda (art. II, sect. 8-9 Cal. Const.). Initiative is the power of the electors to propose statutes and amendments to the Constitution. An initiative measure may be proposed by submitting a petition to the Secretary of State which sets forth the proposed statute or amendment, provided that the initiative has been signed by at least 5% of the electors in case of a statute, and by at least 8% in case of an amendment to the constitution. The initiative measure must be submitted at the next general election or special statewide election (art. II, sect. 8a-b Cal. Const.).

Electors also have the possibility of petitioning for a referendum. With a referendum the electors can approve or reject statutes (except urgency statutes, statutes calling elections, and statutes providing for tax levies or appropriations for usual current

²³¹ For a detailed description of the functions of these elective officers see:

http://www.guidetogov.org/ca/state/overview/state_exec.html.

²³² <http://www.guidetogov.org/ca/state/overview/legislative.html#11>. See also art. IV Cal. Const..

²³³ <http://www.guidetogov.org/ca/state/overview/legislative.html#11>.

²³⁴ <http://ca.lwv.org/lwvc.files/judic>

²³⁵ <http://ca.lwv.org/lwvc.files/judic>

expenses). The petition for referendum must be signed by at least 5% of the votes for all candidates for Governor at the last gubernatorial elections (art. II, sect. 8a-b Cal. Const.).

An initiative measure or referendum approved by a majority of votes takes effect the day after the election unless the measure provides otherwise (art. II, sect. 10 Cal. Const.).

Logistics of the vote

There are currently more than 500 polling stations in California.²³⁶ Elections for members of the State Legislature are organized on the first Tuesday after the first Monday in November of even-numbered years (art. IV, sect. 2b Cal. Const.). Elections for members of the State Executive are held every fourth year at the same time and place as for members of the Assembly (art. 5, sect. 2 and 11 Cal. Const.). The elections at the State level thus coincide with the federal elections.²³⁷ Counting of the votes occurs either in the individual voting precinct, or at a central location within the election jurisdiction (or both). The votes may be counted by a machine, by human inspection, or both.²³⁸

As is the case for federal elections, individuals are not required to vote in California. Individuals who want to vote must therefore register to vote prior to elections. Individuals become registered to vote by affidavit of registration (see sect. 2102 of the California Elections Code) (CEC). Individuals may submit the affidavit to the Department of Motor Vehicles or any other public agency designated as a voter registration agency pursuant to the National Voter Registration Act²³⁹ of 1993 (sect. 2102a(2) CEC).

6.9.2 Traditional voting procedure

For a long time, the traditional voting procedure in California consisted of voting at a designated polling station by filling out paper ballots. Currently, almost all counties use some form of electronic voting system. Several counties however still offer the opportunity to vote using paper ballots.²⁴⁰ The most popular electronic voting systems are either optical scan applications (marksense forms) or direct recording electronic (DRE) systems (cf. infra).

The California Secretary of State has created an “Internet Voting Task Force” to study the feasibility of using the internet to conduct elections in California.²⁴¹ Although it has been reported that California experimented with (non-binding) internet voting in the November 2000 elections²⁴², the Task Force has thus far not brought forth an

²³⁶ See http://www.ss.ca.gov/elections/elections_ppl.htm for a detailed overview of all polling locations.

²³⁷ The California Elections Code provides other “established” election dates for other elections (county, municipal, ...). See section 1000 of the CEC.

²³⁸ See sect. 15201 et seq. CEC.

²³⁹ 42 U.S.C. Sec. 1973gg

²⁴⁰ See http://www.ss.ca.gov/elections/voting_systems/ca_map_counties3.html for a detailed overview for the voting systems in use in each county.

²⁴¹ See <http://www.ss.ca.gov/executive/ivote>

²⁴² See a.o. A.L. JOHNSON, “Heading towards internet voting in public elections: the California approach and other states leading the way” (available at <http://www.cwsl.edu/content/johnson/admin07/Internet%20voting%20paper.doc>) and E. FISCHER,

official report evaluating the experiment. The discussion of internet voting in California will therefore focus primarily on the feasibility issues discussed in the Task Force report of January 2000.

6.9.2.1 Voting Place

California voters cast their vote in designated polling places. Throughout California there are currently more than 500 polling places.²⁴³

6.9.2.2 Opening and closing of the election

As indicated above, there exists one uniform election date for California State elections (the Tuesday after the first Monday in November of the election year). The California Election Code establishes some additional dates on which elections may be held (e.g. for municipal or county-level elections) (see sect. 1000 CEC).

As soon as the polls are finally closed, the precinct board commences to count the votes by taking the (unopened) ballots to ascertain whether the number of ballots corresponds with the number of people who cast a vote (sect. 15271 CEC). All voting machines are locked as soon as the polls are closed (sect. 19370 CEC).

If the ballots are to be counted at a central counting place, the ballots are placed in a sealed container and delivered to the designated counting place (sect. 15201 CEC). In the case of electronic voting, the storage medium used for tabulation and any other electronic storage medium containing election results must be kept in a secure location and preserved for a set period of time (sect. 15209 CEC).

6.9.2.3 Authentication of eligible voters

Authentication of eligible voters occurs primarily at the moment of voter registration. Section 2150 of the CEC has incorporated provisions similar to section 303 of the Help America Vote Act. The procedures under federal law and California State law are now largely identical: individuals registering to vote in federal elections must provide their driver's license number or state identification number on the affidavit of registration. If an applicant does not possess a current and valid driver's license, he/she will be asked to provide the last four digits of his/her social security number. In the event the applicant possesses neither a valid driver's license, nor a social security number, the State shall assign him/her a unique number, which shall serve to identify the voter for registration purposes (sect. 2150a-c CEC).

California, unlike some other states, does not issue its registered voters a voter identification card. Voters must bring a "satisfactory proof of identity" with them to the polls. This means that the applicant must provide either a current and valid photo identification or another document deemed satisfactory proof of identity. Section 20107(d)(1) of the California Code of regulations establishes which forms of

"Voting Technologies in the United States: Overview and Issues for Congress", in X., *CRS Report RL30773*, March 21, 2001 (available at <http://usinfo.state.gov/usa/infousa/politics/voting/rl30773.pdf>).

²⁴³ See http://www.ss.ca.gov/elections/elections_ppl.htm for a detailed overview of all polling locations.

identification are deemed “satisfactory”.²⁴⁴

In the case of absentee ballots, authentication is conducted by checking the absentee ballot signature against the signature that is on file for that voter (sect. 3009 CEC).

6.9.2.4 The casting of the vote

Sect. 2300 CEC (also referred to as the “Voter Bill of Rights”) provides that every voter has a right “to cast a secret ballot free from intimidation”. Pursuant to the Help America Vote Act, voters must be able to use a voting system that permits the voter to verify the votes selected before a ballot is cast and counted and also provides the voter with the opportunity to change the ballot or correct any error before the ballot is cast and counted (sect. 301 HAVA and sect. 2300 CEC).²⁴⁵

Any individual claiming to be properly registered to vote but whose qualification cannot be immediately established upon examination of the index of registration for the precinct or other records of the county election officials shall be entitled to vote by way of a provisional ballot (sect. 14310 CEC).

6.9.3 Alternative voting procedure

6.9.3.1 Voting by mail

Any registered voter in California may vote by way of absentee ballot, even if he/she is present in his county on the election date (sect. 3003 CEC). Absentee voters must apply for their absentee ballot at least seven days prior to the election. Sect. 3007.7 CEC provides the possibility to apply electronically for an absentee voter’s ballot. The application to vote absentee can be obtained from county election officials, but is also available as a PDF download.²⁴⁶ Once the application is processed by the county elections official, the proper ballot will be sent to the individual voter.

Authentication of absentee voters occurs by checking the absentee ballot signature against the signature that is on file for that voter (cf. supra).

A remarkable aspect of absentee voting is that any registered voter may also apply for permanent absentee voter status (see sect. 3201 CEC). Permanent absentee voters automatically receive an absentee ballot for each election. This status is retained as long as the individual votes in all statewide and primary general elections. If the individual fails to cast a ballot in two consecutive statewide general elections, he/she will be removed from the permanent absent voter list and will need to reapply in order to restore permanent absentee voter status.²⁴⁷

In a limited amount of instances, California elections may be conducted wholly by mail. Examples are: elections in which no more than 1,000 voters are eligible to participate, elections for the “Aliso Water Management Agency”, etc. (see sect. 4000 CEC). Additionally, certain cumulative criteria need to be met: the governing body of the local agency must authorize the use of mailed ballots for the election and the election must be held on an established mailed ballot election date (sect. 4000 CEC).

²⁴⁴ Examples of satisfactory photo identification are: state driver’s license, passport, employee identification cards, ... Examples of satisfactory non-photo identification are: utility bills, bank statements, government checks, ... (see Sect. 20107(d)(1)-(2) of the California Code of Regulations.

²⁴⁵ http://www.eac.gov/mission_statement.asp?format=none (see Section 301 HAVA).

²⁴⁶ http://www.ss.ca.gov/elections/elections_m.htm.

²⁴⁷ http://www.ss.ca.gov/elections/elections_m.htm

Another remarkable aspect of the absentee voting system in California is that the Elections Code provides the opportunity for absentee voters to submit their completed ballots by fax (sect. 31303.5 CEC). An additional requirement then is that the voter signs an oath acknowledging that he/she has waived the right to have their ballot kept secret.

6.9.3.2 Proxy-voting

Even though proxy voting is not permitted in U.S. federal elections²⁴⁸, the California Elections Code does provide that absentee voters who, because of illness or other physical disability, are unable to return their ballot, may designate their “spouse, child, parent, grandparent, grandchild, brother, sister, or a person residing in the same household” to submit their ballot to the elections official for California elections (sect. 3017 CEC).

6.9.4 Electronic voting

As is the case for U.S. federal elections, the electronic voting systems used in California State elections fall into two primary categories: optical scan and direct recording electronic (DRE) systems.

Optical scan

An optical scan voting system consists of computer-readable ballots, appropriate marking devices, privacy booths, and a computerized tabulation device. The ballots are tabulated by “optical-mark-recognition equipment”, which counts the ballots by sensing or reading the marks on the ballots. The ballots are counted either at the polling place, or at a central location.²⁴⁹

Direct Recording Electronic Systems

DRE voting systems capture votes electronically without the use of paper ballots. There are two basic types: pushbutton or touchscreen. To cast their vote, voters touch the screen or press a button next to the candidate or issue, and the button or screen then lights up to indicate the selection. When voters are finished making their selection, they make their vote definitive by pressing a final “vote” button or screen.²⁵⁰ Touchscreen voting systems make out the majority of DRE systems used in California.²⁵¹

The votes can be counted in different ways. Some DREs contain removable storage media that can be taken from the voting device and transported to a central location to

²⁴⁸ http://www.fvap.gov/pubs/vag/pdfvag/chapter_2.pdf

²⁴⁹ R.C. Hite, “Elections – All Levels of Government Are Needed to Address Electronic Voting System Challenges”, in X., *Testimony before the Subcommittee on Financial Services and General Government Committee on Appropriations, House of Representatives*, March 7, 2007, available at: <http://www.gao.gov/new.items/d07576t.pdf>

²⁵⁰ R.C. Hite, “Elections – All Levels of Government Are Needed to Address Electronic Voting System Challenges”, in X., *Testimony before the Subcommittee on Financial Services and General Government Committee on Appropriations, House of Representatives*, March 7, 2007, available at: <http://www.gao.gov/new.items/d07576t.pdf>

²⁵¹ For a detailed overview of the electronic voting systems in use in each county visit http://www.ss.ca.gov/elections/voting_systems/ca_map_counties3.html

be tabulated. Others can be configured to electronically transmit the voting data from the polling place to a central location.²⁵²

California law requires that all DRE voting machines used after January 1, 2006, must have an accessible “voter-verified paper audit trail” (sect. 19250 CEC). All voters voting on an electronic voting machine are to review and verify their ballot choices on this printed paper record, prior to actually casting their ballot. Once the ballot is cast, this paper record of the ballot is retained inside the voting machine as part of the election audit trail in order to verify the accuracy of the votes recorded. However, individuals are not entitled to retain a printed paper record of their vote choices.²⁵³

All voting systems must be approved by the Secretary of State prior to any election at which it is to be first used (sect. 19201 CEC). The Secretary of State establishes the specifications for and the regulations governing voting machines, voting devices, and any software used for each (sect. 19205 CEC).²⁵⁴ The California Elections Code specifies that in any event the systems must preserve the secrecy of the ballot and be safe from fraud or manipulation (sect. 19205b-c).

One of the directives issued by the Secretary of State determines that new voting systems will not receive approval unless their application contains proof of federal certification (which is conducted by the EAC’s Independent Testing Authority).²⁵⁵

The Secretary of State is also charged with auditing voting systems in use throughout the various counties (sect. 19222 et seq. CEC). Detailed evaluation reports of the voting systems are made available on the Secretary of State’s web site.²⁵⁶

6.9.5 The possibility of Internet voting in California

As indicated above, the California Secretary of State has created an “Internet Voting Task Force” (CIVTF) to study the feasibility of using the internet to conduct elections in California.²⁵⁷

Experiments with non-binding internet voting from controlled polling places were said to have been conducted in the November 2000 election.²⁵⁸ Strangely enough however, the Internet Task Force has not as of yet published an official report of evaluation. To the best of our knowledge, no internet voting applications are planned for the immediate future. We are therefore limited to discussing the Task Force’s

²⁵² R.C. Hite, “Elections – All Levels of Government Are Needed to Address Electronic Voting System Challenges”, in X., *Testimony before the Subcommittee on Financial Services and General Government Committee on Appropriations, House of Representatives*, March 7, 2007, available at: <http://www.gao.gov/new.items/d07576t.pdf>

²⁵³ http://www.ss.ca.gov/elections/elections_vs.htm.

²⁵⁴ Visit http://www.ss.ca.gov/elections/elections_vs.htm to obtain an overview of current criteria.

²⁵⁵ http://www.ss.ca.gov/elections/voting_systems/requirements.pdf

²⁵⁶ Visit http://www.ss.ca.gov/elections/elections_vs.htm

²⁵⁷ See <http://www.ss.ca.gov/executive/ivote>

²⁵⁸ See a.o. A.L. JOHNSON, “Heading towards internet voting in public elections: the California approach and other states leading the way” (available at <http://www.cwsl.edu/content/johnson/admin07/Internet%20voting%20paper.doc>) and E. FISCHER, “Voting Technologies in the United States: Overview and Issues for Congress”, in X., *CRS Report RL30773*, March 21, 2001 (available at <http://usinfo.state.gov/usa/infousa/politics/voting/rl30773.pdf>).

report on the feasibility of internet voting.²⁵⁹

The main conclusion of the CIVTF was that despite the significant challenges facing internet voting, it would eventually be possible to use the internet for voting in a fairly secure manner (“at least as secure from vote-tampering as the current absentee ballot process”).²⁶⁰

In order to ensure that all the proper safe guards are instituted, the CIVTF recommends that the State take a “phased-in approach”. Because one of the most difficult tasks for an internet voting system involves authentication of the voters, election officials should initially test internet voting technology through the use of internet voting machines that are under the direct control of election personnel in traditional polling places. The process could then gradually transition towards allowing voters to cast their votes from any computer with Internet access. More specifically, the recommended approach consists of four phases:

- 1) Internet voting at voter’s polling place: In this phase voters would simply vote at their designated polling station through an internet voting system instead of a paper ballot or other electronic voting system. The polling place workers would verify the identity of voters similar to current election procedures and provide the voter with an electronic ballot.
- 2) Internet voting at any polling place: This phase is largely identical to phase 1), except that voters are allowed to vote at any polling place within a county or at centrally located polling locations available to all voters in the county.
- 3) Remote internet voting from county computers or kiosks: In this stage the voter is provided with a password or digital signature by the county election officials and voters are allowed to use any polling place established by the elections office. Poll workers will no longer be charged with voter authentication, so voting can take place at any time the internet voting machines are available for use.
- 4) Remote internet voting from any internet connection: In the final phase all voters will be allowed to vote on their own computers, as long as the operating system and web browser are protected from corruption. To ensure security, election officials would provide voters with a single-use clean operating and special web browser for voting.

The CIVTF also delineated some of the major technological hurdles which have to be overcome in order to ensure a secure internet voting system. Issues that need to be addressed involve:

- a) Digital signatures and identification: Internet voting should not be made available until digital signatures and identification are a common aspect of everyday life for all Californians. The voter registration rolls would need to contain a digital signature or biometric identification for all registered voters.
- b) Unique operating system and web browser: In order to minimize technological threats inherent to internet applications, the CIVT recommends that elections officials would provide voters with a unique operating system and web browser software. However, for remote internet voting to be successful, the

²⁵⁹ The full text of the report of the California Internet Voting Task Force is available at: http://www.ss.ca.gov/executive/ivote/final_report.htm

²⁶⁰ California Secretary of State Bill Jones, California Internet Voting Task Force, “A Report on the Feasibility of Internet Voting”, January 2000. (http://www.ss.ca.gov/executive/ivote/final_report.htm)

additional burden placed on voters may not outweigh the benefits flowing from the increased flexibility of the internet voting system.

- c) Ballot integrity and secrecy: All identifying information used to electronically verify the identity of a voter (digital signatures or biometric identification) must be removed from the ballot prior to the tabulation of the votes.
- d) Network administration: In addition to the aforementioned privacy and security protections, specific safeguards should be instituted that take into consideration that many voters might be accessing the internet through a local area network. Local network administrators could access the voter's computer while the ballot is still in an unencrypted state. At the very least, substantial penalties should be imposed on network administrators who attempt to violate a voter's privacy or tamper with votes.

With regards to the legal framework surrounding the voting process, the CIVT also indicated some specific legislative initiatives that should be taken in the following areas:

- 1) Equal access: Several laws mandate equal access to the voting process for all voters. Specific initiatives should be undertaken to ensure that internet voting applications are sufficiently accessible to all voters.
- 2) Electioneering: Current laws preventing voter persuasion at the polling place and during absentee voting should be expanded to address possible electioneering during internet voting, particularly because a many internet voters may be accessing their ballots on a computer terminal in a public place, such as libraries.
- 3) Voting in the workplace: Consideration should also be given to the fact that for many voters the primary method of internet access is from the workplace. Specific legislation should be adapted ensuring that employers do not monitor the ballots of employees in any way, nor tamper with votes or engage in any form of electioneering at the workplace.

Other legal reforms are likely to be necessary to institute a comprehensive system of internet voting. For instance, section 19250 of the California Elections Code stipulates that "a direct recording electronic voting system shall not be connected to the Internet at any time". Seeing as how internet voting systems could be considered a form DRE, it would appear necessary to amend this provision.

6.10 United Kingdom

The United Kingdom is a constitutional monarchy. The bicameral Parliament is comprised of the House of Lords and the House of Commons. Members of the House of Lords are appointed for life and include some 500 peers, 92 hereditary peers and 26 high clergy. The House of Commons comprises 646 Members elected by popular vote to serve five-year terms, unless the House is dissolved earlier.²⁶¹

A government working party set up after the 1997 general election to examine and review electoral procedures, recommended that pilot schemes of innovative electoral procedures should be used to evaluate their effectiveness, and that those shown to be beneficial should be implemented more widely. The recommendations of the working party were given effect by the Representation of the People Act 2000, which allowed local authorities to run innovative electoral pilot schemes at local elections in England and Wales.²⁶²

To date, election pilots have taken place in a number of English local authorities in May 2000 and May 2002. In May 2000, 32 local councils ran a total of 38 experimental voting arrangements, including postal voting on demand, all postal ballots, voting on more than one day (including a weekend), extended polling hours, mobile polling stations and electronic voting and counting. To encourage these pilots the Government made funding available to those local councils experimenting with eVoting pilot schemes. The Independent Commission on Alternative Voting Methods, set up by the Electoral Reform Society (ERS), published the results of its inquiry into eVoting in February 2002. Its report welcomed experiments in new ways of voting, but warned that “it is vital that changes to our electoral process do not render that process more vulnerable”. It recommended that pilot schemes continue to test new ways of voting, and that the results of experiments are formally assessed by an independent body. No specific provisions have been introduced in the legislative framework, thus this option will not be discussed in the present chapter. The central issues seems to reside in the establishment of a central voter’s register, not existing at the current date, to enable voters to vote at any polling station and to avoid personation and ensuring the legal requirement of “one ballot, one vote”.²⁶³

6.10.1 Electoral system

Elections in the United Kingdom are conducted under a complex legal framework including Acts, Statutory Instruments, Regulations, Orders, and Rules. Also relevant to the administration of elections are court decisions that have interpreted various provisions of the legal framework. The primary legislation regulating the conduct of elections is the Representation of the People Act of 1983. Other laws have been enacted specifically for conducting elections in Northern Ireland, including the Electoral Law Act of 1962, the Elected Authorities Act of 1989, the Northern Ireland Act of 1998, and the Electoral Fraud Act of 2002.²⁶⁴ In 2006, the Electoral Administration Act²⁶⁵ has integrated some of the criticisms made to the electoral

²⁶¹ OSCE/ODIHR, Assessment Mission Report on United Kingdom Of Great Britain And Northern Ireland 2005 General Election of 5 May 2005, Warsaw, 5 August 2005, p.4

²⁶² UK Electoral committee, Factsheet on new ways of voting: eVoting, available on-line at: <http://www.electoralcommission.org.uk/about-us/factsheetspub.cfm>

²⁶³ Ibid.

²⁶⁴ OSCE, op. Cit.

²⁶⁵ Electoral Administration Act, 2006, Chapter 22.

system and have started a reform.

Another important piece of legislation is the Political Parties, Elections and Referendums Act of 2000 (PPERA), which introduced regulations regarding registration of political parties, and reporting of donations to and expenditures by political parties. The PERA established the UK Electoral Commission (EC), and consequently, for the first time, the UK now has a state body responsible to administer national and regional referendums.²⁶⁶

Elections to the House of Commons

The Members of the House of Commons are elected under a plurality system, in one round of voting and in single member constituencies (First-Past-the-Post system, or FPTP). Each voter in a constituency votes for one candidate proposed by a political party or running as an independent. The candidate who receives the highest number of votes wins the seat. The average number of electors per constituency is 68,390. Under the FPTP, the delimitation of constituencies is of major importance. A key requirement is that constituencies include approximately the same number of voters. Additionally, UK law emphasizes that constituency boundaries consider administrative units and local conditions. A review of the constituency boundaries is carried out approximately once every ten years by independent commissions. There do not appear to be complaints about the delimitation process.²⁶⁷ There has been a lasting debate in the UK about the electoral system. Advocates of reform of the system advance the concept of a proportional system, either by single transferable vote, or variants of mixed member systems.²⁶⁷

*Local elections*²⁶⁸

The different approaches to elections (whole-council, by thirds, and by halves) mean that the pattern of elections varies greatly in different areas. There is a complex and varied cycle of elections to local government offices in England:

- There are areas with one or two tiers of local government, and in those with two tiers the elections are staggered so that they do not occur for both simultaneously.
- A variety of systems are used for elections to local councils; these include all-at-once, by halves and by thirds – with all-at-once and by-thirds elections most common.
- Terms of local councilors are all for four years, and in those areas with elections by thirds elections are held in three consecutive years (with the fourth year being “fallow”, at least insofar as local council elections are concerned).
- Depending on where they live, voters in England may be called upon to vote in local elections between one and four times during a four-year period.
- There is no particular relationship between the timing of local government elections and other elections – including general (Parliamentary) and European parliamentary elections – but local elections are sometimes held

²⁶⁶ OSCE, op. Cit.

²⁶⁷ OSCE, op. Cit.

²⁶⁸ OSCE/ODIHR, United Kingdom: Consultation paper by the electoral commission on the cycle of local government elections in England, Warsaw, 2 October 2003.

concurrently with other elections.

6.10.2 Traditional voting procedure

Voting is not mandatory in the United Kingdom, despite the register is.

6.10.2.1 Paper ballots

Ballot papers are printed according to a prescribed form. Ballots do not contain instructions, but instructions for completing the ballot are posted at the polling place. An explanation on how to vote is also given by the polling clerks if requested. Ballot papers are torn from booklets, leaving a counterfoil (or stub). Both the ballot and the counterfoil contain a serial number. The voter's number from the electoral register is written on the counterfoil when the ballot is given to the voter. The ballot is stamped before it is given to a voter.²⁶⁹

Including the serial number on the ballot paper creates opportunities to breach the secrecy of vote. It seems that voters occasionally complain to election officials that their ballot is not secret, and electoral officials are routinely supplied with guidance on how to respond to such complaints. While the secrecy of the vote has virtually always been respected, the procedure has recently been an issue of debate. The current procedure that allows the possibility to trace a marked ballot to a particular voter may be contrary to the UK's OSCE commitment that elections should be held by secret ballot or by equivalent free voting procedure. It may also be contrary to suffrage provisions of the European Convention for the Protection of Human Rights and Fundamental Freedoms.²⁷⁰

6.10.2.2 Opening and closing of the election

Polling stations are staffed with a presiding officer and one or two polling clerks per ballot box. Polling stations are open from 7:00 to 22:00 and close promptly at the designated hour. Only a voter who has received a ballot by 22:00 may vote.

Polling booths are shielded by screens to avoid ballot papers being seen by others. At the close of poll, ballot boxes are sealed at the polling stations, and at the count the total number of ballot papers in the ballot boxes is checked against the total number of ballot papers issued in the polling station.

After the count, all ballot papers, corresponding number lists, and other election documentation are sealed and held in secure storage for one year. They are then destroyed in a secure manner.²⁷¹

6.10.2.3 Authentication of eligible voters

It is remarkable that, as it happens in The Netherlands, voters are not requested to present an identification card in order to receive a ballot.

Moreover, there is no national voter register. Voter registration is a decentralised and local responsibility, and there is no single standard for the format of the voter

²⁶⁹ OSCE, 2005, op. Cit.

²⁷⁰ OSCE, 2005, op. Cit.

²⁷¹ UK Electoral Committee, factsheet on ballot secrecy, December 2006, available on-line at: <http://www.electoralcommission.org.uk/about-us/factsheetspub.cfm>

registers. As standards are developed locally, according to their various formats, they may not be electronically fully compatible. There is no check on possible double registration. For example, students may register both at home and at university and may even vote in two separate local council elections provided they are considered to reside at both addresses. However, it is illegal to vote more than once in the same national election.²⁷²

Voter registers are compiled by local government officials. The law requires that each household should be contacted during an annual canvas conducted between September and November. The householder is required to fill out a single form listing all eligible voters in the household. While registration is not compulsory for individuals in Great Britain, it is obligatory to return the form and provide accurate information. Financial penalties exist for failure to comply, but it appears that these are rarely applied. A voter who fails to register during two subsequent annual canvases is excluded from the register on the third year.²⁷³ Since the reform of 2006, Electors can now register up until 11 working days before polling day and anonymous registration is available for those people whose safety might be threatened if their details were published (this will commence on 1 June 2007).²⁷⁴

In Northern Ireland, registration is compulsory, and it is an obligation for each eligible voter to register. Failure to comply may result in a fine of up to £1,000.

The Electoral Administration Act of 2006 has settled a framework for a centralized register of electors, called the Co-ordinated Online Record of Electors (CORE), has been introduced with a view to improving the accuracy of registers and allowing national access.

6.10.2.4 The casting of the vote

Admission to polling stations is limited to voters, candidates and their election agents, polling officials and clerks appointed for that station, constables on duty, and the companions of voters with disabilities.²⁷⁵

Voters who have applied for postal voting may hand in the postal ballot pack comprising their marked ballot paper and completed declaration of identity to the staff of a polling station. The presiding officer will ensure its delivery to the counting place.

6.10.3 Alternative voting procedure

Most people vote at elections by going to a polling station. However it is possible instead to cast an 'absent' vote, that is, the voter does not have to be physically present at a polling station to vote. There are two ways to do this, by post or by appointing someone else (a proxy) to vote on your behalf.²⁷⁶

The Electoral Administration Act of 2006 has introduced new anti-fraud measures affecting both the application and voting processes for those who wish to vote by post

²⁷² OSCE, 2005, op. Cit.

²⁷³ OSCE, 2005, op. Cit.

²⁷⁴ UK Election Committee, factsheet on Changes in England resulting from the Election Administration Act of 2006, March 2007. Similar provisions have been taken for Wales and Scotland. Available online at: <http://www.electioncommission.org.uk/about-us/factsheetspub.cfm>

²⁷⁵ OSCE, 2005, op. Cit.

²⁷⁶ www.electioncommission.org.uk

or proxy. Three new electoral offences have been introduced in relation to supplying false information for, failing to supply information for and falsely applying for a postal or proxy vote.²⁷⁷

6.10.3.1 Postal voting²⁷⁸

Postal voting procedures have been established in 2000, as exceptional voting procedures, in order to enfranchise eligible voters who are not able or do not desire to come in person to their assigned polling stations and cast their ballots there for a variety of reasons. Postal voting presumes marking the ballot in person, outside the assigned polling station.

Postal voting is now available “on demand” in Great Britain, without the need to present a reason for the application, with a view to increase voter participation. Any voter can apply, only in writing, for a postal ballot up to six days before election day. A postal ballot must be received by the Presiding Officer of a polling station or the Electoral Registration Office (ERO) by 22:00 hours on polling day in order to be counted.

More stringent requirements are in place in Northern Ireland. There, in order to be permitted to vote by post, a voter must explain why absentee voting is necessary and submit an attestation by another voter confirming that it is in fact the case. Voters seeking to vote absentee in Northern Ireland must also provide their date of birth and UK insurance number (or indicate they do not have one). Upon receipt of the application, these details, together with the voter’s signature, are to be verified.

The number of postal voters has increased substantially. This has led election administrators in a number of areas to request contractual support of private companies in order to handle the postal ballots in a timely manner. Thus, at times, sensitive election materials have been processed by individuals, other than election officials, some of whom may have been party representatives or supporters.

Since 2006, a signature and date of birth are also required on the postal vote statement sent with the ballot papers.

6.10.3.2 Proxy-voting²⁷⁹

A voter is allowed to vote by a designated proxy, if he or she can convince the Administration that he or she cannot attend his or her polling station on election day due to physical incapacity, or because he or she will be away from home for good reasons. A voter, who has requested to vote by proxy, may vote in person if the proxy has not already cast his or her vote. This system is well established in the UK and seems to be broadly accepted. The introduction of postal voting would appear to render proxy voting unnecessary.

Since 2006, those who wish to vote by post or proxy must now provide a signature and date of birth on their application form.

²⁷⁷ UK Election Committee, Factsheet on Changes in England resulting from the Election Administration Act of 2006, March 2007. Similar provisions have been taken for Wales and Scotland. Available online at: <http://www.electoralcommission.org.uk/about-us/factsheetspub.cfm>

²⁷⁸ OSCE, 2005, op. Cit.

²⁷⁹ OSCE, 2005, op. Cit.

6.11 Ireland

Ireland is a parliamentary democracy. The two houses of the Oireachtas (parliament) are Dáil Éireann (house of representatives) and Seanad Éireann (the Senate). The Constitution was enacted in 1937. It defines the powers and functions of the President, the Government and the Oireachtas.

Each of the Dáil's 166 members is directly elected by the people for five years. The electoral system is based on proportional representation by means of the Single Transferable Vote (STV). This system is used to elect members to the Parliament, the president, local councils and the European Parliament. Electors indicate their most favoured candidate by putting "1" beside the candidate's name on the ballot paper (or screen), and can go on to indicate their second, third and lower preferences in the same way.²⁸⁰

The Senate (Seanad) has 60 members; 11 are nominated by the Irish Prime Minister, the rest from a number of vocational panels and by graduates of universities. The Senate can initiate or revise legislation, but the Parliament has the power to reject these proposals or amendments.²⁸¹

The local government system is administered by 114 local authorities and is undergoing a process of renewal and reform.²⁸²

The Irish Constitution states that "(i) All citizens, and (ii) such other persons in the State as may be determined by law, without distinction of sex who have reached the age of eighteen years who are not disqualified by law and comply with the provisions of the law relating to the election of members of the House of Representatives, shall have the right to vote at an election for members of the House of Representatives." (Article 16, section (1.2)).

The Irish government has already begun to introduce an electronic voting system, stating that it will be easier to use, give more accurate results, eliminate spoiled votes, speed up the count, and modernise the electoral system. The Irish government had planned to introduce eVoting at local and European elections on 11 June 2004. In this sense, electronic voting machines have been tested in the Parliamentary elections of 2002. Ireland uses an IT system provided by Dutch company Nedap for its eVoting projects. However the idea had been abandoned, following a report of the Independent Commission on Electronic Voting (ICEV) which raised doubts over the accuracy of the software used in the system. The commission has recommended that there should now be an independent end-to-end test of the eVoting system and independent parallel test of the system, including where possible in a live electoral context.²⁸³ The Government has published a call for tender in this sense in 2005. The Electoral (Amendment) Act of 2004 has defined the conditions of use of electronic voting machines.

6.11.1 Electoral system

The Constitutional provisions for elections in Ireland require that voting be conducted

²⁸⁰ www.eu2004.ie

²⁸¹ www.eu2004.ie

²⁸² www.eu2004.ie

²⁸³ Press release, Irish eVoting system gets canned, Anthony Quinn, April 30 2004, available at: <http://www.electricnews.net/frontpage/news-9410281.html>, last access on 28 March 2007.

by secret ballot and the Courts have ruled that this secrecy must be complete and inviolable. As the Courts have further ruled that it must not be possible for the voter to prove to any third party how they have voted.²⁸⁴

The law relating to the election of members to the Parliament is contained mainly in the Electoral Act 1992, the Electoral (Amendment) Act 1996, the Electoral Act 1997, the Electoral (Amendment) Act 1998, 2001, 2002, 2005 and 2006.

Between three and five candidates are elected per general election constituency. The PR-STV electoral system requires a candidate to attain a threshold proportion of the valid votes cast, termed a quota, if they are to be elected. All the candidates whose first preference votes exceed the quota are elected on the first count. Their surplus – the amount by which their first preference vote exceeds the quota – is then distributed between those candidates who have failed to reach the quota, based on the second preferences of those who voted for them. If no candidate exceeds the quota on a count, the lowest placed candidate in that count is eliminated and their votes are distributed amongst the other, remaining, candidates, based on the next highest preferences expressed by those who had voted for the eliminated candidate. This process is repeated in a number of subsequent counts until the requisite number of candidates has reached the quota, or until all the other candidates have been eliminated.²⁸⁵

Casual vacancies in the membership of the Parliament are filled by eElections.

The Ireland's lower house of parliament, is composed of 166 members representing 42 constituencies and elected for a five years term. This will increase to 43 to the next general Elections. The Constitution requires the total membership of the Dail to be set so that the ratio of member will be between 20.000 and 30.000. Constituencies are revised following the publication of the results of each census of population. Each constituency elects multiple members to Parliament. The average constituency elects four representatives; every constituency elects at least three representatives.²⁸⁶

6.11.2 Traditional voting procedure

Voting is by secret ballot.

Every citizen of Ireland and British citizens, ordinarily resident in the State who are aged 18 years or over and whose names appear on the register of electors are entitled to vote. A register of electors is compiled each year by county council and city council.²⁸⁷

6.11.2.1 Polling card

Where a poll is to be taken at an election in a constituency, the returning officer shall send to every elector whose name is on the register electors for the constituency and is not on the postal voters list a polling card in the form specified by regulations made

²⁸⁴ Commission on Electronic Voting, Second report on Secrecy, Accuracy and Testing of the Chosen Electronic Voting System, July 2004, p.156.

²⁸⁵ Dr. Adrian Kavanagh, 'How would the result of the 2005 UK General Election have differed with a PR-STV electoral system?', www.essex.ac.uk/bes/EPOP%202005/Papers/AKavanagh%20EPOP%20Paper.doc -

²⁸⁶ http://www.instantrunoff.com/Irish-Voting/Irish_Elections.html

²⁸⁷ Department of the environment, heritage and local government, How the Dail is elected, available at on-line at:

<http://www.viron.ie/DOEI/DOEIPol.nsf/wvNavView/wwdElections?OpenDocument&Lang=en>

by the Minister informing him of his number (including polling district letter) on the register of electors and of the place at which he will be entitled to vote.²⁸⁸

6.11.2.2 Polling Place

Polling place are appointed by county and city councils. The returning officer provides polling stations at each polling place. Schools or public buildings are normally used. The returning officer is responsible for the organization of the poll, printing of ballot papers and counting of votes in each constituency. The returning officer also makes the necessary arrangement for voting by postal and special voters.²⁸⁹

6.11.2.3 Polling time

The Minister for the Environment and Local Government appoints the polling day which must be between the 18th and 25th day (excluding Good Friday, Sundays and Public Holidays) after the issue of the writ. The Minister also appoints the polling period which must consist of at least 12 hours between 7.00 a.m. and 10.30 p.m.²⁹⁰

6.11.2.4 Authentication of eligible voters

Irish law accepts a long list of documents for identification purposes: passport, employee identity cards containing a photograph, driving license, a student identity card issued by an educational institution and containing a photograph, credit card, cheque book, etc.²⁹¹

Where the presiding officer is satisfied as to the elector's identity, a ballot paper is stamped with an official mark and handed to the elector.

It is an offence to interfere with a polling card or to use a polling card at a polling station which is not addressed to the person presented it.

6.11.2.5 The casting of the vote²⁹²

Electors votes in person at their local polling station. On polling day, the elector applies for a ballot paper in the polling station by stating his or her name and address. In the Irish paper ballot system, the voter goes to the polling station where their vote is registered. If they are successfully authenticated, they are marked off the register and at the same time given a valid ballot paper, fulfilling requirement. The ballots' are pre-printed and bear some distinctive markings that ensure that valid papers are easily distinguishable from invalid papers. The voter then indicates their choice and deposits the paper in a ballot box.

The ballot paper acts as a kind of token indicating that the holder has been authenticated, but which gives no clue as to their identity. The ballot box ensures that the voter's paper cannot be viewed by anyone other than the voter himself.

The elector votes in secret in a voting compartment. The names of the candidates

²⁸⁸ Ibid.

²⁸⁹ Ibid.

²⁹⁰ Ibid.

²⁹¹ Ibid.

²⁹² Ibid.

appear in alphabetical order on the ballot paper, together with their photograph, political affiliation and party emblem, if any.

Persons with a visual impairment, a physical disability or literacy difficulties may be assisted by the presiding officer or by a companion.

6.11.2.6 Counting and tallying of votes²⁹³

When paper ballots are first inspected by election officials for the purpose of verifying which ballots are valid and which are not, each ballot paper is reviewed by officials face up under the scrutiny of observers.

All ballot boxes are taken to a central counting place for each constituency. Before the counting of votes begins, the envelopes containing the postal and special voters' ballot papers are opened in the presence of the agents of the candidates and the ballot papers are associated with other ballot papers of the constituency. The count commences at 9.00 a.m. on the day after polling day. Each ballot box is opened and the number of ballot papers checked against a return furnished by each presiding officer.

6.11.3 Alternative voting procedure

6.11.3.1 Postal voting

Postal voting is available to the Police force, Defence Forces and civil servants and their spouses attached to Irish missions abroad, as well as to electors living at home who are unable to vote at the polling station due to a physical illness or disability. It is also available to electors whose occupations are likely to prevent them from voting at their local polling station (including full-time students registered at home who are living elsewhere while attending an educational institution in the State). Under this arrangement, a ballot paper is posted to the elector at home who must arrange to have his or her declaration of identity witnessed by a policeman before marking the ballot paper and returning it by post to the returning officer.²⁹⁴

As indicated above in relation to accuracy criteria regarding postal voting, the ballots returned by postal voters under paper voting are accounted for and authenticated from the accompanying documentation before they are mixed with the ordinary ballot papers and included in the count.

6.11.3.2 Special voting

Electors living in a hospital; nursing home or similar institution who are unable to vote at a polling station due to a physical illness or physical disability are allowed to ask for a special procedure. The ballot paper is brought to them in the hospital, etc. and they vote in the presence of a special presiding officer accompanied by a Policemen.²⁹⁵

²⁹³ Ibid

²⁹⁴ Ibid.

²⁹⁵ Ibid.

6.11.4 Electronic voting

The Electoral (Amendment) Act 2004 provides for a full regulation of the voting process when using voting machine. According to the Electoral (Amendment) Act 2004, voting machine means an apparatus on which voters cast their votes, that records each vote, and that furnishes a total of the number of votes cast on the machine at an election or at a referendum. Voting systems are defined as method of casting and counting votes that is designed to function wholly or partly by use of mechanical, electromechanical or electronic apparatus and includes the procedures for casting and counting votes and the programmes, operating manuals; printouts and other software necessary for the system's operation. Their use is decided by the Minister.(Section 4).

Moreover, the Act introduces new offences specific to voting machines. A person shall be guilty of an offence if (a) wilfully and without lawful authority, he or she takes, destroys, conceals, opens or otherwise interferes with any voting system equipment, or (b) he or she maliciously destroys, tears or defaces any voting machine equipment. A person guilty of an offence under this section shall be liable on summary conviction to a fine not exceeding 3,500 or imprisonment for a term not exceeding 12 months or both.(Section 2).

The Act includes specific provisions as regards the preparation of voting machines, opening of the poll, procedure for voting, duties of presiding officer at close of pollcounting of postal and special voter ballot papers under this procedure and the preliminary proceedings and time for counting of votes.

6.11.4.1 Preparation of voting machines

Regarding the preparation of voting machines, the Act (Section 8) states that the returning officer at an election or referendum shall, after the content of a ballot paper is finalised, arrange for the printing and procuring of a sufficient quantity of such ballot papers for use on voting machines. He should also supply, where relevant, as soon as practicable to the local returning officers concerned such number of ballot papers for use on voting machines as those officers reasonably require.

The returning officer or the local returning officer shall arrange to have installed on the voting machines for his or her constituency or local electoral area the ballot paper. He should program the details of the ballot paper in the cartridges or discs for recording votes to be cast on each such voting machine and have such a cartridge or disc installed in each voting machine.

The returning officer or local returning officer shall ensure that, after installing a ballot paper and a cartridge or disc as aforesaid in the machine, each voting machine is operating satisfactorily.

Finally, the returning officer or local returning officer shall cause the compartment of the machine which contains a cartridge or disc to be locked and sealed in such a manner as to prevent the compartment being interfered with without breaking the lock or seal.

6.11.4.2 Opening of the poll (Section 9)

Immediately before the commencement of the poll at an election or referendum, the presiding officer at each polling station, after ensuring that the lock on the machine has not been interfered with, shall operate the voting machine in his or her charge to

demonstrate to such persons as are present in the polling station that no votes are cast or recorded on the machine.

The presiding officer shall cause a printed statement to be produced by the machine showing the names of candidates on the ballot paper at the election or the two questions on the ballot paper in the case of a referendum and that no votes are cast or recorded on the machine. The statement shall be signed by the presiding officer and witnessed by an agent or other person in the polling station.

The presiding officer shall then place the voting machine in his or her view during the poll. If, for whatever reason, the voting machine concerned fails to produce the printed statement, the information that would have been recorded in that statement, being information displayed on the voting machine's display screen, together with any other information specified by the form to be entered on it, shall be entered on a form directed by the Minister for the purposes of this subsection.

The form should be signed by the presiding officer and witnessed by an agent or other person in the polling station.

6.11.4.3 Procedure for voting (Section 10)

The presiding officer shall permit an elector, who applies to vote and declares his or her name and address, to vote on a voting machine. Immediately before an elector is permitted to vote (a) the number (including polling district letter) and name of the elector as stated in the register shall be called out, (b) a mark shall be placed in the register against the number of the elector to denote that the elector has been permitted to vote, and (c) the presiding officer or person authorised by him or her shall open the voting machine.

An elector on receiving permission to vote shall go alone to one of the voting machines in the polling station or such one of them as he or she is directed to so go to by the presiding officer and there shall secretly record his or her preferences on the ballot paper displayed on the voting machine and shall then cast his or her vote by pressing the cast vote button on that machine. He or she shall vote without undue delay and shall leave the polling station as soon as he or she has voted.

Where an elector has failed to cast his or her vote and has left the polling station and the presiding officer, accordingly, has reason to believe that the voting machine concerned is still open, the presiding officer shall verify, remotely (by means of the control unit), whether that is the case and, if the machine is open, shall deactivate it.

Where an elector fails to leave a voting machine within a reasonable time, and, where, in such circumstances, the voting machine is still open, the presiding officer shall deactivate it. In this case, an elector shall not be entitled to re-apply to vote at the poll.

The presiding officer shall keep a separate record and make out a separate statement in a form directed by the Minister of the number of electors permitted to vote on voting machines in the polling station and, as respects each such machine, the number of electors who voted on it and the number of instances arising with respect to each such machine.

6.11.4.4 Duties of presiding officer at close of poll (Section 11)

As soon as practicable after the close of the poll, the presiding officer, after ensuring

that the lock on each voting machine in the polling station has not been interfered with, shall cause a statement showing a list of the candidates on the ballot paper at the election or two questions on the ballot paper in the case of a referendum and the total number of votes recorded on the machine at the polling station to be produced by the machine. The statement shall be signed by the presiding officer and witnessed by another person in the polling station.

The presiding officer shall then open the lock and remove the cartridge or disc from each such voting machine so that no further votes can be entered therein. The presiding officer shall immediately send the said cartridge or disc together with the statements produced at the opening and close of the poll to the returning officer or to the local returning officer together with a polling station reconciliation account, in such form as may be directed by the Minister, made out by him or her and shall seal up in separate packets

- the marked copies of the register of electors used,
- a statement prepared,
- any authorisations given by the returning officer or local returning officer authorising persons to vote at the polling station and any undertakings by a personation agent to prove that a person has committed personation,
- unused stationery and other documents and materials relating to the election or referendum, and shall deliver all such packets to the relevant returning officer or local returning officer.

The returning officer or the local returning officer shall make adequate arrangements for the safe custody of the packages delivered in pursuance of this section and of all documents connected with the poll.

If, for whatever reason, the voting machine concerned fails to produce the printed statement information that would have been recorded in that statement, being information displayed on the voting machine's display screen, together with any other information specified by the form to be entered on it, shall be entered on a form directed by the Minister for the purposes of this subsection. The form shall be signed by the presiding officer and witnessed by an agent or other person in the polling station.

6.11.4.5 Counting. Postal and special votes (Section 12).

The returning officer or local returning officer shall operate the voting machine in his or her charge, which shall have a cartridge or disc installed to demonstrate to such persons as are present that no votes are cast or recorded on the voting machine.

The returning officer or local returning officer shall cause a printed statement to be produced by the voting machine showing the names of the candidates on the ballot paper at the election or the two questions on the ballot paper in the case of a referendum and that no votes are cast or recorded on the machine.

The returning officer or local returning officer shall then in the presence of agents and not less than 2 members of his or her staff enter the preferences shown on the postal and special voters ballot papers on the ballot paper displayed on the voting machine. After a vote preference or preferences has or have been entered on the said ballot paper from each postal or special voter ballot paper, the returning officer or local

returning officer shall then press the cast vote button on the voting machine.

On completion of the entry of the votes in the voting machine, the returning officer or local returning officer shall cause a printed statement to be produced by the machine showing the list of candidates on the ballot paper at the election or the questions on the ballot paper in the case of a referendum and the number of votes recorded.

The statements produced because of invalid ballot papers and by the voting machine shall be signed by the returning officer or local returning officer or a person authorised by him or her and witnessed by an agent or if no agent is present by another person present.

The returning officer or local returning officer shall extract the cartridge or disc from the voting machine and retain it, together with statements produced by the voting machine, in a sealed envelope until the counting of votes commences. On completion of this activity, the returning officer or local returning officer shall place in separate sealed packets— (a) the postal and special voters ballot papers, and (b) the ballot papers rejected and shall mark on each packet particulars of its contents, the date of the polling day at the election or referendum and the constituency or local electoral area to which it relates and such packets shall be retained and accounted for together with other election or referendum documents specified in the relevant Act or Regulations.

If, for whatever reason, the voting machine concerned fails to produce the printed statement the information that would have been recorded in that statement, being information displayed on the voting machine's display screen, together with any other information specified by the form to be entered on it, shall be entered on a form directed by the Minister for the purposes of this subsection. The form shall be signed by the returning officer or local returning officer and witnessed by an agent or if no agent is present by another person present.

6.11.4.6 Preliminary proceeding and time for counting (Section 13)

Following the closing of the poll, the returning officer or local returning officer, at the place appointed under the relevant Act or Regulations, shall, unless circumstances arise that render it impracticable at that time to do so, proceed with the counting of the votes, in the presence of agents, as the cartridges or discs referred to in sections 11 and 12 are received at the count centre. If circumstances as aforesaid arise, the returning officer or local returning officer shall, upon those circumstances ceasing to exist, proceed with the counting of the votes in the manner aforesaid.

Immediately on receipt of the cartridges or discs from the various polling stations, including the cartridge or disc containing the votes of postal and special voters, the returning officer or local returning officer in the presence of the agents shall insert each cartridge or disc in an apparatus provided in the constituency or local electoral area concerned for the purpose of counting the votes entered in the voting machines in the various polling stations in that constituency or local electoral area (in this Part referred to as a "constituency -vote counting machine").

The returning officer or local returning officer shall compare the number of votes shown on the constituency vote counting machine in respect of each cartridge or disc from a voting machine with the number of votes recorded on the statements mentioned above in respect of each machine and shall prepare a statement showing the result of this comparison in respect of all the voting machines. The returning

officer or local returning officer shall, on request, allow an agent to be present at that procedure and shall on request provide a copy of the second-mentioned statement to any agent.

When the cartridges or discs are received from all the voting machines for the constituency or local electoral area the returning officer or local returning officer shall cause the constituency vote counting machine to mix the votes recorded in all the cartridges or discs inserted on the said machine, to create a table of the mixed votes which shall be numbered in consecutive order, the number “1” being assigned to the vote placed highest in the table, the number “2” being assigned to the vote placed next highest in the table and so on, and to proceed to cause the said machine to count the votes.

Where more than one poll, including a referendum, is held on the same polling day, the provisions of the polls shall be taken at the same time, at the same places and in the same manner; the same official mark shall be used for the ballot papers displayed on a voting machine at each poll ; the ballot papers displayed on a voting machine at each poll shall be of a different colour; the same or different ballot boxes may be provided; if separate ballot boxes are provided, a ballot paper displayed on a voting machine shall not be invalid by reason only of its being put into the wrong ballot box; an authorisation by a returning officer to a person to vote at one poll at a polling station other than the one allocated to him may authorise the person to vote at that station at the other poll or polls, in the case of a Parliamentary election, presidential election or referendum in the same constituency or, in the case of a European election, in the same county or county borough or, in the case of a local election, in the same local electoral area. (Section 165 of the Act of 1992 as modified by Part 3 of the Act of 2001).

6.12 Latvia

Latvia is a Republic doted with an unicameral Parliament (Saeima), composed of 100 seats. It is elected for a four-year term through party-list proportional representation system. A threshold of 5% is required. The President of Latvia is in turn elected by the Saeima for a four-year term and a maximum of two mandates. Members of the Parliament are elected on an open-list proportional system from five multimember constituencies. The constituencies do not correspond to administrative or territorial divisions and vary in size; they are allocated mandates in proportion to the number of voters estimated to reside in each. There is a 5 per cent threshold based on the valid votes cast across the country. The number of mandates won by each party or alliance is determined on the basis of constituency-wide votes, applying the Sainte Laguë formula.²⁹⁶ If a candidate wins a seat in more than one constituency, he or she is given the seat in the district in which most votes were won.²⁹⁷

The city and town councils, district councils and *pagasts* councils are elected for a period of three years. The number of deputies to be elected to the councils is determined in proportion to the number of residents registered in the Residents' Register in the territory of the respective local government on the date the elections are announced. Advanced voting is contemplated by the law only for these elections.

The elections shall be held once in five years, between 7 a.m. and 10 p.m. (Latvian time) on the second Saturday of June.

Electronic voting is not explicitly contemplated by the Electoral Law which furthermore contains some provisions which could hinder some forms of electronic voting as Internet voting such as the mandatory physical presence of voters when casting their votes. Postal voting is only allowed for Latvian citizens living abroad. Despite these difficulties, Latvian authorities are starting to think of introducing some forms of electronic voting.

6.12.1 Electoral system

Citizens of Latvia who have reached the age of 18 by Election Day have the right to vote (Art 1 Saeima Election Act). Convicted which still have their political rights are allowed to vote since 2002, when the Constitutional Court bans the prohibition.

A Central Election Commission has been established by the Act of 20 January 1994 in order to organize the elections and veils for their legality. This body is a permanently functioning elected public institution which duties include preparations and conduct of Parliamentarian (Saeima), European Parliament and local elections, as well as national referendums and referendums on legislative initiatives.

Each electoral procedure is regulated by a specific Act: the Saeima Election Act of 6 June 1995, the The Election Law On City and Town Councils, District Councils and Pagasts Councils of 25 January 1994, the European Parliament Election Law of 29 January 2004.²⁹⁸ In this report, a reference is made only to the Saeima Election Act means that the provisions of the other two acts are similar.

Voting is not mandatory in Latvia. The traditional voting procedure is based on paper-

²⁹⁶ OSCE/ODIHR, Limited Elections Observation Mission, Final report on Parliamentary Elections of 7 October 2006 in Latvia, Warsaw, 7 February 2007.

²⁹⁷ Ibid.

²⁹⁸ The English versions of these Acts are available at: <http://web.cvk.lv/pub/public/28029.html>

ballot and even if mobile voting is allowed in certain cases, postal voting is only foreseen for Parliamentary elections for Latvian living abroad. No other alternative mode of voting is foreseen by the Law.

6.12.2 Traditional voting procedure

6.12.2.1 Vote place

Polling stations operate without pre-prepared voter lists in Parliamentary elections. An eligible citizen may vote in any polling station in the country (Article 3 of the Saeima Election Act), including stations outside his or her own resident constituency. Voter lists are created in the polling station as individual voters present themselves.²⁹⁹

In contrast, the laws regulating European Parliament and local elections provide for the use of voter lists in those elections. There is a continuing debate as to whether voter lists should be used in Parliamentary elections, with some arguing that voter turnout could drop if the system is changed.³⁰⁰

6.12.2.2 Opening and closing of the election

Parliamentarian Elections are held from 7 a.m. to 10 p.m. on the first Saturday of October. If the Saeima elections are to be held at some other time of the year in case of the dissolution of the Saeima, Election Day would be determined by the Central Election Commission. (Art. 17 of the Saeima Election Act). On Election Day only those voters who have entered the polling station before 10 p.m. shall be allowed to cast their votes after 10 p.m. Then the polling station shall be closed.(Art. 27 of the Saeima Election Act)

At 7 a.m. the chairperson or the secretary of the polling station commission, in the presence of the commission, shall check to see that the ballot boxes are empty. Then the chairperson or the secretary of the polling station commission shall seal the ballot boxes with a sticker bearing the polling station's stamp and the signatures of all the commission members present. Election observers, if any, may also sign on the sticker (Art. 18 of the Saeima Election Act).

During elections the maintenance of order at the polling station shall be the responsibility of the chairperson of the polling station commission. It shall be his/her responsibility to see that there is no infringement of voting rights, no public disturbance and no campaigning in the polling station and within 50 meters from the entrance to the building in which the polling station is located. (Art. 19 1 of the Saeima Election Act)

The chairperson of the polling station commission shall be responsible for supervising and storing documents, materials and assets at the disposal of the given polling station commission.(Art 19 2 of the Saeima Election Act).

Starting with the opening of polling stations on Election Day, the secretary of the polling station commission or, in his/her absence, another member of the commission authorised by the chairperson of the commission shall take minutes of the voting process in accordance with the procedure set by the Central Election Commission.

²⁹⁹ OSCE/ODIHR, op. cit.

³⁰⁰ OSCE/ODIHR, op. cit.

Any complaints made by voters about the voting process shall be immediately filed with the chairperson of the polling station commission and registered in the minutes of the voting process. Complaints about the voting process shall be examined, and a reply shall be issued to the claimant; the substance of the complaint shall be recorded in the minutes of the voting process.(Art 28 of the Saeima Election Act).

Immediately after the closing of the polling station, the polling station commission shall seal the ballot boxes, close the voters' lists and prepare the room for the counting of votes. The unused voting materials shall be packaged or placed in accordance with the procedure set by the Central Election Commission so that they do not get in the way of vote counting (Art 30 of the Saeima Election Act).

6.12.2.3 Authentication of eligible voters

In local and European elections, voters could authenticate themselves by producing any personal identity document valid in the Republic of Latvia. A member of the election committee of the polling station should verify that the person is included on the list of voters and that the list bears no mark about the participation of this person in the respective election. Once the person has cast his vote, the member of the election committee shall make a mark on the list of voters about participation of a voter in the election. The voter shall sign the list of voters (Art. 28 Local Elections Act).

On the contrary, for Parliamentary Elections, a Latvian citizen's passport is the only acceptable form of identification and is stamped by a Polling Station Commission member to prevent the voter voting more than once (Art. 20 of the Saeima Election Act).

Inside the polling station, a member of the polling station commission, having checked that the person is a voter and that his/her passport does not already bear a mark about participation in the current Parliament elections, shall write the full name and personal identity number of the voter in the list of voters and shall make a mark in the voter's passport indicating that he/she has participated in the current elections. The voter shall sign the list of voters confirming the receipt of all ballot papers containing the lists of candidates nominated for the constituency and the ballot envelop (Art 22 of the Saeima Election Act).

6.12.2.4 The casting of the vote

A voter may cast a vote only in person (Art 21 of the Saeima Election Act). The only exception to this rule is, apart from postal voting for Latvian citizen living abroad, when mobile voting is allowed because of the health condition of the voter. Moreover, physical handicap persons who can not vote or sign the voters' list, can appoint a member of his/her family or some other trustworthy person to make the marks in the ballot paper on his behalf and on his presence. A special entry to this effect shall be made in the voters' list. A member of the relevant election commission may not act as such a trustworthy person (Art. 25 Saeima Elections Act).

Voting shall be by secret ballot. Each voter shall be issued a set of ballot papers containing the lists of candidates nominated for the constituency and a ballot envelope bearing the stamp of the given polling station commission. The voter shall insert into this envelope the ballot paper containing the list of candidates that he/she has chosen to vote for. It is prohibited to issue any ballot papers separately.

A separate room or compartment must be arranged inside the polling station for the voter to insert one ballot paper into the envelope and seal it in privacy (Art. 23 of the Saeima Election Act). The voter may choose to put a “+” mark opposite the surname of any candidate, to cross out a candidate’s name or surname or to leave the ballot paper unannotated.

The “+” mark opposite the surname of a candidate indicates special support given to the candidate by this voter. If the voter does not support a candidate included in the ballot paper, he/she may cross out the name or the surname of this candidate. The voter may also insert an unaltered (unannotated) ballot paper into the ballot envelope.

The voter shall personally insert the sealed ballot envelope into the ballot box in the presence of a member of the polling station commission.

If the voter has damaged the ballot paper or the envelope before inserting the ballot paper into the envelope, a new envelope or a new set of ballot papers with the names of the candidates nominated for the constituency shall be issued to the voter. The voter shall sign the list of voters, thus confirming receipt of a duplicate set of ballot papers or a duplicate ballot envelope, and a special entry to this effect shall be made in the minutes of the voting process.

6.12.2.5 The counting procedure

The preliminary counting of votes shall start immediately after the polling stations have closed. Votes shall be counted at an open meeting of the polling station commission (Art. 29 of the Saeima Election Act)

The polling station commission shall write vote-counting minutes in two original copies. The vote-counting minutes shall consist of two parts: the preliminary vote counting and the tallying of final results.

Before opening the ballot boxes, the polling station commission shall make an entry in the vote-counting minutes about the received, used and unused ballot envelopes and the number of voters at the polling station and off-site locations. The unused stamped envelopes shall be invalidated. After this information has been recorded in the first part of the vote-counting minutes and after the unused election materials and envelopes have been packaged, the ballot boxes shall be opened. The ballot boxes shall be opened one at a time, and the ballot envelopes shall be counted. The unopened ballot envelopes removed from each ballot box shall be sorted as valid and invalid envelopes.

When the counting of votes and their recording in the vote-counting minutes have been completed, all the cast valid and invalid ballot papers, together with ballot envelopes, unused stamped ballot envelopes, invalid ballot envelopes and one original copy of the vote-counting minutes, shall be packaged and sealed. (Art. 36 of the Saeima Election Act)

The district (major city) election commissions shall accept and tally, according to the vote-counting minutes, all the vote-counting results of the polling stations located in their administrative area and shall send election materials, together with their own vote-counting minutes, to the Central Election Commission in accordance with the procedure set by the Commission. (Art. 37 of the Saeima Election Act). In local elections, the polling station forward the election materials to the city, district or *pagasts* election commission according to the procedure stipulated by the Central Election Commission.(Art. 41.3 of the Local Elections Act).

The Central Election Commission shall determine which candidates have been elected in each constituency. Lists of candidates with the same name that have received less than five per cent of the total number of votes cast in all constituencies, regardless of the number of constituencies where these lists of candidates have been submitted, shall be excluded from the allocation of seats. The number of valid ballot envelopes shall be regarded as the total number of votes cast (the total number of voters taking part in the election). (Art. 38 of the Saeima Election Act).

6.12.3 Alternative voting procedure

Alternative voting procedures are foreseen by the Law in counted cases. Advanced voting is only allowed in local elections, postal voting in Parliamentary Elections, meanwhile mobile voting is allowed in both for medical reasons. There is no provision relative to any form of electronic voting.

6.12.3.1 Advanced voting

When the voter is unable to vote on the day of the election he/she may cast the vote within three days prior to the general election day at the polling station where he/she is registered on the lists of voters. The opening hours of the polling station in the days of advance voting shall be: on Wednesday from 17.00 to 20.00; on Thursday from 9.00 to 12.00; on Friday from 10.00 to 16.00. During those periods the commission of the polling station is staffed by no less than four members. The announcement about the location of the polling station and its working hours are displayed at the local government building and the polling stations established on the administrative territory of the respective local government. (Art 26 of Local Elections Act).

The voters who vote before the date of the general election shall post their ballot in an envelope in a separate sealed ballot box. The commission of the polling station shall make a mark in the list of voters that the voter has participated in advance voting.

6.12.3.2 Mobile voting

Mobile voting is mainly foreseen for detention centre and at home for the elderly people or the ones with a specific health condition which prevents him from coming to the polling station. On the basis of a written request filed by the voter or a person authorised by him/her and registered in a special journal, the polling station commission shall conduct voting by secret ballot at a place where the voter is located (Art. 24 of the Saeima Election Act).

On Election Day the polling station commission can accept written requests to conduct on-site voting. Requests received after 12 o'clock shall be fulfilled if it is possible to arrive before 8 p.m. at the place where the voter is located.

Information about the ballot envelopes issued at the place of the voter and unused ballot envelopes, including damaged ones, shall be entered into the minutes of the voting process.

6.12.3.3 Postal voting

Citizens outside Latvia can vote by mail or in person at polling sites to Parliament and European Elections.(Art. 45 of the Saeima Election Act).

A voter wishing to vote by mail shall submit an application to this effect to the

relevant diplomatic or consular mission of the Republic of Latvia and shall present his/her Latvian citizen's passport. In the application the voter shall indicate his/her full name, personal identity number and the address to which the election materials shall be sent. The voter may apply for voting by mail five weeks before Election Day but not later than three weeks before Election Day.

Having received such an application, the officer of the diplomatic or consular mission will check that the applicant is a citizen of the Republic of Latvia who has reached 18 years of age and that his/her passport does not already bear a mark about participation in the current Saeima elections. He will then enter the name of the voter in a special voting-by-mail register and make a note in the voter's passport about participation in the current Saeima elections.

The voter will then receive election materials for voting by mail (Art. 46 Saemia Elections Act). The voter shall select the ballot paper containing the list of candidates he/she intends to vote for, shall make the annotations referred to in Article 23 of this Law if so desired, shall insert the ballot paper into the ballot envelope and shall seal it.

The voter shall insert the sealed ballot envelope into a mailing envelope, together with the registration form indicating the full name and personal identity number of the voter, and shall immediately send the mailing envelope to the polling station commission from which he/she received the election materials. The mailing envelope shall indicate the voter's number in the voting-by-mail register and shall bear a notation that it contains a ballot envelope.

6.13 Lithuania

Lithuania is an independent and democratic Republic with a unicameral parliamentary system, with a Parliament (Seimas) of 141 seats elected for a four-year term on the basis of universal and equal suffrage, by secret ballot in direct, mixed-system elections. Lithuania's mixed parliamentary election system allocates 70 seats by proportional representation and 71 seats by direct constituency mandate. All parties need 4% of the vote to be represented, except of parties representing ethnic minorities. Electoral coalitions need to receive even 7% of the vote.

Lithuania is divided in 71 single-member constituencies and one multi-member (70 seats) nationwide constituency. A constituency is formed from polling districts which have common boundaries. The number of voters in constituencies must be from 0.8 to 1.2 of the average number of voters in all single-member constituencies. With a view of making it more convenient for a voter to reach a polling station and with account of the number of voters, the territories of cities and regions are divided into polling districts. No more than 5, 000 voters must reside within the territory of a polling district.

After the positive experience of their neighbors, Lithuania is planning to introduce Internet voting for the next Parliamentarian elections of 2008, using a similar system to the one used in Estonia. A Draft law has been enacted in 2006 in order to allow Internet voting which provides for online banking systems to be used to register voters and to cast ballots in elections.³⁰¹ The prime minister, ordered to institute a working group for creating an eVoting model in Lithuania at the beginning of March,

³⁰¹ Press release, *After Estonia, Lithuania may vote online*, 8 March 2007, available at: http://www.ioltechnology.co.za/article_page.php?iSectionId=2885&iArticleId=3720578, last access on 28 March 2007.

2007.³⁰² It is proposed that, because Lithuania does not have an e-signature infrastructure, electronic voting should be based on the principle of electronic banking. However, no English version of the Draft Act is available, thus this report will not be able to deal with this issue in details and will stick to a description of the current electoral system and its limits for electronic voting.

6.13.1 Electoral system

The law relating to the Lithuanian elections is contained mainly in the Law on Elections to the Seimas (Parliament) of 9 July 1992, The Law on Presidential Elections of 22 December 1992, Law on Elections to the European Parliament of 20 November 2003, The Law on Elections to Municipal Councils of 7 July 1994, The Law on Referendum of 4 June 2002.³⁰³ This report will focus on the legislation applicable to the Parliament elections and will refer to the other acts where appropriate.

A candidate shall be considered elected in a single-member constituency, if not less than 40 percent of the registered voters of that constituency have participated in the elections, and the said candidate has received more than half of the votes cast by the registered voters. If less than 40 percent of the registered voters of that constituency have participated in the elections, the candidate who has received the majority, but not less than one-fifth of the votes cast by all the registered voters of that constituency, shall be considered to have been elected.

If more than two candidates have participated in the elections and none has been elected pursuant to above-mentioned procedure, a second poll is held after two weeks, in which the two candidates who have received the majority of votes shall participate. In this case, the candidate who has received more votes, regardless of the number of voters, shall be considered to have been elected. In the event of a tie, the candidate who received more votes during the initial poll shall be declared elected. If both candidates received an equal amount of votes during the initial poll, lots are drawn to determine the winner.

Nationwide party-list proportional system, on the basis of the simple quotient and greatest remainders rules, with the country as a whole forming one constituency (for 70 seats). In order for the election to be valid, at least 25% of the electorate must have cast its vote.

Vacancies arising between general elections are filled through by-elections (in the single-member constituencies) or by the "next-in-line" candidates of the same party (in the multi-member constituency).

Voting is not compulsory.

6.13.2 Traditional voting procedure

6.13.2.1 Election day

Voting shall take place on the polling day from 7:00 a.m. until 8:00 p.m. in the place

³⁰² Press release, Inspired by Estonian success, Lithuanian PM to initiate development of voting on Internet system, 8 March 2007, available at: http://www.sbccc-chamber.com/index.php?lng=en&page_id=41&news_id=114, last access on 28 March 2007.

³⁰³ English versions of these acts are available at: http://www3.lrs.lt/rinkimai/rink_istatymai.eng.htm

designated by the electoral committee of the polling district. The voter should vote in the polling district in whose list of voters his name has been included, unless this Law provides otherwise (Art. 62 of Seimas Elections Law).

6.13.2.2 Opening and closing of the election

The day when ballots are cast in the multi-member constituency and in the first election round of one-member constituencies shall be considered the day of the elections to the new Seimas.(Art. 6.5 of Seimas Elections Law).

On the day of election, the polling station opens only when at least 3/5 of the members of the electoral committee of the polling district are present. Prior to opening of the polling station for voters, only the electoral committee members, observers and the policeman on duty can be present in it.

The chairman of the electoral committee, together with the members of the electoral committee, shall make sure that the ballot box is empty and have to seal it up.

After the electoral committee of the polling district checks that the polling station has been furnished according to the established requirements, the chairman of the electoral committee of the polling district registers the total amount of the ballot papers received by the electoral committee of the polling district from the constituency electoral committee into the vote counting record, affixes the seal on ballot papers, distributes ballot papers and the voter list among the members of the electoral committee, registers the number of ballot papers issued to each member of the electoral committee into the vote counting record of the polling district, and opens the polling station to the voters, thereby proclaiming the commencement of the elections. (Art. 64 of Seimas Elections Law).

6.13.2.3 Authentication of eligible voters

All citizens of the Republic of Lithuania who have the right to vote have to be registered in the voter list of the Republic of Lithuania according to the data of issuance of the document (passport) certifying citizenship, and according to the population register of the Republic of Lithuania.(Art. 26 of Seimas Elections Law)

Each voter is delivered a voter's certificate, i.e. a document issued by an electoral committee specifying the polling district in the voter list whereof a citizen of the Republic of Lithuania is registered. (Art. 30 of Seimas Elections Law)

At the entrance to the polling station, a voter shall present his voter certificate, passport or other document certifying his identity and citizenship to an electoral committee member of the polling district. Upon having established that the voter has arrived at the polling district in whose list of voters his name has been included, the committee member hands the voter an arrival card indicating which the voter was to come to the polling station to vote and shall show the committee member to be applied to for a ballot. It is not allowed to hand several arrival cards to one voter or to hand in to a voter another voter's arrival card. (Art. 65 of Seimas Elections Law)

It is prohibited to hand the voter the ballot paper of another person (Art. 65 of Seimas Elections Law).

6.13.2.4 The casting of the vote

Having been handed ballot papers, the voter goes into the polling booth and marks the

ballot papers. It is prohibited to mark ballot papers outside the polling booth.

The voter marks the name of the candidate for Seimas member whom he is voting for on a ballot paper of a single-member constituency (Art. 66 of Seimas Elections Law).

On a ballot paper of the multi-member constituency, the voter marks the list of candidates whom he is voting for and, expressing his opinion about the candidates on the list, enters the election numbers of the 5 chosen candidates in the designated spaces of the ballot paper.

In this way preference votes are given for the candidates. If the election number of one and the same candidate is entered two or more times on the ballot paper, only one preference vote from the ballot paper is considered for the candidate. Where the marks on the ballot paper make it impossible to determine the voter's preferences regarding the election numbers of one or more candidates, it is considered that the voter has not expressed his preferences regarding the candidates. (Art. 66 of Seimas Elections Law).

The voter casts his marked ballot papers personally into the ballot box. He/She can ask to exchange spoiled ballot papers for new ones. Spoiled ballot papers are crossed and signed by a member of the electoral committee who then hands a new ballot paper. They are kept separately. (Art. 66 of Seimas Elections Law)

The voter who, because of his physical disability, is unable to mark his ballot papers and cast them into the ballot box himself, may invite another person (with the exception of the chairman of the electoral committee or its member, or an election observer) to carry out these actions for him. A voter who has no physical disabilities precluding him from marking the ballot papers must vote personally. (Art. 66 of Seimas Elections Law).

During the election to the Seimas, each voter is presented with two ballot papers: one for voting for a candidate in a certain single-member constituency, and the other for voting for a list of candidates in the multi-member constituency. Instructions for the voter regarding the procedure for filling out the ballot paper must be printed on the ballot-paper which must also contain a special space designated for indicating the voter's will (Art.58 of Seimas Elections Law).

The first part of the ballot paper the names of all candidates for Seimas members is placed on the ballot paper of single-member constituencies in alphabetic order on the same space and in the same type (types). Such ballot papers indicates the first name and name of each of the candidates for Seimas member, as well as the name of the party which has nominated him or it shall indicate "Nominated himself". A ballot paper of the multi-member constituency contains all the lists of candidates arranged according to the assigned election numbers in an increasing order on the same space and in the same type (types).

The second part of the ballot paper of the multi-member constituency contains 5 designated spaces where the voter shall record the election numbers of the chosen candidates.

Upon closing the polling station, the chairman of the polling district electoral committee, in the presence of at least 3/5 of the members of the electoral committee, seals and stamps the ballot box slot. Unused ballot papers are individually collected from each member of the polling district electoral committee, shall be counted publicly, the number of them shall be entered into the vote counting record. According to signatures in the voter list, voter certificates, arrival cards, ballot papers which have been spoiled by voters and returned to be exchanged for blank ballot

papers it shall be inspected if a committee member has handed all ballot papers lawfully (Art. 76 of Seimas Elections Law).

The polling district electoral committee, in the presence of at least 3/5 of its members, inspects the ballot box of the polling station whether the seals have not been broken and whether there are no other evidences which indicate that it could have been opened or that ballot papers could have been removed in any other way. The electoral committee, in the presence of at least 3/5 of its members, decides if the ballot box has been tampered with. If the committee decides that the ballot box was tampered with, an act is drawn up about this, the ballot box shall be packed up, the package shall be put under seal and votes shall not be counted. The ballot box is delivered to the constituency electoral committee. The decision concerning counting of votes of this ballot box is adopted by the constituency electoral committee (Art. 77 of Seimas Elections Law).

Having ascertained that the ballot box has not been tampered with, in the presence of at least 3/5 of the members of the polling district committee as well as observers, it can be opened, all ballot papers shall be placed on tables on which there are no other documents and writing materials (except black lead pencils), and the committee starts counting votes.(Art.77 of Seimas Elections Law).

6.13.2.5 Counting

6.13.2.5.1 Invalid ballot papers

Are invalid, the ballot papers with the following characteristics:

- non-standard ballot papers;
- ballot papers sealed with the seal of the electoral committee of the wrong polling district (ballot papers received by post - without the seal of the constituency electoral committee);
- ballot papers of the wrong constituency;
- in a single-member constituency, those ballot papers on which the voter has marked more than one candidate for Seimas member, or has not marked any candidate, or it is impossible to ascertain the voter's will from the mark made thereon; and
- in the multi-member constituency, the ballot papers on which the voter has marked more than one list of candidates or has not marked any list of candidates, or it is impossible to ascertain the voter's will from the mark made thereon.

The decision to declare a ballot paper invalid or, in the event of dispute among the committee members as to the assessment of markings on the ballot paper, is made by the electoral committee by voting. The voting results are indicated on the other side of the ballot paper. If the polling district committee declares the ballot paper invalid in accordance it should immediately inform the constituency electoral committee about this (Art.80 of Seimas Elections Law).

6.13.2.5.2 Procedure

The Central Electoral Committee establishes the concrete procedure for the counting

of ballot papers and votes not later than 14 days before the election. (Art. 77 of Seimas Elections Law).

The records of voucher envelopes and ballot papers is kept by the head of the post office, indicating the data of said records in a journal specially designated for this purpose in accordance with the procedure established by the Central Electoral Committee. The post office head delivers unused envelopes and ballot papers to the constituency electoral committee one day prior to elections. The post office delivers envelopes containing ballot papers marked by voters to polling district committees on the day of the election, but not later than 2 hours before the closing of the polls. The Central Electoral Committee has to keep records of voucher envelopes and ballot papers (Art. 74 of Seimas Elections Law).

The chairman of the polling district electoral committee organises and directs vote counting in the committee (Art. 75 of Seimas Elections Law).

The electoral committee counts the unused and spoiled ballot papers publicly; annuls them by cutting off the upper right corner; puts them into the envelopes specially designated for this purpose and seals these envelopes. The number of unused or spoiled ballot papers is entered in the vote counting record.(Art. 76 of Seimas Elections Law).

Once the ballot papers are sorted out according to constituencies (single-member and multi-member), they are classified into valid and invalid ballot papers. Valid ballot papers are divided into groups according to the marks made in them by voters. Each group of ballot papers must be recounted at least two times. For the second time ballot papers must be counted by other members of the committee. Ballot papers which do not hold necessary attributes (irregular ballot papers, unsealed or sealed with a seal of another electoral committee, etc.) must, if found, be separated from the rest of the ballot papers. The constituency electoral committee should be immediately informed about such ballot papers and such fact must be entered into the vote counting record of the polling district. Counting results must be proclaimed and entered into the record, counted ballot papers put into a special envelope (envelopes) which is sealed and safeguarded. After the electoral committee establishes how many votes have been cast by voters who voted in the polling station of the polling district for lists of candidates in the multi-member constituency and for candidates in single-member constituencies, counting of votes received by post can commence (Art. 77 of Seimas Elections Law).

Ballot papers from the marking whereof it is possible to establish which list of candidates a voter voted for, but it is impossible to establish what kind of opinion he expressed regarding the candidates from the list he voted for, may not be declared invalid only because of this reason. If a voter has not indicated the election number of a candidate in the ballot paper, indicated a non-existing election number of a candidate, as well as when it is impossible to define voter's will from the inscription or inscriptions, preference vote or votes in the special space (spaces) of the second part of this ballot paper should not be counted. If the election number of the same candidate is written down two or three times, only one vote should be counted in accordance with this ballot paper (Art. 77 of Seimas Elections Law).

A decision regarding the declaration of a ballot paper invalid or in the presence of dispute between committee members concerning the assessment of marks in the ballot paper is adopted by the electoral committee by way of voting. The result of such voting is indicated on the other side of the ballot paper (Art. 77 of Seimas Elections Law).

Votes shall be counted in such a way that this procedure, marks of voters in the ballot papers may be observed by all the persons present during the counting of votes, and they would be able to make sure that votes are counted justly and fairly. The committee must recount the votes if at least one committee member or observer requests so before the signing of the vote counting record (Art. 77 of Seimas Elections Law).

After the counting of ballot papers found in the ballot box, ballot papers received by post are calculated in the following procedure (Art. 78 of Seimas Elections Law):

- the chairman of the polling district committee should present, unopened, all outer envelopes received by post. Their number is announced and entered in the vote counting record;
- outer envelopes are opened one at a time;
- a voter certificate is taken out of the outer envelope, the voter's surname is read aloud, it is checked against the voter list of the polling district, and the voucher envelope is stamped with the seal of the polling district. If the person on the voter certificate is not on the voter list; if the voter has already signed the voter list indicating that he has already voted in the polling district; if another envelope for voting by post has been received from the same voter; if there is no voter certificate in the outer envelope; or if there is more than one voucher envelope in the outer envelope - the seal should not be affixed and the ballot paper in the envelope is considered invalid, the envelope shall not be opened. This fact must be noted on the voucher envelope (voucher envelopes). The content of such envelopes is not taken into account in the vote counting record of the polling district;
- in the voter list of the polling district, the words "voted by post" or "VBP" are written by the surname of the voter whose vote has been received by post;
- the sealed voucher envelope shall be cast into the ballot box prepared and sealed according to the established requirements;
- when all envelopes received by post have been inspected, the ballot box and the sealed voucher envelopes are opened. If there is more than one ballot paper of the single-member and multi-member constituency in the voucher envelope, all ballot papers in the envelope shall be considered invalid. Then the votes received by post can be counted.

If only one sealed voucher envelope for voting by post is in the polling district (committee), it, in order to protect the secrecy of voting, shall not be opened, and shall be handed over to the electoral committee, which has formed this committee, which enters the results of the voting in its vote counting record.(Art.78 of Seimas Elections Law).

After votes cast in a polling station and by post for lists of candidates and candidates have been counted, all data have been entered into the vote counting record of a single-member constituency and the first part of the vote counting record of the multi-member constituency, the record and the first part of the record have been signed by the committee members, chairman and observers and the polling district committee has announced to the constituency electoral committee that the votes for lists of candidates were counted, the polling district committee may commence counting votes cast for candidates (preference votes). The polling district committee may decide to count preference votes at once or, with the consent of the chairman of the

constituency electoral committee, to count them at another time, but not later than within 24 hours. If it is decided to count preference votes at another time, the ballot papers to be counted shall, in a manner prescribed by the Central Electoral Committee, be transferred in a special envelope for safekeeping to the constituency electoral committee. In this case, the constituency electoral committee, after it has accepted election documents from the polling district committee, must adopt one of the following decisions on the counting of preference votes in the ballot papers transferred to it:

- 1) to return ballot papers and to instruct the polling district committee from which it has got the preference votes to count such votes;
- 2) to change the decision of the polling district committee from which the election documents have been received, regarding the counting of preference votes and to instruct the committee of another polling district to count preference votes or to count preference votes itself. In this case, the constituency electoral committee must set the place and time of counting preference votes.

If the committee counts preference votes next day or recounts ballot papers, it has to check, in the presence of at least 3/5 of the members, whether the special envelope (envelopes) has not been opened. If the polling district committee adopts a decision that the envelope has been tampered with or its contents have been changed, an act is drawn up concerning this fact, the envelope shall be packed, the package shall be sealed and the votes shall not be counted. The package is delivered to the constituency electoral committee. The Central Electoral Committee shall be immediately informed about this. A decision pertaining to the counting of the votes which are in the package shall be adopted by the constituency electoral committee. Upon having ascertained that the envelope has not been tampered with, counting of preference votes shall commence. Information on the time and place of the counting of preference votes as well as in the event when the constituency electoral committee decides to recount ballot papers, must, not later than one hour before the commencement of the counting, be announced on two notice boards: one installed in the building in which the headquarters of the constituency electoral committee is situated, and the other in the premises in which preference votes shall be counted. When counting preference votes, election observers may attend and a police officer must be on duty. All ballot papers should be put on tables on which there are no other documents and writing materials (except black lead pencils), and the committee should check if there are all the ballot papers from which preference votes must be counted.

The concrete procedure of preference votes counting is established by the Central Electoral Committee not later than 7 days prior to elections. Votes must be counted in such a way that the procedure might be observed by all the persons present during the counting of votes and would be able to ascertain that votes are counted fairly and justly. Counted votes are recorded in the second part of the vote counting record of the multi-member constituency, ballot papers shall be packed, the package shall be sealed and transferred to the constituency electoral committee.

Two vote counting records should be drawn up in every polling district: one of the single-member constituency and one of the multi-member constituency.

6.13.3 Alternative voting procedure

Proxy voting is expressly forbidden by the law for Parliamentary elections (Art. 4 of Seimas Elections Law).

The elections day is the day of repeat voting as well. Voting by post, voting on ships and in diplomatic missions are carried out before the elections day or should be completed on the day of the elections as laid down by this Law.

6.13.3.1 Postal voting

One cannot vote by post without a certificate (Art.30 of Seimas Elections Law).

Citizens who due to their health condition or other reasons are not able to come to the polling station on the elections day shall be provided with a possibility to participate in elections by voting by post. Voting by post is possible at post offices during their business hours beginning 5 days before the election and ending 1 day prior to the election, provided the voter is put on the voter list of the constituency which is situated that city, region, and ending 2 days prior to the election, provided the voter is not put on the voter list of the constituency which is not situated in that city, region. Expenses related to voting by post shall be covered from the funds of the State Budget. (Art. 67 of Seimas Elections Law).

The head of the post office is responsible for the organisation of voting by post. He shall be responsible for keeping of records, issue and collection of ballot papers and voucher envelopes during voting by post. The chairman of the electoral committee of the polling district within the territory of which a post office is situated, shall be responsible for the organisation of the supervision of the work of the post office during voting by post. When necessary, he must, in conjunction with the chairmen of other polling district committees, whom the constituency electoral committee has assigned with such task, arrange for the organisation of members' of polling district committees watching-over in post offices. (Art. 67 of Seimas Elections Law).

The head of the post office, with the consent of the constituency electoral committee, appoints postal workers for the issue and collection of ballot papers and voucher envelopes during voting by post, who are entrusted with the issue of ballot papers and voucher envelopes. If the constituency electoral committee requests so, the head of the post office must remove a postal worker from the work with election documents.

Postal workers who are authorised to issue election papers shall be issued by the constituency electoral committee the certificates of the established form. An electoral committee member, election observer, having produced his certificate to the postal worker, a voter, having produced the voter certificate and the document proving his identity, has the right to write his remark in this certificate, and the head of the post office should immediately notify the constituency electoral committee about this remark. The postal worker who does not have this certificate do not have the right to issue election papers (Art. 67 of Seimas Elections Law).

Post offices must provide a room (place) where the voter can, without interference and in secrecy, mark the ballot papers and put them into a voucher envelope. Voting may be observed by the observers of parties and political organisations, who have certificates permitting to observe voting in any polling district (Art. 67 of Seimas Elections Law).

The postal worker issues election documents to a voter in accordance with the procedure established by the Central Electoral Committee. Together with ballot papers, voters are given envelopes for voting by post. An outer envelope for voting by post shall be addressed by the postal worker to the polling district committee which is indicated in the voter certificate of the person. (Art. 67 of Seimas Elections Law).

Voting in secrecy, the voter marks the ballot papers; puts the marked ballot papers

into the voucher envelope; seals the voucher envelope; puts the voucher envelope into the outer envelope together with the voter certificate; seals the outer envelope. (Art. 67 of Seimas Elections Law).

The outer envelopes, voucher envelopes and ballot papers are delivered at least 2 days prior to the election by a postman to the homes of voters who due to their health condition are not able to come to vote at a post office or a polling station on an election day.

A concrete schedule of postmen's arrival to the homes of voters must be approved by the head of a post office not later than 12:00 noon, its copy shall be put on an announcement board and may be implemented only on the day following the approval. Not less than 2 committee members as well as observers may arrive at the voter's home together with the postman.

The list of such voters is compiled 10 days before the elections by polling district committees in accordance with requests to ensure the possibility to vote at home, which are of the form established by the Central Electoral Committee and filled in by the citizens. Polling district committees, with the consent of the chairman of a constituency electoral committee or a member of the constituency electoral committee authorised by the chairman, may supplement the list, if they receive the requests of these voters not later than 3 days prior to the elections. Citizens' requests must also be approved by heads of town, regional care and guardianship or health surveillance and treatment institutions. The requests should be appended to the list of voters who due to their health condition are not able to come to vote at a post office or a polling station on an election day, which is compiled by a polling district committee. Postal workers, electoral committee members or other persons may not bring envelopes for voting by post and ballot papers to the homes of voters who are not on the list of voters who due to their health condition are not able to come to vote at a post office or a polling station on an election day.

Officers who furnish false information about voters who due to their health condition are not able to come to vote at a post office or a polling station on an election day, shall be held liable in accordance with the procedure established by law. (Art. 67 of Seimas Elections Law)

The sealed outer envelope (with the voter certificate, voucher envelope and ballot papers in it) the voter may hand to a postal worker, hand to the postman who has delivered the election documents to him, put into a post-box. (Art. 67 of Seimas Elections Law)

When a voter votes at home, it is prohibited to exert influence on his determination and to urge him to vote. The voter who has no physical disability preventing him from marking ballot papers, shall himself put the secretly marked ballot papers into the voucher envelope, seal it, put the voucher envelope into the outer envelope together with the voter certificate and seal the outer envelope. Upon request of the voter who because of his physical disability is not able to do this himself, the person chosen by him (except the postman, electoral committee member or observer) shall assist him in doing so. The said person must keep the voting secret. The voter may hand the sealed outer envelope to the postman or to send it on the same day or another day (Art. 67 of Seimas Elections Law).

It is prohibited to accept from the voter an outer envelope which is not sealed. (Art. 67).

Specific provisions are foreseen for voting in diplomatic missions, on a ship (Art.68),

in medical treatment facilities and Institutions of social guardianship and care (Art. 71), in military units (Art. 72) and in places of confinement (Art. 73).

7 Organizational Aspects

7.1 Scope of this Part of the Study

Article 3 of the contract between the Federal and Regional Administrations and the university Consortium does not explicitly mention “organizational aspects” in the list of items to be studied by the Consortium with respect to the various eVoting systems in operation world wide. However, the requirements regarding the Belgian eVoting system are broader: they specify that this system must be evaluated “*in all its facets*”. We take this to mean that the study is to include an analysis of the organizational aspects of the Belgian eVoting system.

Since eVoting has been used in Belgium several times already and since many modifications and improvements have been applied, the question arises as to which version of the Belgian eVoting system should be studied. Assuming that lessons learned from past experiences have resulted in gradual improvements of the original eVoting system, **we have decided to analyze the eVoting system which will be used for the June 10, 2007 federal elections**. This means that the analysis will not explicitly refer to previous elections, unless useful. The available time and resources also precluded a separate analysis of specific practices in the various regions or communes of the country, some of which may have organized elections somewhat differently from what is taken into account here.

7.1.1 What are Organizational Aspects of eVoting Systems?

We define organizational aspects as the answer to the following question: “**who does what when and for what purpose?**” within the overall eVoting process. We are not concerned here with the technical details or with individual components, but with the **processes** and the **parties** (actors) involved in those processes. The analysis of organizational aspects is needed to ensure that the eVoting system indeed achieves its stated aims and that it exhibits all characteristics (security, privacy, reliability, accountability, usability, etc.) expected from such systems.

7.1.2 Working Hypotheses

This part of the study has been undertaken under the following hypotheses:

- The purpose of the work is not to produce a description of the Belgian eVoting system, but to analyze it with respect to organizational aspects.
- The analysis will be based solely on written information provided by the Administration (Department of the Interior), possibly supplemented with verbal clarifications when written documents are unclear, incomplete or ambiguous.
- The analysis will examine **in what measure the organization of the eVoting process for the June 10, 2007 elections satisfies requirements for eVoting**.

The question which immediately arises is that of the requirements to be used in the analysis, since many states, organizations, and groups have produced lists of such requirements. In the absence of specific guidelines, **we have decided to use the requirements (standards) adopted by the Council of**

Europe in 2004 [CoE 2004]. Even though these requirements have been rightly criticized for vagueness, inconsistency, and over specification [McGaley 2006], they do reflect a broad consensus among a large number of countries in Europe and may thus legitimately be used as a basis for the analysis.

As shall be explained below, it turned out to be impossible to satisfy the second working hypothesis listed above and much information had to be obtained verbally and could only partially be verified by existing documents.

7.1.3 Preliminary Observations

Our first observation is that that no single, complete document seems to exist which describes the overall eVoting process in Belgium in sufficient detail to answer the basic question “**who does what when and for what purpose?**”. The Administration has made a large number of documents available, but, as far as we were able to ascertain, none of them contains a complete description of the eVoting process in Belgium. Many documents contain information about *some* aspects of the eVoting process, but no single, complete, officially sanctioned document was made available to the Consortium. Besides, many of these documents are written for specific audiences (e.g., polling stations or counting offices chairmen) and cover only those aspects deemed relevant for these audiences. The document which comes closest to describe the eVoting system in Belgium is [OSCE 2006], a report by the OSCE on the communal and provincial elections of October 8, 2006. This document is, however, an interpretation by visiting experts and it has no official status. Its accuracy could not be verified.

To obtain a complete view, it is therefore necessary to collate information from many sources, which may or may not be up to date, which may or may not be correct and consistent, and thus constitute a legitimate basis for our analysis.

This first observation entails a second one: it would be very useful to be able to consult a single official glossary of terms and a single official list of all entities involved in the eVoting process. Most documents which were made available mention some of the actors playing a role in the process, but it is quite difficult to ascertain the meaning of the names and acronyms used in the various documents.

The third observation we must make is that many of the necessary documents were obtained very late during this first phase of the study (on March 20 and 22). Several useful documents were not even available on the official website of the June 10th, 2007 elections³⁰⁴ by the time the report of the first phase was due (but various relevant documents were posted during the week of March 26, 2007). The time which was needed to understand all the information, to obtain clarifications where needed and to produce the analysis was undoubtedly much too short.

These observations lead us to state – regretfully – that our analysis is not based on fully reliable, verifiable, and officially sanctioned information, but rather on our probably imperfect understanding of the Belgian eVoting system. However, “*à l'impossible nul n'est tenu*”.

The reader is asked to bear in mind that any error which may appear in this report is entirely ours, as are all opinions expressed in the analysis.

³⁰⁴ <http://www.elections.fgov.be/2007/2007Fr/introfmfr.htm>

7.1.4 About the Belgian eVoting System

It should be noted at the outset that the Belgian eVoting system is not a completely (end-to-end) automated voting system, but rather a system in which **two** specific phases of the voting process are performed by electronic means: (1) the casting of votes by means of electronic ballots and (2) the counting of votes cast in this way at the “canton” level.

Since the system was originally designed in the early 1990’s, it makes no use of technologies which are nowadays freely available and entirely commonplace. Several phases of the election process are identical to the same phases in manual voting, but for the fact that information is hand-carried on electronic supports (diskettes) rather than on paper. If these phases are vulnerable in manual voting, they are vulnerable too in the Belgian eVoting system, since the additional protection relies on passwords, whose confidentiality depend on their secure handling by election officials (which is harder to check than the integrity of physical seals). Still, it should be acknowledged that many security measures are taken to prevent tampering with the eVoting process. Determining whether they are entirely successful lies outside the scope of this part of the study.

7.1.5 Analysis of the Federal Elections eVoting System of 10 June 2007

The items used in the analysis are numbered according to [CoE 2004]. We have selected only those items (73 out of 112) which were deemed relevant for the analysis of the organizational aspects of the Belgian eVoting system in

- Section “B. Procedural safeguards” of Appendix I “Legal standards”
- Appendix II “Operational standards”
- Section C “Systems operation” of Appendix III “Technical requirements”
- Section D.III “Requirements in the voting stage” of Appendix III “Technical requirements”
- Section D.IV “Requirements in post-voting stages” of Appendix III “Technical requirements”
- Section E “Audit” of Appendix III “Technical requirements”.

The evaluation uses the following rankings:

- **Needs improving** (there is no doubt about the need for improvement),
- **May need improving** (could be satisfactory, but needs further investigation),
- **Satisfactory**,
- **N.A.** (not applicable)
- **???** (impossible to ascertain at the present time).

We are fully aware that some of the perceived shortcomings are due to the current legal framework; others are dependent on entities (e.g., communes) whose independence precludes direct intervention. Our purpose is of course not to apportion blame, but rather to point to items which should be addressed in any future eVoting system in Belgium if one wishes to truly fulfill all the requirements set forth by the Council of Europe.

Item	The Belgian eVoting system	
	Evaluation	Comments and justifications
20. Member states shall take steps to ensure that voters understand and have confidence in the eVoting system in use.	Needs improving	<p>The lack of a single, comprehensive, official document describing the components of the eVoting system and the overall eVoting process in terms understandable to the general public makes it impossible to satisfy this requirement at this time. One cannot expect the average citizen to analyze the large amount of variously available information in order to understand the system.</p> <p>The voters must therefore trust the assertions made by the various appointed bodies that the voting system is reliable. They have no means to make their own minds about this question.</p>
21. Information on the functioning of an eVoting system shall be made publicly available.	Needs improving	<p>See 20.</p> <p>The Department of the Interior (DoI) and the equipment suppliers provide manuals for election officials³⁰⁵; There is also a website with information for the general public³⁰⁶; the communes may, if they wish, provide their own information for voters.</p> <p>The information for election officials is not really written in a way suitable for the average citizen.</p>
22. Voters shall be provided with an opportunity to practice any new method of eVoting before, and separately from, the moment of casting an electronic vote.	Needs improving	<p>Communes are encouraged to provide demo practice sessions with equipment and software provided by the DoI. There is no obligation to do so and no a posteriori verification of the effectiveness of the proposed activities. The DoI requests information from the communes about their initiatives in this respect.</p> <p>The DoI operates a website simulating an election with actual candidate lists. The simulation does not include the operation of the light pen, but provides a realistic way for the (Internet-savvy) voter to go through the election process. No information is available about the number of citizens taking advantage of this simulation.</p>

³⁰⁵ <http://www.elections.fgov.be/2007/2007Fr/introfr.htm>

³⁰⁶ <http://verkiezingen2007.belgium.be/nl/> and <http://elections2007.belgium.be/fr/>

<p>23. Any observers, to the extent permitted by law, shall be able to be present to observe and comment on the eElections, including the establishing of the results.</p>	<p>May need improving</p>	<p>The various assemblies appoint members to a committee of experts with broad powers of inquiry and observation. It is not clear whether this committee has sufficient time, resources, and incentive to perform its duties correctly and extensively.</p> <p>The voting and counting may be observed by party representatives.</p>
<p>24. The components of the eVoting system shall be disclosed, at least to the competent electoral authorities, as required for verification and certification purposes.</p>	<p>May need improving</p>	<p>The law specifies that the task of analyzing the components of the eVoting system is to be subcontracted to a so-called “control organization”, i.e., private companies specializing in the auditing of software (currently: PWC and CSS). This raises the question of public accountability.</p> <p>The software is made available, before the election, to political parties and to the committee of appointed experts. After the election, the software is made publicly available on the election website.</p> <p>See item 69.</p>
<p>25. Before any eVoting system is introduced, and at appropriate intervals thereafter, and in particular after any changes are made to the system, an independent body, appointed by the electoral authorities, shall verify that the eVoting system is working correctly and that all the necessary security measures have been taken.</p>	<p>May need improving</p>	<p>See items 23 and 24. The committee of experts has access to the official version of the election software after it has been checked by the auditing companies of the “control organization”. A version of this software is kept in a bank vault.</p>
<p>26. There shall be the possibility for a recount. Other features of the eVoting system that may influence the correctness of the results shall be verifiable.</p>	<p>Needs improving</p>	<p>The recount is used only when a totalizing machine (urn) fails to operate properly or when the chairman of a canton requires it.</p> <p>There is no way to tally votes independently of the electronically registered ones if it is feared that these are compromised. An automatically produced voter-verifiable paper trail has been abandoned because of its cost.</p>
<p>27. The eVoting system shall not prevent the partial or complete re-run of an election or a referendum.</p>	<p>Satisfactory</p>	<p>There have been instances when a re-run was needed because of undetected errors in the pre-voting phases.</p>
<p>28. The member state’s authorities shall ensure the</p>	<p>???</p>	<p>Many measures are taken with respect to reliability and security. The “control</p>

<p>reliability and security of the eVoting system.</p>		<p>organization” is required to check them. The evaluation of these measures is a technical matter rather than an organizational one and was thus not performed in this part of the study.</p>
<p>29. All possible steps shall be taken to avoid the possibility of fraud or unauthorized intervention affecting the system during the whole voting process.</p>	<p>???</p>	<p>A number of steps are taken (passwords, encryption), but this item should be analyzed in more detail to verify the robustness of the measures; this analysis could not be performed in the available time span and with the available resources. Some doubts have been expressed in the past by the committee of experts about this topic.</p>
<p>30. The eVoting system shall contain measures to preserve the availability of its services during the eVoting process. It shall resist, in particular, malfunction, breakdowns or denial of service attacks.</p>	<p>Satisfactory</p>	<p>Procedures exist and appear to be operational to handle various possible breakdowns. Since the voting machines are not networked, no denial of service attacks can be performed.</p>
<p>31. Before any eElection or e-referendum takes place, the competent electoral authority shall satisfy itself that the eVoting system is genuine and operates correctly.</p>	<p>Satisfactory</p>	<p>Procedures exist to check the operation of the eVoting system 4 months and 1 week before the polling date. An audit trail of detected problems is generated and analyzed. “Reference” votes are performed at the opening of the voting sessions by the polling station chairperson, but they don’t provide strong guarantees about the correct operation of the voting machines.</p>
<p>32. Only persons appointed by the electoral authority shall have access to the central infrastructure, the servers and the election data. There shall be clear rules established for such appointments. Critical technical activities shall be carried out by teams of at least two people. The composition of the teams shall be regularly changed. As far as possible, such activities shall be carried out outside election periods.</p>	<p>N.A.</p>	<p>There is no “central infrastructure” to speak of during the voting period. The machines used to prepare the ballots, etc. belong to the Department of the Interior and are kept in a secure location. The machines used in the voting process belong to the communes. The final counts and the attribution of seats are handled by private contractors.</p>
<p>33. While an electronic ballot box is open, any authorized intervention affecting the system shall be carried out by</p>	<p>Needs improving</p>	<p>Interventions to voting machines are carried out by authorized technicians (private contractors) called by polling station personnel. Many interventions consist in the</p>

<p>teams of at least two people, be the subject of a report, be monitored by representatives of the competent electoral authority and any election observers.</p>		<p>complete replacement of faulty machines.</p> <p>There is no provision for having at least two people doing the work. Some form of tampering could occur during such interventions. The checks which are performed after technical interventions are not extensive (“reference” votes).</p> <p>The fact that polling station officials and party representatives are present during interventions is but a weak form of monitoring.</p> <p>A report is produced.</p>
<p>34. The eVoting system shall maintain the availability and integrity of the votes. It shall also maintain the confidentiality of the votes and keep them sealed until the counting process. If stored or communicated outside controlled environments, the votes shall be encrypted.</p>	<p>Satisfactory</p>	<p>If the votes which are recorded on the magnetic cards used by the voters are indeed the votes which were expressed, then the process does as good job of guaranteeing the integrity and the availability of the votes as in the manual voting system with paper ballots.</p>
<p>35. Votes and voter information shall remain sealed as long as the data is held in a manner where they can be associated. Authentication information shall be separated from the voter’s decision at a pre-defined stage in the eElection or e-referendum.</p>	<p>Satisfactory</p>	<p>If the election software performs as specified, then this criterion is satisfied since voter identification is performed manually before the vote is expressed. Measures are taken to prevent the sequence of votes to be associated with the sequence of voters.</p>
<p>36. Domestic legal provisions governing an eElection or e-referendum shall provide for clear timetables concerning all stages of the election or referendum, both before and after the election or referendum.</p>	<p>Satisfactory</p>	<p>The timetables are available and published on the election website. Since Belgian elections are mixed (traditional + electronic), the timetables are not specific to eVoting alone.</p>
<p>37. The period in which an electronic vote can be cast shall not begin before the notification of an election or a referendum. Particularly with regard to remote</p>	<p>N.A.</p>	<p>Electronic voting may only occur on the polling date. No advance nor remote voting is allowed.</p>

eVoting, the period shall be defined and made known to the public well in advance of the start of voting.		
38. The voters shall be informed, well in advance of the start of voting, in clear and simple language, of the way in which the eVoting will be organized, and any steps a voter may have to take in order to participate and vote.	May need improving	No special steps are needed to participate in eVoting in Belgium. The information provided to voters may or may not be available in a “clear and simple language”, depending on one’s point of view. The advice of an expert in man-machine interactions could shed useful light on this subject matter.
42. The possibility of introducing online candidate nomination may be considered.	Satisfactory	Duly appointed representatives of political parties may introduce lists of candidates via a secure website.
43. A list of candidates that is generated and made available electronically shall also be publicly available by other means.	Satisfactory	Lists of candidates are published. They are checked and validated by election officials at the district (“circonscription”) level.
44. It is particularly important, where remote eVoting takes place while polling stations are open, that the system shall be so designed that it prevents any voter from voting more than once.	N.A.	No remote eVoting is allowed (outside of polling stations).
46. For every eVoting channel, support and guidance arrangements on voting procedures shall be set up for, and be available to, the voter. In the case of remote eVoting, such arrangements shall also be available through a different, widely available communication channel.	Needs improving	See items 21 and 22. Explanations about the eVoting process are available on the elections website. More information may be provided by the communes or the regions (see, for instance, what the Brussels Region has done for the 2006 elections). The instructions provided by the Department of the Interior make no mention of an obligation in this respect. No evaluation has been made of the efficiency of the support and guidance tools.
47. There shall be equality in the manner of presentation of all voting options on the device used for casting an electronic vote.	Satisfactory	The only options are: regular vote and blank vote: the choice is presented equally. It is harder to produce a null vote than in paper voting.
48. The electronic ballot by which an electronic vote is	May need	The electronic ballot contains only the lists of candidates and the option for blank vote. The

<p>cast shall be free from any information about voting options, other than that strictly required for casting the vote. The eVoting system shall avoid the display of other messages that may influence the voters' choice.</p>	<p>improving</p>	<p>option for blank vote appears as if it was another list of candidates, which may cause some confusion for certain voters.</p> <p>It is quite cumbersome to produce a "null" vote (a possibility explicitly mentioned in the election law).</p>
<p>49. If it is decided that information about voting options will be accessible from the eVoting site, this information shall be presented with equality.</p>	<p>N.A.</p>	
<p>52. In a supervised environment, the information on the vote shall disappear from the visual, audio or tactile display used by the voter to cast the vote as soon as it has been cast. Where a paper proof of the electronic vote is provided to the voter at a polling station, the voter shall not be able to show it to any other person, or take this proof outside of the polling station.</p>	<p>Satisfactory</p>	<p>The removal of the magnetic card used to record the vote occurs only after the information about the vote has disappeared from the screen of the voting machine. Only an analysis of the software could guarantee that it is impossible to recover a vote previously cast on a voting machine.</p> <p>There are no paper proofs any more: the experiment has been abandoned because of its cost.</p>
<p>53. The eVoting system shall not allow the disclosure of the number of votes cast for any voting option until after the closure of the electronic ballot box. This information shall not be disclosed to the public until after the end of the voting period.</p>	<p>May need improving</p>	<p>The polling station's chairman's computer (ballot box or urn) is used to record votes on a diskette. Knowing the password, the polling station chairman could violate this specific requirement by reading the diskette in a suitably programmed computer.</p>
<p>54. The eVoting system shall prevent processing information on votes cast within deliberately chosen sub-units that could reveal individual voters' choices.</p>	<p>Satisfactory</p>	<p>Measures are taken when counting votes to ensure that every partial result which is communicated includes at least two more polling stations than the previous one.</p>
<p>55. Any decoding required for the counting of the votes shall be carried out as soon as practicable after the closure of the voting period.</p>	<p>Satisfactory</p>	
<p>56. When counting the votes,</p>	<p>May need</p>	<p>The committee of appointed experts may</p>

representatives of the competent electoral authority shall be able to participate in, and any observers able to observe, the count.	improving	only observe whether procedures are followed precisely; it has no other means to verify that the counting is accurate than asking for a recount on different machines. Observers delegated by political parties are present too.
57. A record of the counting process of the electronic votes shall be kept, including information about the start and end of, and the persons involved in, the count.	Satisfactory	Minutes are available; they are produced electronically and signed by election officials.
58. In the event of any irregularity affecting the integrity of votes, the affected votes shall be recorded as such.	Satisfactory	Measures taken to prevent tampering are similar to the ones taken for manual voting and rely on sealed envelopes. However, additional security is provided by means of secure passwords.
69. The competent electoral authorities shall publish an official list of the software used in an eElection or e-referendum. Member states may exclude from this list data protection software for security reasons. At the very least it shall indicate the software used, the versions, its date of installation and a brief description. A procedure shall be established for regularly installing updated versions and corrections of the relevant protection software. It shall be possible to check the state of protection of the voting equipment at any time.	Needs improving	<p>The software for both models of voting machines and ballot boxes is published on the elections website after the election date. A series of security measures are taken to ensure that the published software is indeed the one used in the various machines.</p> <p>The source code is not always accompanied by the necessary technical documentation.</p> <p>The software for the computation at the canton level and the software for the attribution of seats are not made available. Since the results of the counting at the canton level are made public, the correctness of the attribution of seats can be verified independently.</p>
70. Those responsible for operating the equipment shall draw up a contingency procedure. Any backup system shall conform to the same standards and requirements as the original system.	Satisfactory	Contingency procedures exist both for voting machines and for electronic ballot boxes.
71. Sufficient backup arrangements shall be in place and be permanently available to ensure that voting	May need improving	The arrangements depend on the communes, which may or may not exert due diligence in this respect (e.g., having enough spare parts). A crew of authorized technicians is on call.

<p>proceeds smoothly. The staff concerned shall be ready to intervene rapidly according to a procedure drawn up by the competent electoral authorities.</p>		<p>Service Level Agreements (SLA's) specify suppliers' responses in case of technical problems.</p> <p>See also item 75.</p>
<p>72. Those responsible for the equipment shall use special procedures to ensure that during the polling period the voting equipment and its use satisfy requirements. The backup services shall be regularly supplied with monitoring protocols.</p>	<p>Needs improving</p>	<p>The last complete test of the machines is executed one week before the polling date. A "dummy" reference vote is executed on every voting machine before the start of the actual voting.</p> <p>There is no systematic or random testing of the voting machines or of the ballot box during the voting period, unless executed by the committee of appointed experts.</p> <p>The central monitoring relies on the information transmitted by the personnel of the polling stations.</p>
<p>73. Before each election or referendum, the equipment shall be checked and approved in accordance with a protocol drawn up by the competent electoral authorities. The equipment shall be checked to ensure that it complies with technical specifications. The findings shall be submitted to the competent electoral authorities.</p>	<p>Satisfactory</p>	<p>See 31 and 72</p>
<p>74. All technical operations shall be subject to a formal control procedure. Any substantial changes to key equipment shall be notified.</p>	<p>Satisfactory</p>	<p>The control procedure is executed by private contractors chosen (after a public bid) by the producers of the eVoting software. The equipment itself has mostly been kept unchanged but for simple upgrades and replacements.</p>
<p>75. Key eElection or e-referendum equipment shall be located in a secure area and that area shall, throughout the election or referendum period, be guarded against interference of any sort and from any person. During the election or referendum period a physical disaster recovery plan shall be in place. Furthermore, any</p>	<p>May need improving</p>	<p>Security depends entirely on the vigilance of the commune (before election day) and of polling station personnel (during election day).</p> <p>The disaster recovery plan is based on SLA's with the suppliers, which guarantee maximum delays for fixing (or replacing) voting machines and urns. A distributed strategic reserve of equipment is to be made available by the suppliers.</p> <p>The data retained after the election is kept at</p>

<p>data retained after the election or referendum period shall be stored securely.</p>		<p>the canton offices until the election is validated (same as for paper ballots). After validation, all data supports are erased.</p>
<p>76. Where incidents that could threaten the integrity of the system occur, those responsible for operating the equipment shall immediately inform the competent electoral authorities, who will take the necessary steps to mitigate the effects of the incident. The level of incident which shall be reported shall be specified in advance by the electoral authorities.</p>	<p>May need improving</p>	<p>Instructions for polling station and counting station personnel handle primarily normal operations and equipment malfunctions. Technical incidents are signaled to commune personnel and to equipment suppliers. The procedure also entails informing the canton chairman and the canton representative of the DoI. DoI thus monitors what is reported and may offer logistic support where and when needed.</p> <p>Much relies on election officials, who may not be sufficiently technically savvy to correctly evaluate risks when no obvious malfunction occurs.</p> <p>Reporting of incidents is identical to reporting of incidents in the case of manual voting.</p>
<p>77. Technical and organizational measures shall be taken to ensure that no data will be permanently lost in the event of a breakdown or a fault affecting the eVoting system.</p>	<p>Satisfactory</p>	<p>The only irrecoverable situation is the physical destruction of magnetic cards and voting diskettes (same as for paper ballots).</p>
<p>78. The eVoting system shall maintain the privacy of individuals. Confidentiality of voters' registers stored in or communicated by the eVoting system shall be maintained.</p>	<p>Satisfactory</p>	<p>This requires examination of the voting software which could not be undertaken within the available time frame. It seems, however, that voting registers are not stored in the machines used in the voting process itself: they are used by the communes only in the pre-voting stages. Associating a person and a vote is thus effectively prevented.</p>
<p>79. The eVoting system shall perform regular checks to ensure that its components operate in accordance with its technical specifications and that its services are available.</p>	<p>Needs improving</p>	<p>There is no systematic or random testing of the voting machines or of the ballot box during the voting period, unless executed by the appointed committees of experts.</p> <p>It is assumed that, if a machine appears to operate correctly at the start and at the end of the vote (or after a replacement) – checked by the so-called “reference votes” –, it will continue to do so during the entire voting session.</p>
<p>80. The eVoting system shall restrict access to its services, depending on the user</p>	<p>Needs improving</p>	<p>Sensitive operations are password-protected, but voting machines are not really tamper-proof.</p>

<p>identity or the user role, to those services explicitly assigned to this user or role. User authentication shall be effective before any action can be carried out.</p>		<p>Except for the word “Confidential” printed on the envelopes containing passwords, instructions for election officials fail to sufficiently stress the need to keep the automatically generated 16-character (DIGIVOTE) or 10-digit (JITES) passwords secret!</p> <p>It was not possible to verify, within the available time frame, that the password generation and distribution process, organized by the Department of the Interior, is fully secure.</p>
<p>81. The eVoting system shall protect authentication data so that unauthorized entities cannot misuse, intercept, modify, or otherwise gain knowledge of all or some of this data. In uncontrolled environments, authentication based on cryptographic mechanisms is advisable.</p>	<p>???</p>	<p>It was not possible to verify, within the available time frame, that the password generation and distribution process, organized by the Department of the Interior, is indeed secure.</p> <p>Passwords are based on modern cryptographic techniques. Data is stored in encrypted form.</p>
<p>82. Identification of voters and candidates in a way that they can unmistakably be distinguished from other persons (unique identification) shall be ensured.</p>	<p>Satisfactory</p>	<p>Relies on the Belgian ID system. For local elections, in which certain non Belgians are allowed to vote, this may create difficulties.</p>
<p>83. eVoting systems shall generate reliable and sufficiently detailed observation data so that election observation can be carried out. The time at which an event generated observation data shall be reliably determinable. The authenticity, availability and integrity of the data shall be maintained.</p>	<p>Needs improving</p>	<p>No specific observation data are generated. The committee of appointed experts must perform its own verifications. The technical limitations and obsolescence of the hardware prevents adding new functionalities.</p>
<p>84. The eVoting system shall maintain reliable synchronized time sources. The accuracy of the time source shall be sufficient to maintain time marks for audit trails and observations data, as well as for maintaining the time limits for registration,</p>	<p>N.A.</p>	<p>No time synchronization is ensured. Because of the nature of the current Belgian eVoting system, this is not (yet) a major drawback.</p>

nomination, voting, or counting.		
85. Electoral authorities have overall responsibility for compliance with these security requirements, which shall be assessed by independent bodies.	May need improving	Many security functions are implemented by private contractors (authorized by law). An independent body (committee of experts) is appointed to assess the operation of the eVoting system.
89. The integrity of data communicated from the preVoting stage (e.g., voters' registers and lists of candidates) shall be maintained. Data-origin authentication shall be carried out.	Satisfactory	Lists of voters: prepared by the commune Lists of candidates: validated at the district level
90. It shall be ensured that the eVoting system presents an authentic ballot to the voter. In the case of remote eVoting, the voter shall be informed about the means to verify that a connection to the official server has been established and that the authentic ballot has been presented.	Satisfactory	Diskettes containing the ballots are prepared by the Department of the Interior on basis of validated lists of candidates. They are securely dispatched to the canton officials in sealed containers; canton officials are responsible for dispatching them to polling station officials, but no particular security measures are taken in this step of the process.
91. The fact that a vote has been cast within the prescribed time limits shall be ascertainable.	N.A.	eVotes may only be cast at polling stations, which are open for specific durations on election day. There is no provision for advance voting or for distance voting.
92. Sufficient means shall be provided to ensure that the systems that are used by the voters to cast the vote can be protected against influence that could modify the vote.	Satisfactory	Same as for manual (paper) voting.
93. Residual information holding the voter's decision or the display of the voter's choice shall be destroyed after the vote has been cast. In the case of remote eVoting, the voter shall be provided with information on how to delete, where that is possible, traces of the vote from the device used to cast the vote.	???	Can only be verified through analysis of the voting software. The specifications require that all information stored in the voting machine's memory is to be erased before returning the ballot card to the voter.

<p>94. The eVoting system shall at first ensure that a user who tries to vote is eligible to vote. The eVoting system shall authenticate the voter and shall ensure that only the appropriate number of votes per voter is cast and stored in the electronic ballot box.</p>	<p>Satisfactory</p>	<p>Same as for manual (paper) voting: relies on Belgian ID and on the accuracy of lists prepared by the communes. This process is entirely manual and relies on polling station officials.</p>
<p>95. The eVoting system shall ensure that the voter's choice is accurately represented in the vote and that the sealed vote enters the electronic ballot box.</p>	<p>???</p>	<p>The voter may display the contents of the magnetic card on a voting machine before the card is deposited in the urn. A complete analysis of the voting software would be needed to ascertain whether this is really sufficient.</p>
<p>96. After the end of the eVoting period, no voter shall be allowed to gain access to the eVoting system. However, the acceptance of electronic votes into the electronic ballot box shall remain open for a sufficient period of time to allow for any delays in the passing of messages over the eVoting channel.</p>	<p>N.A.</p>	
<p>97. The integrity of data communicated during the voting stage (e.g., votes, voters' registers, lists of candidates) shall be maintained. Data-origin authentication shall be carried out.</p>		<p>See 89</p>
<p>98. The counting process shall accurately count the votes. The counting of votes shall be reproducible.</p>	<p>May need improving</p>	<p>Can only be verified through analysis of all the components of the voting software.</p> <p>The counting is reproducible, but this provides no useful information if it cannot be shown that votes which are recorded on magnetic ballots are indeed the votes which were cast by the voters.</p>
<p>99. The eVoting system shall maintain the availability and integrity of the electronic ballot box and the output of the counting process as long as required.</p>	<p>May need improving</p>	<p>The electronic ballot box remains available and its integrity is assured by physical seals. However, the information from the electronic ballot box is transmitted by means of encrypted diskettes, whose integrity is protected by a password, which may or may not have been kept secret (see 80).</p>

<p>100. The audit system shall be designed and implemented as part of the eVoting system. Audit facilities shall be present on different levels of the system: logical, technical and application.</p>	<p>Needs improving</p>	<p>There is no full-fledged end-to-end audit system as such, but a number of useful auditing actions are taken for some of the process steps. Procedures exist and a committee of experts is supposed to verify that they are applied everywhere and every time, which is impossible. Several audit steps are managed by external contractors.</p> <p>A complete and coherent auditing system should have been designed together with the eVoting system, preferably by other contractors.</p> <p>The obsolescence of the hardware currently in use may prevent satisfying this and the following requirements.</p>
<p>101. End-to-end auditing of an eVoting system shall include recording, providing monitoring facilities and providing verification facilities. Audit systems with the features set out below shall therefore be used to meet these requirements.</p>	<p>Needs improving</p>	<p>See 100.</p>
<p>102. The audit system shall be open and comprehensive, and actively report on potential issues and threats.</p>	<p>Needs improving</p>	<p>See 100.</p>
<p>103. The audit system shall record times, events and actions, including:</p> <ul style="list-style-type: none"> a. all voting-related information, including the number of eligible voters, the number of votes cast, the number of invalid votes, the counts and recounts, etc.; b. any attacks on the operation of the eVoting system and its communications infrastructure; c. system failures, malfunctions and other threats to the system. 	<p>Needs improving</p>	<p>See 100.</p> <p>Some of the requirements are met, but not integrated in a complete audit system.</p>
<p>104. The audit system shall</p>	<p>Needs</p>	<p>See 100.</p>

provide the ability to oversee the election or referendum and to verify that the results and procedures are in accordance with the applicable legal provisions.	improving	
105. Disclosure of the audit information to unauthorized persons shall be prevented.	???	No mention of specific measures to this effect. Polling station officials are not explicitly forbidden to disclose this type of information to unauthorized persons.
106. The audit system shall maintain voter anonymity at all times.	N.A.	
107. The audit system shall provide the ability to cross-check and verify the correct operation of the eVoting system and the accuracy of the result, to detect voter fraud and to prove that all counted votes are authentic and that all votes have been counted.	Needs improving	See 100.
108. The audit system shall provide the ability to verify that an eElection or e-referendum has complied with the applicable legal provisions, the aim being to verify that the results are an accurate representation of the authentic votes.	Needs improving	See 100.
109. The audit system shall be protected against attacks which may corrupt, alter or lose records in the audit system.	Needs improving	See 100.
110. Member states shall take adequate steps to ensure that the confidentiality of any information obtained by any person while carrying out auditing functions is guaranteed.	Needs improving	See 100.
111. Member states shall introduce certification processes that allow for any ICT (Information and Communication Technology)	Needs improving	Not done: the certification is with respect to Belgian requirements only.

<p>component to be tested and certified as being in conformity with the technical requirements described in this recommendation.</p>		
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7.1.6 Conclusions

Because of its inherent simplicity, because it only automates a part of the voting process, and because of the improvements brought upon over the years, the Belgian eVoting system meets many of the requirements set forth by the Council of Europe in 2004. Still, a number of shortcomings have been detected. Here are the most significant ones:

- The information about the voting process should be made available in a single, officially sanctioned, and easily accessible (and understandable) document. It should be stressed, however, that producing such a document would be easier if the legal framework concerning (electronic) elections was sufficiently stable (which has not always been the case in the past).
- It should be made certain that communes do indeed train voters satisfactorily in the use of the eVoting machines.
- It should be made certain that the committee of experts has the time and resources needed to do its job comprehensively and that the job is indeed performed correctly.
- A recount procedure should be possible whenever the integrity of the registered eVotes is in doubt.
- The quality of the technical documentation for the eVoting software should be improved; it should be checked with the same level of expectations as the software itself.
- Voting machines should self-test periodically during the voting period.
- The eVoting system should generate reliable and sufficiently detailed observation data so that election observation can be carried out.
- The eVoting system should have been designed together with a comprehensive auditing system, but by separate teams relying on the same set of specifications (standard software engineering practice).
- Stronger emphasis should be put on the need to keep passwords secret.

The reliance on private contractors for critical operations such as certification, verification, monitoring – mandated by law – may need to be reconsidered or, at least, duly explained to the voters.

7.1.7 Final Observations

The organization of the eVoting process has a direct bearing on the cost of the vote. This part of the study has not examined the various factors related to the cost of the current Belgian eVoting system. The fact that many data transfer operations are still carried out without automation means that many possible cost savings are not

achieved. The proposals to be put forward in the second phase of the study should of course include a costing of the proposal(s).

7.1.8 References

- [CoE 2004] *Legal, Operational and Technical Standards for eVoting*, Recommendation Rec(2004)11 adopted by the Committee of Ministers of the Council of Europe on 30 September 2004 and explanatory memorandum
Available for download at URL
[http://www.coe.int/t/e/integrated_projects/democracy/02_activities/02_e%2Dvoting/01_recommendation/Rec\(2004\)11_Eng_Evoting_and_Expl_Memo.pdf](http://www.coe.int/t/e/integrated_projects/democracy/02_activities/02_e%2Dvoting/01_recommendation/Rec(2004)11_Eng_Evoting_and_Expl_Memo.pdf)
- [McGaley 2006] McGaley, M. and Gibson, F. P. *A Critical Analysis of the Council of Europe Recommendations on eVoting*
Available for download at URL
<http://www.usenix.org/events/evt06/tech/slides/mcgaley.pdf>
- [OSCE 2006] *Expert Visit on New Voting Technologies – 8 October 2006 Local Elections Kingdom of Belgium*, Organization for Security and Cooperation in Europe, Office for Democratic Institutions and Human Rights
Available for download at URL
http://www.osce.org/documents/odihr/2006/11/22177_en.pdf

7.2 Optical Scanning of Paper Ballots (PBOS)

7.2.1 Scope of this Part of the Study

According to publicly available information, the optical scanning of paper ballots is used most extensively in the USA. This part of the study will thus analyze PBOS systems as used in that country and examine whether similar approaches would be applicable in Belgium.

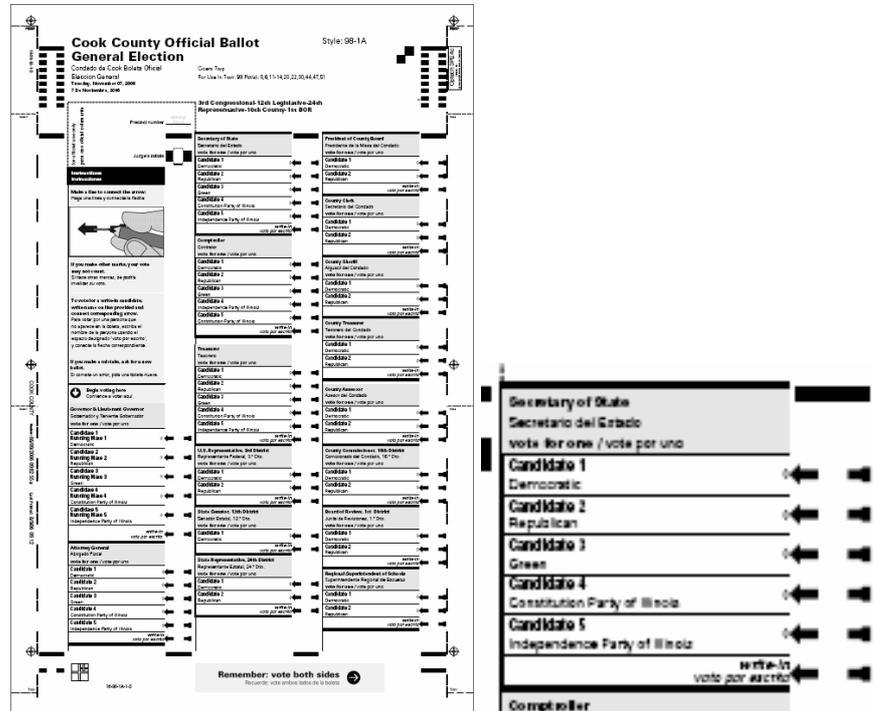
7.2.2 Optical Scanning of Paper Ballots in the USA

The USA has a long history of automated voting: gear-and-lever voting machines were designed and developed in the late 19th century. When computers became readily available, new approaches were used, such as pre-scored IBM data processing cards, which were manually punched to indicate votes for candidates. Due to the relative lack of reliability of punched cards (demonstrated in the 2000 presidential election) a strong push for newer technologies resulted in the adoption, by several states and/or precincts of two different types of electronic voting systems:

- direct-recording electronic voting systems (DRE's), with or without a voter-verifiable paper audit trail (VVPAT), which use no paper ballots (information is displayed on a computer screen);
- paper ballot optical scanning voting systems (PBOS).

In PBOS systems, also called Mark sense voting systems, the voter marks the ballot

using a pen or a no. 2 pencil. The voter must write a *prescribed mark* precisely in the *voting targets*. Both sides of the ballot may be printed with candidate names and referendum issues. Next to each is a hollow square, circle or oval to be filled in, or a head-and-tail of an arrow to be connected.



Ballots may be tabulated in two ways:

- in the polling place using an optical scan reader; this allows some verification of the validity of votes (under- or over-voting) and possibly voting again on a new ballot after cancellation of the erroneous one;
- in a central location, where collected ballots are processed by an optical scan reader.

In either case, each ballot is entered into the reader, which reports to the software of a computer the ballot positions marked by the voter. The software summarizes the votes for each candidate or referendum issue.

Because of the many issues raised with respect to DRE's (lack of security, reliance on hard to verify software, obvious errors encountered in some elections, high cost, etc.), many officials have now turned to PBOS voting systems. Electionline, a non-profit organization which reports on elections in the USA, has published a report in February 2006 [Electionline 2006] showing that the percentage of PBOS voting systems has risen between November 2000 and January 2006 from 29,49% to 41,20% of all registered voters. In the same period, punch cards have gone down from 30,76% to 4,75% and DRE's from 12,57% to 38,24%.

25 states in the USA now require by law either paper ballots or DREs with voter-verifiable paper audit trails (VVPAT). It appears that, out of the 16 states which now require VVPATs, 12 execute a systematic count by means of these VVPATs after every election to verify the accuracy of DRE's. This turns out to be very costly and time-consuming.

Hybrid systems, which use electronic means to produce paper ballots to be scanned

optically later in the process, have grown in popularity, but are contested by some organizations as being unfair for voters with disabilities.

7.2.3 Advantages of PBOS Voting Systems

According to their proponents (who are admittedly often adversaries of DRE voting systems), PBOS voting systems have the following advantages [NCvoter ???]:

- **All voters use an identical ballot and the same system.** Absentee, disabled, military, and provisional voters use the same ballot; and the voter can immediately verify that the right ballot has been issued.
- **Paper ballots are easily understood by voters and are inherently voter verified.** All of us have had experience with pencils & paper; most of us have taken tests or filled out lottery tickets to be read by an optical scanner.
- **Paper ballots allow each voter to vote only once.** Each voter is given a single ballot when signing in at the polling place. Some DREs require “smart cards” to be inserted in the computer to allow voting. These could be compromised and used to vote several times.
- **Precinct-based optical scanners allow voters to correct mistakes and detect over-votes and under-votes.** Incorrectly completed ballots (e.g., over-voted ballots, smudged ballots, etc.) will be rejected by the scanner. Voters can then exchange the spoiled ballot for a new blank ballot and correct their mistakes. In the case of under-votes, they have the option of completing the same ballot or having the scanner accept it as is.
- **The paper ballot is the official record of the vote.** Since the vote is recorded by the voter on the paper rather than electronically, the scanner only counts the votes into memory and then deposits the ballot into a locked ballot box. The paper ballot marked by each voter is the official record of the vote and is used in recounts.
- **Paper ballots for optical scanners are easy to recount by hand.** Lay-out is clear and on quality paper, whereas DRE VVPATs are light, quickly-fading print on thermal, ATM-type paper; recounts are difficult.
- **Paper ballot systems easily accommodate additional voters at low cost.** If a precinct has an unexpectedly large turn-out, only additional privacy booths must be provided, since a single scanner can handle voters from multiple privacy booths and election districts.
- **Voters can continue to vote on paper ballots in the event of equipment failure.** Both DREs and optical scanners have back-up batteries; but in the event of a prolonged power failure or other type of equipment failure, voting can continue on paper ballots that later are either fed into the scanner or hand-counted.
- **Voting will take less time and lines will move fast with paper ballots.** Some people, particularly the elderly, find computers unfamiliar and will find the marking of a paper ballot more comfortable than using DREs. Separate ballot marking devices will enable other voters to continue voting even when it takes longer for a disabled person, an elderly person, or someone needing to use the multi-lingual features of the marking device to vote. Optical scanners take just seconds to read and verify a ballot, and no problems with lines are

experienced in states using precinct based scanners.

- **Only one optical scanner and one small marking-device per precinct will require storage between elections.** Optical scanners and ballot markers are much smaller than DREs and can be stacked in storage, requiring far less storage space and cost during the year than DRE systems. They are also small, and easy to transport to and from polling places during elections and do not require professional movers to handle them.
- **The scanner only counts votes;** therefore, it is much less complex and will require much less maintenance and upgrading over the years than DREs which are a newer, unproven technology.
- **Optical scanners are a reliable, mature technology that has been used successfully in U.S. elections for 20 years.** About 30% of precincts in the United States use paper ballots and precinct based optical scan systems. Many states are now adopting PBOS systems to meet HAVA compliance. Arizona, Minnesota, Michigan, Ohio, Oklahoma and West Virginia are some examples of states that have decided to use this reliable, auditable, cost effective voting technology.

7.2.4 Potential Problems with PBOS Voting Systems

Even though optical scanning is a mature technology, its use in scanning election ballots is not immune to problems. Since the marking is done by humans, there will be a large spectrum of different ways to mark a ballot. This raises the question of deciding which marks are acceptable (i.e.: meet the legal requirements to be counted as a vote) and which are not. This requires providing precise answers to questions such as:

- How much of the oval must be filled for it to be counted as a vote?
- What colors or shades of grey are considered to be black?

Prof D. W. Jones of the University of Iowa is a well-known expert on the use of technology in voting systems. He has written extensively on the subject of accuracy of mark sensing technologies applied to the optical scanning of paper ballots [Jones 2002]. Some of his conclusions are troubling:

- The fraction of the target area filled in by the voter does not necessarily determine which marks will be counted on a particular mark-sense ballot tabulating machine; in fact, many machines will detect and count some marks that are entirely outside of the target printed on the ballot.
- It is quite possible for a ballot to be counted in two different ways on two successive passes through the same voting machine.
- Neither the darkness of the mark nor the width of the mark, taken alone, determine which marks will be counted on a particular mark-sense vote tabulating machine.
- The apparent darkness of a mark, as seen by the human eye, does not necessarily determine whether that mark will be counted on a particular mark-sense vote tabulating machine.
- The use of advanced technologies such as visible light sensing and fax bars

cannot eliminate the class of marginal marks; at best, such technologies can reduce the number of marks that might be marginal.

- The exact same ballot format may be used with a variety of different mark-sense ballot tabulating machines, where the different tabulating machines count marks in distinctly different ways, applying different criteria to determining which marks are and are not counted as votes.
- If erasures are forbidden by law, we must face the fact that most of the available mark-sense vote tabulating systems will disregard most competently made erasures. If, on the other hand, we allow erasure, we must face the fact that some erasures will be so darkly smudged that most mark-sense scanners will detect them as marks.
- If we apply the procedures for correcting damaged absentee ballots to all of those ballots where a vote tabulating machine detects overvotes and the voter is unavailable to make corrections, we can interpret apparent overvotes due to false-positives caused by accidents, defects or erasures, thus offering these voters at least part of the protection available to voters who use precinct-count ballot tabulating systems.
- Voters do not respond to technical details of how mark-sense scanners operate, they only respond to the instructions they are given and to the layout of the ballot. Therefore, the rules governing the interpretation of voter markings should depend only on these factors and not on the details of the scanning mechanism.
- We need to routinely conduct hand recounts of some small but significant number of ballots in order to monitor the extent to which our ballot tabulating machines are successfully counting the marks voters are actually making on the ballots. An appropriate approach might be to require a hand count of all votes in one randomly selected race in one randomly selected precinct after every election.

Prof. D. W. Jones is particularly concerned with the issue of incorrect calibration of optical scan devices, which may greatly impact the reliability of PBOS systems.

Another expert, Prof. M. I. Shamos, contends that “*there is no assurance that the machine will count the ballot the way it was marked by the voter*” and that “*there is no consistent method of determining voter intent from an optical ballot, so some voters will necessarily be disenfranchised through their use*”³⁰⁷.

One must also add that PBOS scanners, albeit simpler than the computers used in DREs, are not immune to tampering and hacking (but a manual recount is always possible). Also, the number of machines involved in PBOS systems is much lower than that needed in DRE systems: it may thus be easier to guarantee their integrity.

7.2.5 Reliability

A thorough study by a consortium consisting of the California Institute of Technology (Caltech) and the Massachusetts Institute of Technology (MIT) conducted in 2001 has attempted to measure the reliability of various voting systems in use in the USA [Caltech/MIT 2001]. They examine the number of uncounted votes (“residual votes”)

³⁰⁷ http://www.wheresthepaper.org/NYT03_14LettersToEditorWithComment.htm

in four presidential, senatorial and gubernatorial elections in the USA between 1988 and 2000.

We quote from their summary:

The central finding of this investigation is that manually counted paper ballots have the lowest average incidence of spoiled, uncounted, and unmarked ballots, followed closely by lever machines and optically scanned ballots. Punch card methods and systems using direct recording electronic devices (DREs) had significantly higher average rates of spoiled, uncounted, and unmarked ballots than any of the other systems. The difference in reliabilities between the best and worst systems is approximately 1.5 percent of all ballots cast.

This study can be taken to indicate that PBOS systems achieved a better level of reliability (as measured by the researchers) than DRE based systems.

7.2.6 About Cost

According to VoteTrustUSA³⁰⁸, every voting system (paper ballots counted by hand, PBOS, DRE, lever machines, punch cards, etc.) has costs associated with it. The hard costs can be categorized as falling into 3 areas:

- 1) Acquisition
- 2) Training
- 3) Election-specific Programming
- 4) Election-specific Administration.

Soft costs are those costs which are hard to quantify in dollars and cents. These soft costs include:

- 1) Electoral trust
- 2) System Reliability
- 3) Exposure to Litigation for contested results

Election-specific administration costs include:

- 1) Election-specific training of poll inspectors
- 2) Payment of poll inspectors and other election-day workers.
- 3) Printing any required paper ballots for a specific election
- 4) Printing any required information or instructions for electors
- 5) Printing and verifying polling lists of registered voters
- 6) Testing the software or mechanism of any voting machinery used
- 7) Collecting, auditing and storing election materials and records at the close of a specific election.

A study conducted by J. Washburn [Washburn 2006] dealing only with the cost of testing the software of any particular software machinery used to aid in the administration of an election has yielded the following results:

³⁰⁸ http://www.votetrustusa.org/index.php?option=com_content&task=view&id=2132&Itemid=26

Test	PBOS	DRE
One round of logic and accuracy testing	\$ 23.97	\$ 53.22
Testing for software errors	\$ 44.48	\$ 109.23

The New Yorkers for Verified Voting organization has compared the relative costs of acquiring DRE and PBOS solutions for New York State [NYVV 2005]. They get the following figures:

Type	Cost
PBOS	\$ 114,423,640
DRE	\$ 230,473,000

Both studies show a distinct cost advantage for PBOS systems over DRE systems, at least under the hypotheses used by the authors.

7.2.7 Applicability to Belgium

The use of PBOS systems in the USA relies on single-sheet paper ballots, of which one or both sides are used. The electoral system in Belgium is quite different from the American one, which has noticeably fewer political parties than ours.

It seems impossible to fit all the names of all the lists and of all the candidates on a single sheet of paper for all districts. Two solutions may be envisioned:

- One could have a system with two documents: a traditional list of parties with their lists of numbered candidates posted in every voting booth and a single-sheet ballot for marking and optical scanning on which no other information would appear than candidate numbers and associated voting targets.
- One could adopt a system with multiple-sheet ballots.

The first option induces the obvious risk of erroneous marking by the voter, who needs to rely solely on a number to designate a candidate. Experiments may be needed to find out whether this is a serious problem.

The second option induces no major technical problems, but it entails answering a number of questions:

- In how far must the election laws be amended and is there a political will to amend the existing code?

How must the organization of a polling station (voting precinct) be modified to guarantee the accurate handling of multiple-sheet paper ballots by election officials and by voters?

7.2.8 Conclusion

Because of its inherent simplicity, relatively low cost, ease of use by the voters, easy manual recount when needed, etc., the optical scanning of paper ballots should

certainly be considered as an option for a future eVoting system in Belgium.

7.2.9 References

- [Caltech/MIT 2001] Residual Votes Attributable to Technology – An Assessment of the Reliability of Existing Voting Equipment
Available for download at URL
http://www.hss.caltech.edu/~voting/CalTech_MIT_Report_Version2.pdf
- [Electionline 2006] *Election Reform: What's Changed, What Hasn't and Why*
Available for download at URL
<http://www.electionline.org/Portals/1/Publications/Final.2006.Annual.report.pdf>
- [Jones 2002] *Counting Mark-Sense Ballots: Relating Technology, the Law and Common Sense,*
Available for download at URL
<http://www.cs.uiowa.edu/~jones/voting/optical/>
- [NCvoter ???] *Advantages of Paper Ballot and Optical Scan (PBOS) Systems,* North Carolina Coalition for Verified Voting (no date)
Available for download at URL
<http://www.ncvoter.net/downloads/AdvantagesDisadvantagesOpScan.pdf>
- [NYVV 2005] *Analysis of Acquisition Costs of DRE and Precinct Based Optical Scan Voting Equipment for New York State,* New Yorkers for Verified Voting