Electronic Voting in Practice:

Comparative Insights from Four Countries

Australia, Belgium, France and Paraguay

December 2024

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Website: www.aweb.org

ISBN: 979-11-990748-0-4 (Online version)

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About the Author

Régis Dandoy, PhD, is a Professor at Universidad San Francisco de Quito (USFQ) in Ecuador and the Director of the Centre for European Studies. He specializes in comparative politics, elections, and electronic voting. With extensive teaching and research experience across Europe, Asia, and Latin America, he has authored numerous publications on federalism, regionalism, and voting behavior. Dr. Dandoy has also served as a consultant for international organizations and election management bodies.

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Introduction

This book consists of an evaluation of four experiments of electronic voting carried out in democratic countries and the lessons that could be learned from these experiences for the introduction of electronic voting in other countries. The book is structured around three dimensions of electronic voting: the political dimension of the electronic voting system, the legal and regulatory dimension (mainly related to the electoral system), and the acceptance of electronic voting by voters. Based on an analysis of the advantages and disadvantages of electronic voting for each of the three dimensions, this book evaluates the possibility of implementing electronic voting in other contexts. Emphasis is placed on the practical feasibility of this voting method for different types of voter populations (for example, voters residing abroad) and on the possibility of using electronic voting securely.

The four selected countries were chosen from a group of around twenty countries that had tested electronic voting for a significant share of their population during political elections at the national or regional level. The four cases studied are Australia, Belgium, France, and Paraguay. In cases where the electronic voting system varies according to regions within the selected country, the evaluation will be carried out on a specific territorial entity, namely New South Wales in Australia and French residents abroad. In the Belgian and Paraguayan cases, electronic voting was used over a large part of the national territory.

Besides the geographic diversity spanning three continents and the different political traditions, the four selected cases present very different experiences regarding electronic voting. The Belgian and Paraguayan experiences rely mostly on a system of on-site electronic voting, even if Internet voting has been discussed in recent years. On the contrary, Australia has practically no experience in on-site electronic voting but has used remote electronic voting (i.e., Internet voting) for many years. France presents a mixed experience as the country used two systems in parallel: on-site electronic voting in some municipalities on the French territory and Internet voting for its residents living abroad.

In addition, the four countries have a rather large experience of electronic voting. Belgium is one of the pioneers of electronic voting worldwide and implemented electronic voting for the first time in 1991. On-site electronic voting was implemented for the first time in 2001 in Paraguay and in 2002 in France. An Internet voting system was used for the first time in France the following year. Comparatively speaking, the Australian experience is more recent as Internet voting was implemented for the first time in 2011.

Finally, our case studies present an interesting mix of positive and negative experiences as electronic voting has been implemented, developed, adapted, and (partially) suspended in all four countries, while it remains in use in three of them. Internet voting was suspended in France between 2014 and 2021[1], while this system is no longer in use in Australia since 2021. Similarly, on-site electronic voting was suspended in Paraguay between 2008 and 2019. In Belgium, on-site electronic voting has been suspended in one region of the country since 2017 while it remains in use in the other regions.

[1] The French on-site electronic voting has never been suspended since the first pilots in 2002.

In these selected countries, the performed analysis was non-discriminatory and focused on all types of voters potentially affected by electronic voting: citizens living on the national territory, nationals residing abroad, citizens living at a significant distance from the polling station, citizens unavailable (for professional, study, or health reasons) or traveling abroad, as well as voters with different types of disabilities. Particular attention was also given to the measures taken in these countries concerning voters who do not have access to the Internet or do not have basic digital skills.

The detailed inventory of experiences relating to electronic voting carried out in the four selected countries was made using publicly accessible and transmittable documents and information. The analysed documents include electoral laws and electoral regulations and orders; official documentation provided by the institution responsible for organizing the elections; parliamentary debates and expert reports provided to assemblies; scientific articles and other documents from the academic world; press articles and opinion pieces in national dailies; official documentation of the contracted companies; public documents and information (e.g. online tutorials) provided to polling station workers and voters, etc. The information and data analysed mainly include aggregated electoral results (aggregate level) and the results of scientific surveys carried out among voters (individual level).

Structure of the Paper

Although this paper presents four case studies ordered in alphabetical order, each chapter corresponds to one case study and is structured around three dimensions of electronic voting: the organizational and political dimension, the legal and regulatory dimension, and the acceptance of electronic voting by citizens.

The first dimension concerns the socio-political aspects of electronic voting, particularly the decision-making process and the establishment of an electronic voting system by the authorities. These aspects, related to acceptance, encompass the (sometimes changing) position of political and institutional elites (including elected officials and candidates) and the presence of consensus among them. This work analyses the positions of political actors through a series of public documents (which may include party manifestos of the main political parties or parliamentary debates) to understand the positions and arguments (for and against) of the different political actors. The collected elements encompass not only the experimental and monitoring phases of electronic voting but also the long-term decisions made by political actors regarding whether to continue or discontinue electronic voting in the selected countries.

The second dimension discusses the regulatory and legal aspects related to the organization of the electoral process in the four selected countries. This inventory focuses on the legal situation before and after the experimentation with electronic voting, as well as the specificities of the electoral system and the rules in place for the organization of elections. Emphasis is also placed on the extent of legal changes required by the implementation of electronic voting (e.g. revision of the constitution, changes in electoral laws, number of regulations and orders specifically dealing with electronic voting, etc.). By comparing this regulation with that in place in regions or municipalities using paper voting in these four countries, this dimension also assesses the complexity of the legal implementation of

electronic voting. Among the elements studied in the four electoral systems of the selected countries, particular attention was given to the types of elections and the number of voters affected by electronic voting, as well as a series of elements and principles of the electoral system, such as the guarantee of secrecy of the vote, registration of voters, size of electoral districts, and determination of the electoral calendar and voting period.

The third dimension concerns the acceptance of electronic voting among citizens following its implementation, and its potential impact on voting behaviour. This analysis of acceptance also includes a detailed overview of the context in which electronic voting is integrated, as well as various elements related to socio-political issues. More precisely, this dimension analyses the reception given by citizens to electronic voting. Digital skills and access to and use of the Internet among the population were studied using official statistics. The structure of the vote (e.g. turnout, percentage of blank and invalid votes, etc.) was studied using electoral statistics, while the perception that voters have of electronic voting (confidence in the electronic voting system, difficulties in voting, etc.) was studied based on available public opinion surveys.

Chapter 1. Australia

1.1. Voting System in Australia (New South Wales)

Since 2011, the state of New South Wales (NSW) has offered the opportunity to vote online to certain groups of people, in addition to the options of voting by telephone, by post, and in person. The introduction of Internet voting in NSW was triggered by a 2008 judgment finding that the NSW Electoral Commission had acted in a discriminatory manner by failing to provide a blind person with the means to vote independently and secretly, as opposed to the majority of the electorate.[2] At the request of the NSW Parliament, the Electoral Commission in 2010 investigated the possibility of offering an Internet voting option that would allow independent and secret voting to people who could not do so through available voting methods. Based on a positive report[3] and initial contacts made with private providers, the decision was taken to implement an internet and telephone voting solution for the 2011 general elections.

The choice of the voting system and its updating process took place based on a series of contacts with potential suppliers, public requests for information, and calls for tender.[4] The design, implementation, and updates of the voting system, called iVote, were entrusted to the company Scytl for all the elections that have taken place since 2011. The system has undergone a certain number of developments, and the following description is based on the system version used in 2019. [5]

As the use of iVote is limited to a relatively small portion of the population, voters wishing to vote by iVote must submit a registration request to the Electoral Commission. During this registration, the voter also chooses a password or a PIN code which will be used for identification. If the voter's registration is authorized, the voter receives an iVote identifier, which can be sent to him by the Electoral Commission via different channels: SMS, email, postal mail, or telephone. The voter's voting ID and password are also used to protect a signature key that will be used by the voter to sign their ballot.

Voters whose registration has been confirmed can vote on the election website. They authenticate themselves based on the username and password generated during the registration procedure, confirm that they have not already voted elsewhere, and submit their encrypted ballot using the key public corresponding to the secret keys generated by the Electoral Office and signed. The voter then receives a receipt derived from their ballot as well as a QR code which can be used during subsequent verification stages.

One of the initial objectives of iVote was to offer a complementary voting channel to paper voting, in order to allow more people to vote without assistance. The Internet voting system was thus introduced at the same time as a telephone voting option. In practice, it turned out that these voting channels were used much more widely by voters located outside NSW than

[2] Elections Québec (2020).
[3] Electoral Commission NSW (2010).
[4] Electoral Commission NSW (2010); Electoral Commission NSW (2017).
[5] Electoral Commission NSW (2019a)

by people with disabilities, who used these channels less than had been anticipated.[6] Telephone voting has had very little success and in 2015 and 2019, more than 99% of people who registered to vote online or by telephone ended up voting online.

1.2. Socio-Political Dimension

1.2.1. Previous Experiences with Electronic Voting and Postal Voting

In Australia, postal voting and early voting at polling stations have been available to certain categories of voters for many years. Before the 2011 regional elections in New South Wales, various pilot experiments in on-site electronic and Internet voting were carried out at the national level (focused on the armed forces and people with visual impairments), in the state of Victoria (focused on people with disabilities) and in the Australian Capital Territory. Internet voting was frequently used for non-political elections in a range of Australian businesses and non-governmental organizations, such as the National Roads and Motorists Association (NRMA) board elections in 2001.[7]

At the national level, the Australian Electoral Commission conducted two trials of electronic voting during the 2007 federal election. The first was a system allowing military personnel to vote over the Internet using computers installed in Afghanistan, Iraq, Timor-Leste, and the Solomon Islands. The 1.500 voters declared themselves very satisfied and had a higher rate of valid votes than the population using paper voting.[8] The second trial in 2007 was based on an electronically assisted voting system to allow visually impaired people to vote early. Younger voters were generally more comfortable using the electronic system, while older voters tended to need assistance. Turnout was lower in locations that were difficult to access and did not have the support of visually impaired organizations. 97% of users said they were satisfied with the experience and associations for the visually impaired praised the independence and confidentiality provided by electronic voting in 2007.[9] These pilot experiments were not extended during the 2010 federal election, mainly due to cost issues.

In the Australian Capital Territory, on-site electronic voting has been used for regional elections since October 2001. This system has been used five times for regional elections in 2004, 2008, 2012, 2016, and 2020. Machines are installed in different electoral precincts in the Territory and voting was possible up to 3 weeks before polling day. The voting machines operate in 12 languages and offer a range of audio and visual features to help the visually impaired and those with language difficulties. Electronic voting has significantly improved the speed and accuracy of elections, improved voter turnout, and reduced counting times. Up to 20% of votes, or about 44,000 votes, were cast electronically in the October 2008 election, and the vast majority of voters say they are satisfied with the experience.[10] In addition, the Territory uses electronic electoral registries and character recognition for scanning paper ballots. During the regional elections of 17 October 2020, voters in the Australian Capital Territory were authorized to vote online (via the platform https://www.osvote.act.gov.au)

[6] Electoral Commission NSW (2015).
[7] Smith (2009).
[8] Allen Consulting Group (2011).
[9] Smith (2009).
[10] Allen Consulting Group (2011).

early from 28 September to 17 October 2020. 1,554 voters used that Internet platform to express their votes.

In the state of Victoria, the 2006 regional elections also saw a pilot of electronic voting. People with disabilities voted early in one of the six electoral precincts and their printed ballots were sent to their respective polling stations. This system was expanded in the 2010 election to include phone voting. Voters' evaluation of this electronic vote was extremely positive.[11] Finally, Western Australia also offered Internet voting in 2017, supported by the iVote platform of New South Wales. The internet voting channel was available to voters with disabilities and was used by 2.200 voters. For the 2025 regional election, Western Australia is developing a procurement strategy for a solution of an electronic voting kiosk.[12]

If electronic and internet voting was a subject discussed with a certain enthusiasm in the early 2000s, things have changed in recent years. In 2013, the publication by the Electoral Council of Australia and New Zealand of a study of Internet voting confirmed the lack of desire to develop or expand Internet voting at the federal level.[13] The failure of the 2016 online census carried out by the Federal Statistical Office had a deterrent effect, particularly on the use of the Internet during elections.[14]

1.2.2. Implementation of Internet Voting

The introduction of Internet voting in NSW was carried out very quickly – in almost two years – and without being based on a real political or partisan project. In 2008, the State Administrative Decisions Court rendered a judgment in a case concerning a visually impaired person who wished to vote independently and secretly in the elections without having to be assisted. In its verdict, the court states that the electoral commission acted in a discriminatory manner and did not treat this visually impaired person like the majority of voters. Blindness and visual impairment are conditions that can significantly affect a person's participation in democratic processes. As a signatory to the United Nations Convention on the Rights of Persons with Disabilities, Australia has an international legal obligation to protect the right of all people with disabilities to vote by secret ballot.[15]

To remedy the situation, the NSW Electoral Commission introduced Braille ballot papers in the 2008 elections and commissioned a report in 2009 on the possibility of implementing electronic and/or Internet voting in the state. Among the visually impaired associations consulted, only one (the Royal Society for the Blind of South Australia) expressed a preference for Internet voting over electronic voting in polling stations.[16] More generally, interest groups representing voters with disabilities or visual impairments have called for the establishment of accessible voting methods that guarantee the secrecy of the vote.[17]

[11] Allen Consulting Group (2011).
[12] Western Australian Electoral Commission (2023).
[13] Electoral Council of Australia and New Zealand (2013)
[14] Maley (2020).
[15] Allen Consulting Group (2011).
[16] Smith (2009).
[17] Barry & Brightwell (2011).

This report presents an overview of the different elements to take into account in the event that Internet voting is implemented in NSW. When it comes to voter turnout, the report says the ease and appeal of internet voting are unlikely to affect youth turnout. Conversely, Internet voting could increase turnout among voters living far away from polling stations in rural and remote areas of NSW. In addition, these voters also experience difficulty voting by mail due to intermittent mail services. In addition, an increasing number of voters would be outside the NSW borders on election day.[18]

Regarding the voting period, the report observes that a growing share of voters vote by mail or vote early at polling stations. For example, in the 2007 federal election, 13.36% of NSW voters voted by mail. The increased use of mail voting would mean that some elements of Internet voting (remote access, voting before election day, and the need for special security measures) will be familiar to an increasing number of voters. The report suggests the ability to vote via the Internet for a period before polling day would be welcomed by a significant share of NSW voters. Additionally, because of its speed, Internet voting could give some voters, particularly those in rural and more remote areas, more time than they currently have to review and cast their ballot.[19] The experiment with Internet voting in NSW would therefore take place in a context where an increasing number of voters are voting early.

In addition, the report says the preferential ballot papers used in NSW are relatively complex and have long posed problems for some voters, such as invalid voting. The report suggests that electronic voting could help reduce these problems and produce greater voter equality in NSW. An Internet voting system could address the complexity of ballots and be designed to alert voters when they have not formally completed their ballot. This system could also allow voters to review their votes and confirm them before the final submission of their ballots. Internet voting could have instructions in multiple languages and be designed to help voters with disabilities vote. Additionally, elections based on proportional representation, such as those used for the NSW Legislative Council, are difficult to count manually, and moving to electronic voting could help avoid manual counting errors.[20]

According to the 2009 report, probably the most contentious element of a move to Internet voting would be the format of the ballot. The report assumes that parties and candidates are very sensitive to possible electoral disadvantages caused by the ballot format. Nevertheless, the report believes that electronic voting has the potential to facilitate the resolution of certain problems of inequality between candidates by, for example, rotating the order of candidates. These elements can be integrated more easily into electronic ballots than into paper ballots. Regarding privacy, the move to internet voting would require that privacy issues be adequately addressed. The confidentiality of Internet voting is more difficult to guarantee given that it is not supervised. The report notes that NSW has not historically witnessed significant electoral fraud. Little or no fraud has been discovered in the use of mail-in voting.[21]

Finally, the report recommends that – if NSW decides to implement electronic voting or internet voting – this implementation should first be carried out through pilot projects.

[18] Smith (2009).
[19] Smith (2009).
[20] Smith (2009).
[21] Smith (2009).

Examples cited in the report include electronic voting for a by-election (the outcome of which will not affect the composition of government), registered voters in a small number of municipalities, out-of-state voters, or voters with disabilities. The report finds that NSW boasts relevant expertise on electronic voting among political science and information technology researchers at universities across the state. Combined with the broad digital skills observed in the population, this report suggests the basic elements that were used to test the feasibility of electronic voting in NSW.[22]

Following this generally positive report, NSW Premier Kristina Keneally announced on 16 March 2010 that the Electoral Commission would investigate Internet voting for visually impaired people to improve their democratic right to a secret ballot. This statement is reflected in an amendment to the Elections and Electorates Amendment Bill 2010, and asks the Electoral Commission to "conduct an investigation as soon as practicable into the possibility of providing Internet voting to visually impaired and disabled persons for elections under this law. And, if this Internet voting is possible, to propose a detailed model of this Internet voting for adoption."

In the coming days, the NSW Electoral Commission began reviewing the implementation of Internet voting for visually impaired people and people living with other disabilities. At the end of its analyses and consultations, the electoral commission confirms its desire to implement Internet and phone voting as additional voting methods for the 2011 regional elections.[23] The commission also suggests broadening the categories of voters able to vote via the Internet and by phone to voters living far from the polling station. Indeed, although the initial scope of the report only concerned visually impaired voters, it emerged during the consultations that an electronic voting system would benefit a wider audience of voters: voters with other disabilities or living in remote rural areas.

The Electoral Commission estimates that the number of voters belonging to these categories (visually impaired people, people with disabilities and those living far away) would amount to nearly 430,000 individuals (out of a total of more than 4.5 million voters): 70,000 visually impaired voters, 330,000 voters with disabilities and 31,000 voters living in rural areas. Until now, most of these people voted by proxy, excluding the possibility of their vote remaining secret. The feasibility study indicates that around 11,000 voters would vote online. The electoral commission report therefore concludes that it is possible to offer Internet voting - called iVote - to voters who are visually impaired, have other disabilities, or live in remote rural areas for the 2011 regional elections.[24]

This feasibility report on an Internet voting system was sent to the Prime Minister's Office on 23 July 2010 and tabled in Parliament on 2 September 2010. On 2 December 2010, the NSW Parliament adopted the report (amended to include the voters who are out of state on election day) and decided on the allocation of funds necessary for its implementation. This legislation thus allows the introduction of Internet and phone voting in regional elections for the categories of voters recommended by the Electoral Commission, as well as for voters who are out of the state or out of the country on election day.

[22] Smith (2009).
[23] NSW Electoral Commission (2010).
[24] NSW Electoral Commission (2010).

In 2015, the Electoral Commission listed two main reasons for the implementation of Internet voting. First, iVote would help reduce systemic errors in current voting processes. This would thus imply a reduction in the voting of invalid ballots, a reduction in the loss of ballots in transit between the voter and the counting centre, as well as a reduction in counting and transmission errors. Second, iVote would reduce the cost of the voting process and reduce the risk of failure associated with postal voting. Indeed, the Electoral Commission emphasizes that postal voting is becoming increasingly problematic as an effective voting method for voters residing far from polling stations and could cease to be a viable solution. As the use of postal services declines in the face of digital alternatives, the quality of postal services also declines. The fear is that, in the near future, the quality of the postal services will call into question the feasibility of postal voting, the distribution of ballots, and the return of ballots within acceptable time frames.[25]

1.2.3. Evolution of Internet Voting Project

Following the Internet voting pilot project in NSW, various lessons were learned and recommendations were made to improve the project for future elections. The Electoral Commission used external expertise, in particular, to develop security mechanisms and to prevent risks. It commissioned a group of independent specialists to write reports on the use of iVote in each general election. Among these recommendations is the need to allow more time for reflection and implementation of the project (overall, it was implemented in almost six months) and to carry out more tests, among others in an environment similar to that of regional elections in NSW. Other recommendations concern the extension of Internet voting to other groups of voters, or even to the general population, in order to reduce the costs of the elections.

More specifically, it is suggested to allow geographically disadvantaged voters to vote online. This category would include not only voters living in remote rural areas, but also voters out of state on election day, including overseas, in Antarctica, or on cruise ships.[26] It also suggested an increased promotion of iVote by visually impaired and disabled voters to civil society and associations of defence of the rights of citizens with disabilities; and a more significant media campaign to raise awareness among the general public of the existence and eligibility conditions of iVote, as well as the concrete modalities of Internet voting.

Some recommendations also concern the governance of the project, with the creation of new project support bodies such as a technical advisory group and a stakeholder reference group (based on the participation of elderly, disabled, visually impaired, and other categories of target voters to contribute to the understanding of the requirements of these stakeholders). Finally, it is suggested to publish the results of Internet voting separately. This publication could improve confidence in the electoral results given that the votes obtained by the Internet could be compared to the results obtained with other voting methods.[27]

Some of these recommendations were followed by the Electoral Commission of NSW and the 2015 regional elections continue the pilot of iVote, with some modifications. The objective of

[25] NSW Electoral Commission (2015).
[26] Barry et Brightwell (2011) ; Allen Consulting Group (2011) ; Barry et al. (2013).
[27] Allen Consulting Group (2011) ; Barry et al. (2013).

the iVote 2015 project is to improve the transparency, integrity, and verifiability of voting and counting processes. Among the changes made compared to 2011, the main ones concern the voting methods (as voters are offered the possibility of voting by Internet from a place under the control of the Electoral Commission), the ability for voters to verify their vote after the election and the period of only a few seconds between voter registration, distribution of credentials required to vote, and creation of the ballot in the voting system (instead of the 24-hour delay existing in 2011 between registering for iVote and distributing the credentials required to vote).[28]

The evaluation reports submitted after the 2015 elections also contain various recommendations. Among other things, based on the 34 recommendations made by the Joint Standing Committee on Electoral Matters (2016), the Electoral Commission modified the iVote project for the 2019 regional elections: the establishment of an independent expert group to conduct a comprehensive security investigation of the iVote project in 2017, improvements to the voting and verification modules, system security, as well as review mechanisms, auditing and monitoring. Other changes have a direct impact on the online voting experience. The categories of voters who can vote online have been extended to anonymous voters[29]. In addition to being able to verify their vote by phone, voters can now do so using a mobile app. The websites used by voters – including the iVote website – are available in several languages other than English (Arabic, Chinese (simplified), Chinese (traditional), Greek, Italian, and Vietnamese). Finally, a series of media campaigns to raise voter awareness was put in place. Specific adverts were delivered to voters with disabilities, voters living in remote rural areas, culturally and linguistically diverse communities, and voters residing outside NSW and overseas.[30]

The issue of Internet voting has been of little interest to political parties in NSW, with the exception of the National Party of Australia (conservative) which proposed in 2008 to use Internet voting as a means of allowing remote voters from rural areas to vote more easily.[31] However, following the legal decisions behind Internet voting, the political consensus around this issue quickly became quite broad. As proof, the iVote project was initiated and implemented by regional Prime Minister Kristina Keneally, belonging to the Australian Labor Party (social democratic), and the three prime ministers who succeeded her continued this initiative despite belonging to another political party (Liberal Party - liberal-conservative) and were in coalition with the National Party of Australia.

Political parties are key players in the NSW Internet voting. Representatives of parties and candidates can, for example, observe all stages of voting, from voting tests carried out before the election to the final decryption process. The NSW Electoral Commission also devotes resources to informing political parties and candidates about the Electoral Act and the Election Finance Act (2018). For example, information sessions were also organized in 2019 for all candidates, political parties, and their representatives regarding the iVote system (system, procedures, audit, etc.).[32]

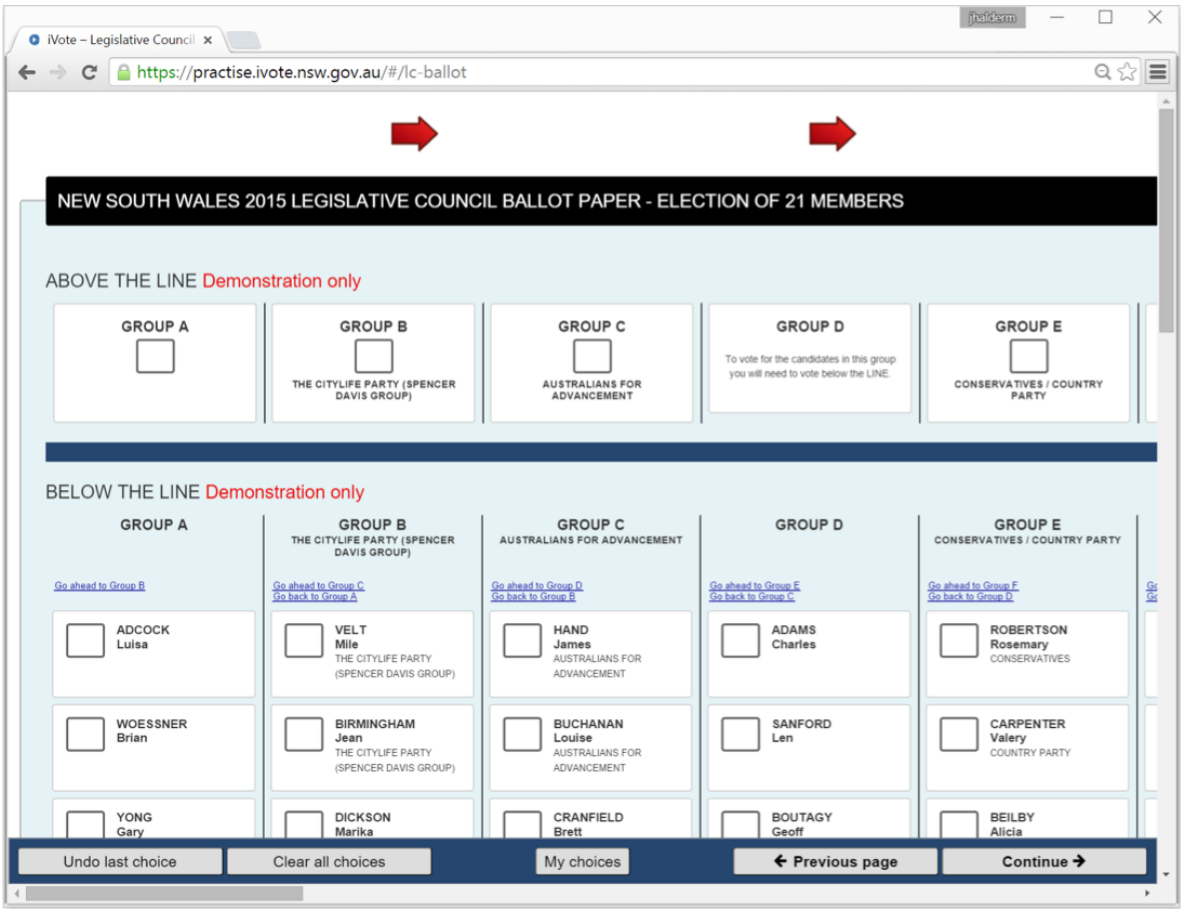
[28] Brightwell et al. (2015); NSW Electoral Commission (2015).
[29] Voters who believe that including their address on the publicly accessible voter list could put their safety or that of their family at risk can request to be registered as anonymous voters.
[30] NSW Electoral Commission (2019).
[31] Smith (2009)
[32] NSW Electoral Commission (2019).

Following the 2011 regional elections, various experts and opinion surveys indicated considerable voter satisfaction with internet voting. Following this positive outcome of the 2011 elections, the NSW Electoral Commission recommended extending internet voting to municipal elections and other categories of voters, among other things in order to make the cost of the iVote system profitable.[33] However, the NSW regional parliament has been somewhat reluctant to expand internet voting, mainly because a security issue with the iVote system could impact the legitimacy of the election results if voting via the Internet was offered to a wider segment of the electorate. Moreover, and even if they were not very present in the campaign to promote iVote in 2011, the political parties of NSW were involved in the evaluation of the Internet voting pilot project and in the parliamentary debates. They also often made constructive suggestions, such as multilingualism (Labor), external control (Greens) or the training of polling station staff (National Party of Australia).[34]

During the 2015 regional elections, a controversy emerged about political parties, quickly relayed by the media. It appeared that the votes cast over the Internet were biased and that the political parties located to the left of the ballot paper received more votes with Internet voting than with paper voting. The Labor Party, located in the 11th column on the ballot paper, recorded almost 20% fewer votes among Internet voters than among other types of voters. In other words, the party obtained 25% based on Internet voting only and 31.1% overall in the Legislative Council elections. The party told the media that it had - according to it - obtained the same score among the different categories of voters, thereby suggesting that there was a problem with the Internet voting system. Conversely, the No Land Tax Party, which occupied the first position on the left of the ballot, received a much higher bonus than usual among voters who voted online: the party obtained 1.7% of the total vote, but not far from 4% of the votes cast via the Internet. Since iVote relies on the use of devices with different format displays and which create a ballot window effect, iVote ballots are displayed differently than what is seen with paper ballots. This difference in the iVote interface and in the display of the ballot on the screen could have influenced the behaviour of voters who voted online.

Following these revelations, the Electoral Commission conducted an in-depth investigation into this phenomenon. The Electoral Commission recognizes that there was a bias in favour of parties located at the top left of the Internet ballot compared to other voting methods. The Electoral Commission believes this bias is likely due to the way iVote's user interface was implemented for these elections. The user interface placed the user's initial viewing window at the top left of the ballot. Although users were encouraged to scroll both vertically and horizontally, it appears this was not done by all voters.[35]

[33] NSW Electoral Commission (2011).
[34] Joint Standing Committee on Electoral Matters (2016).
[35] NSW Electoral Commission (2015b).



Problem of scrolling vertically and horizontally. Source: Halderman J.A., Teague V. (2015)

1.2.4. End of Internet Voting Project

Apart from that issue, few formal complaints have been made regarding internet voting during regional and local elections in NSW.[36] In the 2011 regional elections, 175 voters appeared to have had voting problems but none filed complaints indicating electoral fraud. Similarly, very few technical issues were encountered in 2011 during the registration or voting processes. During a post-election survey, 90% of respondents encountered no technical problems. Of the 10% who experienced a technical problem with the iVote system, 6% of respondents encountered problems during the registration process, 3% during voting, and 1% experienced problems at different moments of the process. The technical problems did not raise serious concerns about the security of the vote. Of the 10% of respondents who had problems, the majority (81%) suggested it did not raise concerns about the security of their vote. When it came to seeking help, 19% of respondents requested help registering or using iVote. The visually impaired were more likely to ask for help (32% of these respondents asked for help) as well as non-English speaking respondents (23%). The demand for assistance was higher for online registration and voting (19%) than for phone registration and voting (11%).[37]

Nevertheless, in 2019, the iVote platform experienced intermittent performance issues that negatively impacted the accessibility and usability of the system during the registration and

[36] Barry & Brightwell (2011); Brightwell et al. (2015).
[37] Allen Consulting Group (2011).

voting periods, particularly the day before the election day and election day itself. Regarding the impact of these disruptions on voters, it is estimated that between 35,000 and 45,000 people were affected in one way or another by these disruptions. Thus, around 12,000 voters started to register for iVote but did not complete their application while around 30,000 voters registered for iVote but voted using another method (compared to around 11,000 in 2015). Based on voter feedback, the most common technical issues involved voters being registered but not receiving their iVote number, forgetting their password, or being unable to register or vote due to problems with the iVote system. In those same elections, the voter call centre operated for an eight-week period leading up to Election Day. 27.57% of total calls were about issues with IVote.[38]

In 2021, the Local Government Act was amended to allow Internet voting for the first time for the local council elections, in response to the challenges of COVID-19. However, at the occasion of the December 2021 local elections, the online voting system witnessed technical problems. Some iVote users were unable to gain access to the system to vote, partly due to the increased volume of people using the iVote system. Almost triple the number of voters has used iVote at these elections as compared to previous elections. In the 2019 regional elections, 234.401 votes were cast using iVote while no less than 652,983 votes had been cast using the system for the 2021 local elections. there was a delay in sending out credentials to electors who applied late in the voting period, due to an unidentified technical error. Many eligible electors did not receive their credentials before the voting closed and were therefore not able to cast their vote through iVote.

An analysis commissioned by the NSW Electoral Commission in 2022 found that 34 voters in Kempsey, 55 in Singleton, and 54 in Shellharbour who attempted to use the iVote system were prevented from casting their vote. In March 2022, the Supreme Court declared void the election results in three wards (Kempsey, Singleton, and Shellharbour). The reasoning of the court was that - even though the number of voters who were unable to vote was small - their omission had potentially an impact on the results in all three councils, in particular, because the electoral system is a proportional one. The new election took place on the 30 July 2022.

Partly due to the "reputational damage" of the system failure, the Electoral Commissioner has confirmed it will be phasing out the Internet voting system and has decided not to use Internet voting in the 2023 regional elections. To maintain the security and transparency of the elections, paper-based voting should continue as the primary voting channel for the foreseeable future.[39] The conclusions of the NSW report state that “Internet voting is a high-risk channel, facing a worsening cyber and misinformation threat environment involving state and criminal actors seeking to disrupt elections. Moreover, the processes for verifying votes and other assurance steps are not generally understood by electors or political participants.”. The Electoral Commission decided to allow 4,000 electors who are blind or have low vision to use Internet voting for the 2027 elections and a system based on Kiosk voting machines at voting centres will be envisaged for 2028 local elections.

[38] NSW Electoral Commission (2019).
[39] NSW Electoral Commission (2023).

1.3. Legal Dimension

1.3.1. Existing Legislation and Adaptation

The NSW Electoral Commission is the body responsible for organizing elections in NSW. With regard to Internet voting, the Electoral Commission has the power to approve "technology-assisted voting" procedures, but any procedure must provide: pre-registration of eligible voters; creation of registers of those who can vote; vote authentication; maintaining the secrecy of the vote; and secure transmission of the vote. The NSW Electoral Commission is widely regarded as a professional and highly competent body.[40]

The Parliamentary Electorates and Elections Act of 1912 did not allow the use of Internet or telephone voting. The adaptation of NSW electoral legislation was carried out in two stages. First of all, the electoral law existing before the 2011 regional elections was amended. The 1912 Act was amended by the Parliamentary Electorates and Elections Further Amendments Act 2010. The Act, which included legislation on technology-assisted voting and other minor changes, was passed by the regional parliament on 2 December 2010 and sanctioned on 7 December 2010. The process was a real race against the legislative watch since it was absolutely necessary to promulgate the legislative amendments no later than December 2010 given that the elections took place on 26 March 2011.

In addition to its hasty nature, the principle which guided the regulatory modification action was that of flexibility. The idea was that Internet voting could take different forms and that many practical and technological aspects related to Internet voting should have been left to the discretion of the Electoral Commission.[41] The legislation used the generic term "technology-assisted voting" rather than Internet voting, left the iVote project free to be phone-based Internet-based, or both, and allowed the Election Commission to adapt iVote to advances in technology and security.[42] More concretely, the 1912 law was amended to provide for technology-assisted voting for people who are visually impaired or have other disabilities and for people unable to vote due to their geographic location.[43]

In 2015 and based on the experience of 2011, the Joint Standing Committee on Electoral Matters (JSCEM) of the NSW Parliament recommended further legislative changes. These include facilitating dialogue between disability groups, parties, and candidates and providing greater information to voters; the possibility of counting votes cast online separately; and the extension of internet voting to voters who are outside their constituency on polling day for regional by-elections.[44]

The second step in adapting NSW electoral legislation was the replacement (rather than amendment) of the Voters and Parliamentary Elections Act 1912 which had governed the

[40] Smith (2009).
[41] Although the legislative changes are not flexible enough in terms of extending eligibility for the internet voting system to other groups of voters or to all voters in general. These possible extensions require further modification of the legislation. See: Allen Consulting Group (2011).
[42] NSW Electoral Commission (2010).
[43] Parliamentary Electorates and Elections Act 1912 No 41, Part 5, Division 12A, Technology assisted voting.
[44] NSW Electoral Commission (2015)

conduct of elections in NSW for over a year. century. On 30 November 2017, the Electoral Act 2017 No 66 replaced the 1912 Act. The new Electoral Act sets out how regional elections in NSW are run and reflects modern electoral practices and technological advances. Among the main changes in the 2017 electoral law, we note the extension of iVote for anonymous voters. In addition, the electoral law has been aligned with the principles of the Electoral Council of Australia and New Zealand (ECANZ) and the Council of Europe and has taken into account each of the 49 Council of Europe recommendations.[45] The new electoral law has been amended five times since 2017.

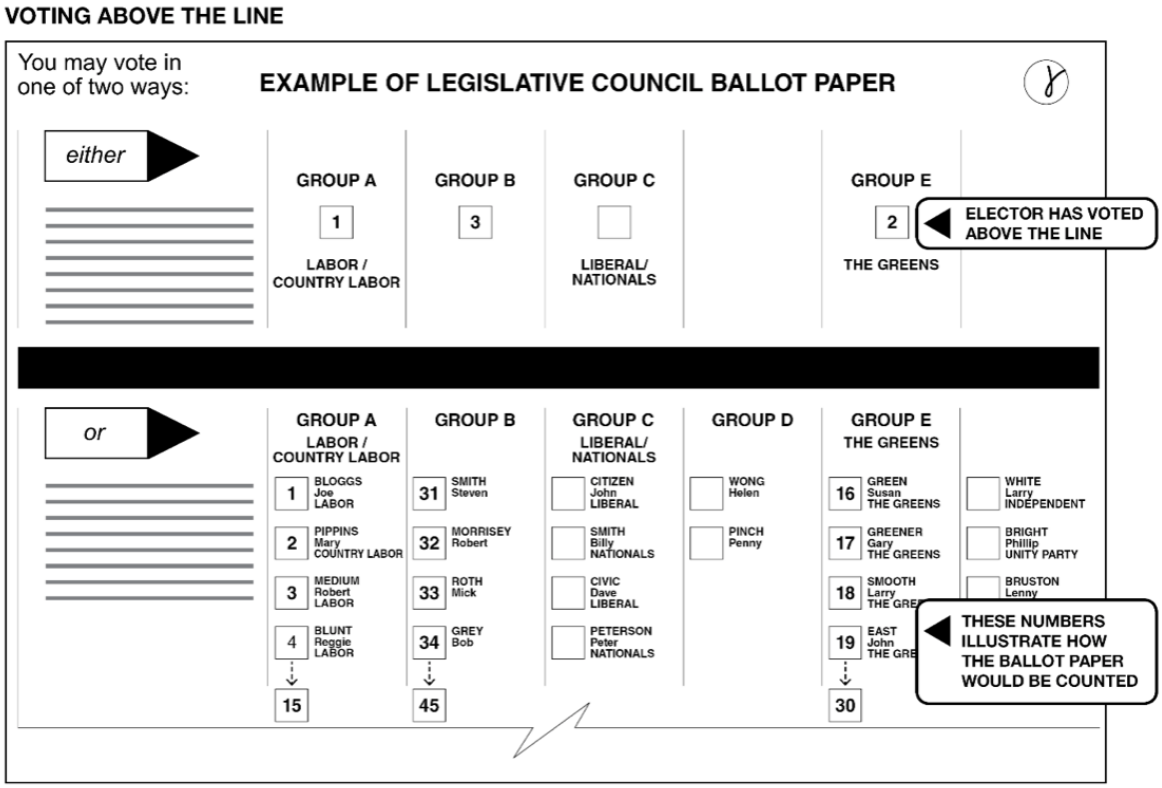
1.3.2. Electoral System

The rules relating to the election of members of the NSW Legislative Assembly and Legislative Council are contained in the NSW Constitution Act 1902, the Voters and Parliamentary Elections Act 1912 (2011 and 2015 regional elections and regional partial elections from 2011 to 2017), and the electoral law of 2017 (regional elections of 2019 and by-election of 2018). As in the rest of Australia, voting is compulsory in all elections in NSW. Voters using the iVote platform can complete their ballot or submit a blank ballot but cannot cast invalid votes.

Regional elections in NSW are held every four years on a fixed date: the fourth Saturday in March. Members of the Legislative Assembly (lower house) are elected for a four-year term and members of the Legislative Council (upper house) for eight years. The Legislative Assembly is made up of 93 members, with one elected from each district. The entire Legislative Assembly is renewed every 4 years. The Legislative Council has 42 members elected for a term of 8 years, half of whom are elected at each election. A by-election may be held when a seat of a member of the Legislative Assembly becomes vacant through resignation, death, or any other reason. There are no by-elections for the Legislative Council. Electoral districts used for regional elections are geographic areas whose boundaries are clearly defined on constituency maps containing approximately equal numbers of voters. Each district is represented by one of the 93 seats in the Legislative Assembly. For the Legislative Council, the district is the entire state.

The ballot papers used in NSW and the resulting counting process are quite complex. The election of single-member seats in the Legislative Assembly is done utilizing an alternative vote. The alternative vote system is a type of ranked-choice voting used in single-seat elections with more than two candidates. Voters can rank the candidates in order of preference by entering the number of their ranking in the box corresponding to the candidate (starting with the number 1). Members of the Legislative Council are elected based on a single transferable vote system with optional preferential voting (or above-the-line voting). In this relatively proportional system, voters can rank political parties in order of preference (i.e., vote above the line) by entering their ranking number in the party box or can rank candidates in order of preference within the same list (numbers 1 to 15) and other lists (from number 16) (i.e., voting below the line).

[45] NSW Electoral Commission (2019).



Note: In this example assume Groups A, B, C and E have 15 candidates in their group.

Source: NSW Electoral Commission website

1.3.3. Elections and Voters

Internet voting in NSW was implemented in three regional elections (2011, 2015, and 2019) and 17 regional by-elections (between 2011 and 2018). In terms of the calendar, three different periods must be distinguished: the registration period for the Internet voting system (on the iVote platform website ivote.nsw.gov.au or by phone), the Internet voting period, and election day. The registration period expanded significantly between 2011 (only 17 days) and 2015 and 2019 (respectively 45 and 41 days) while the voting period remains essentially the same (12 days in 2011 and 13 days in 2015 and 2019). In 2011, Internet voting was offered as an early voting option, but since 2015, registered voters can vote online and early or on election day.

During the 2011 regional elections, the system was available from 17 February 2011 to allow visually impaired voters to test and train with the system and for pre-registrations (before the closing of the authorized lists). Voter registrations in the iVote system took place from 7 March 2011 to 23 March 2011. Internet voting took place from 14 March 2011 at 8 a.m. until 25 March 2011 at 6 p.m. For voters voting at polling stations, the election took place on 26 March 2011. In 2015, voters could register to use iVote from 12 February 2015 until 28 March 2015 at 2 p.m. (election day). Voters could vote from 16 March 2015 at 8 a.m. until 28 March 2015 at 6 p.m. During the 2019 regional elections, registrations were possible from 11 February 2019 to 23 March 2019 at 1 p.m. (polling day). Internet voting took place from 11 March 2019 at 8 a.m. to 23 March 2019 at 6 p.m. Any voter who started voting before 6 p.m. but has not finished voting by 6 p.m. will not be prevented from voting.

Under the NSW Electoral Act, only certain categories of voters who meet one of the eligibility requirements are eligible to use iVote technology-assisted voting. Voters eligible to register for iVote are as follows:
- Voters with a disability (Anti-Discrimination Act of 1977) and who, because of this, have difficulty voting in a polling station or are unable to vote without assistance[46];
- Voters who are illiterate and who, because of this, cannot vote without assistance;
- Voters whose residence is more than 20 kilometres, by the nearest practicable route, from a polling station;
- Voters who will not be in NSW during voting hours on polling day, or who will not be in the relevant constituency during voting hours on polling day in the case of a by-election;
- Anonymous voters (since 2017).

1.4. Australian Citizens and Electronic Voting

1.4.1. Acceptance of Internet Voting by Citizens

Home Internet access rates in NSW are increasing and are comparatively high by international standards. In 2006, 64% of households in the state had access to the Internet, and about two-thirds of those had broadband access. Overall, Australians frequently use the Internet for communication, shopping, education, and business. Internet use varies depending on factors such as age and residence, but the majority of Australians have access to the Internet, except for older people (65 years and over) and citizens in rural areas.[47] By international standards, Australians are also relatively experienced in using the Internet for interactions with government agencies and political processes.

In 2017, 82.4% of households had a computer at home and this figure rose to 86.1% for households with access to the internet at home. At the individual level, the figures are identical since 86.5% of individuals had access to the Internet. During the 2011 regional elections, the percentage of individuals using the Internet was 79.49%, rising to 84.56% in 2015. In terms of households, 82.6% of Australian households had a computer at home in 2011 and 78.9% had access to the internet. In the 2015 regional elections, these figures were 80.4% and 85.9% respectively.[48]

Given that voting is compulsory in NSW, analysing the potential impact of Internet voting on turnout remains very complex. The turnout rate was 92.89% in the 2011 regional elections for the Legislative Council, 90.76% in 2015 and 90.17% in 2019. The turnout rates for the Legislative Assembly elections are generally identical, even if slightly behind those of the Legislative Council. However, it is difficult to estimate a significant statistical link between this decline in the participation rate in 2015 and 2019 and the greater use of Internet voting for these same two years.

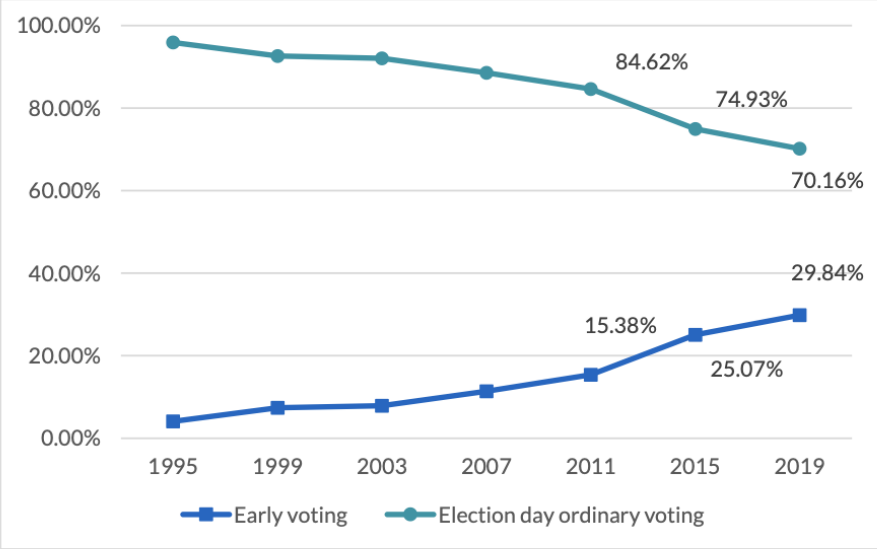
Regarding citizen participation in Internet voting, the number of voters who took advantage of it exceeded initial expectations. 46,862 voters were using the internet or telephone voting

[46] The legislation for the regional elections of 2011 and 2015 distinguished the category of visually impaired voters. This category has been integrated into that of voters with a disability since 2017.
[47] Maley (2020).
[48] ITU World Telecommunication/ICT Indicators Database.

system for the 2011 regional elections (i.e., 1.1% of the total number of votes recorded). Election statistics show a significant increase in the number of voters using iVote over time. These figures quintuple for the 2015 regional elections and rise to 283,669 voters (6.22%) and 234,401 voters (4.97%) for the 2019 regional elections.

Early voting versus election day voting

Figure 7: Trends in early voting versus voting on election day



Source: NSW Electoral Commission, Legislative Assembly results.

During the 2011 elections, a large majority of voters registered on iVote decided to vote online (95.18% of the 46,864 voters who voted by telephone or internet). This trend is confirmed throughout the elections and, in 2015 and 2019, this proportion rose to 99%. The number of Internet voters is in the majority among illiterate people (67.36%). In 2011, half of people with visual disabilities who registered to vote online or by phone chose to vote by phone. This proportion, however, evolved in favour of Internet voting in the following elections.

Voters – enrolment and voting channels

Table 3: Enrolment and voting channels used for NSW State elections (2019, 2015, 2011)

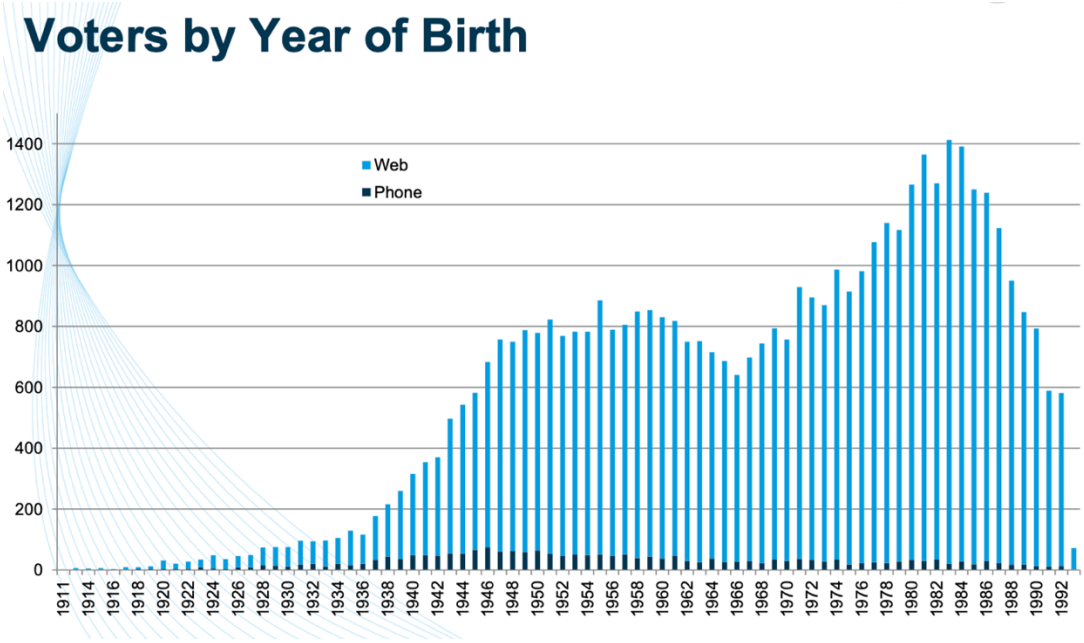
	2019	2015	2011
Enrolment for NSW	5,271,775	5,040,662	4,635,810
Turnout	90.16%	90.49%	92.60%
Total votes	4,714,783	4,561,234	4,290,595
Formal votes	4,551,886	4,404,334	4,153,335
Informal votes	162,897	156,900	137,260
Informality %	3.46%	3.44%	3.20%
Votes by channel			
Postal	136,572	203,625	245,411
iVote	234,401	283,669	46,862
Early (in person)	1,020,780	641,910	352,741
Absent	323,079	288,780	409,035
Enrolment**	-	41,978	20,960
Declared facility	15,094	14,278	14,880
Provisional/silent*	-	13,930	12,564
Enrolment/provisional**	83,463	-	-
Ordinary	2,901,394	3,073,064	3,188,142

Source: NSW Electoral Commission. *The *Electoral Act 2017* changed how silent electors vote at an election: silent electors are no longer required to complete a declaration vote, they now cast an ordinary vote. **Vote categories changed for the 2019 election: provisional/silent is no longer used and enrolment is now categorised as enrolment/provisional.

Source: NSW Electoral Commission (2019).

During the three regional elections, it was mainly voters from outside the state or outside the country who used Internet voting. In 2019, more than 99% of voters registered to vote via iVote cast a vote online (compared to less than 1% by telephone). Of the 232,2211 Internet voters in 2019, 68.32% were outside NSW on election day (58,657 voters), 20.53% were overseas (47,678 voters) and 3.14 lived further away. 20 km from their polling station (7311 voters). The remaining percentages concern voters with disabilities and anonymous voters.[49] With regard to age, the proportion of voters who voted by telephone in 2011 is greater in older groups of voters, but Internet voters remain in the majority for all age categories.[50]

[49] NSW Electoral Commission (2019.
[50] Barry & Brightwell (2011)



Source: Barry & Brightwell (2011).

The survey carried out by Allen Consulting Group and the Social Research Centre among 2011 voters examines, among other things, the reasons that guided some voters not to use iVote. The main reason was that they were not aware of it: 83% of voters had not heard of it. Among voters eligible to use iVote, the main reasons given for not using iVote were a lack of interest (30%), a preference for voting in paper format (26%), and the fact that they did not know that they were eligible (22%). A lack of confidence in online voting was mentioned by only 3% of respondents. Associations and organizations defending the rights of the visually impaired and people with disabilities played a particularly important role in informing and mobilizing these categories of voters.[51]

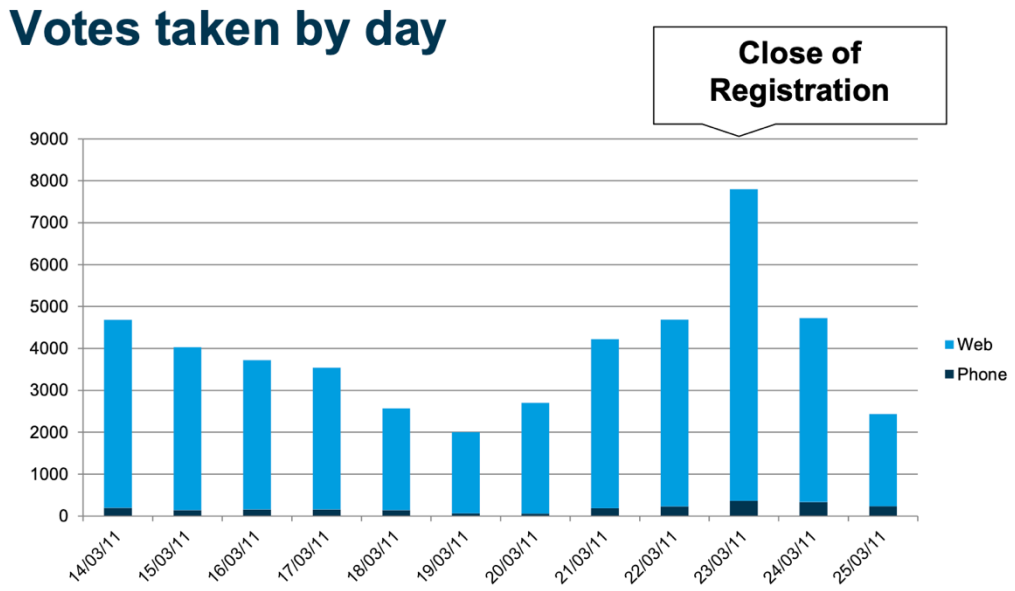
In 2019, the Colmar Brunton survey revealed that online voting was carried out in 66% of cases on a computer and in 34% of cases on a smartphone. Of those who voted by phone, half (50%) spoke to an operator and almost half (45%) used the phone keypad. 11% of voters managed to vote via iVote in less than 2 minutes, 35% between 3 and 5 minutes, and 24% between 6 to 10 minutes. 9% of voters, on the other hand, spent more than 20 minutes to vote. 81% of voters were satisfied with the time spent voting.[52]

One in five voters (20%) asked for help when using iVote in 2019. 70% of those who asked for help when using iVote contacted the call centre, 26% consulted the FAQ page on the website and 16% asked family or friends for help. The main reason for asking for help was with voting itself (33%), receiving the iVote number (27%), and requesting to use iVote (27%). Of those who asked for help when using iVote, more than half (58%) received the help they were looking for. Of those who received the help they were looking for, 75% felt satisfied with the help provided. Only 2% of voters selected another language to be able to vote online (mainly Chinese, Vietnamese, and Italian).[53]

[51] Allen Consulting Group (2011)
[52] Colmar Brunton (2019).
[53] Colmar Brunton (2019).

In addition to analysing the use of Internet voting, the failure rate can also be studied. In the 2015 election, the failure rate with iVote was 3% while it was 25.1% for mail voting. This last score is strongly affected by the difficulties of postal voting for voters residing in another state or abroad.[54] Some conclude that internet voting is a more reliable voting channel than postal voting and offers a greater level of certainty.[55] It is also worth noting that postal voting in NSW saw continued growth until the 2011 election, which coincided with the introduction of iVote. Then, postal voting is declining rapidly, and it is therefore possible to observe a probable shift from postal voting to Internet voting among some voters.[56]

Another element linked to voting behaviour, voters voted via the Internet in the last days of the voting period in 2011.[57] In 2019, 14% of voters who voted via the Internet voted on election day, and peaks in the number of votes by the Internet is between 4 p.m. and 9 p.m.[58] Regarding invalid ballots in 2019, 1,440 blank votes were recorded (0.61%) for internet voting for the election of the Legislative Assembly and 4,082 blank votes for the election of the Legislative Council (1. 74%). These figures are lower than for any other voting method, apart from postal voting for the Legislative Council.[59]



Source: Barry & Brightwell (2011).

Voters had the possibility of verifying the vote cast through iVote and nearly two out of three respondents (63%) said they had verified their vote in 2019. The survey showed that voters who voted online did not verify their votes because they were not aware of the iVote verification process (for 62% of them) and were convinced that the vote had been cast successfully and therefore did not feel the need to check (38%). A second device was used for

[54] NSW Electoral Commission (2015)
[55] Brightwell et al. (2015).
[56] NSW Electoral Commission (2019).
[57] Barry & Brightwell (2011).
[58] Colmar Brunton (2019).
[59] NSW Electoral Commission (2019).

54% of voters who verified their vote cast online and 72% of those who verified their vote said they were very satisfied or somewhat satisfied with the iVote verification process.[60]

1.4.2. Attitudes Towards Internet Voting

Ahead of the 2011 NSW state elections, we have little information about Australian citizens' attitudes towards internet voting. One of the rare exceptions is the 2005 survey on Internet use in politics. This study found preferences for the possibility of providing online comments to parliamentarians on legislation (74% favourable opinions) and for online access to all government services (76% favourable opinions). Conversely, the possibility of voting via the Internet was the least popular of the seven e-politics items tested in this survey since it only received 45% of favourable opinions [61]

Following the 2011 regional elections, the analysis of the comments of voters who voted online shows that the comments on social networks in 2011 were – in the vast majority – positive.[62] The feedback received via official channels (e-mail, voicemail, etc.) confirms this trend. These observations were tested through a large post-election survey on voters' perceptions and satisfaction with the Internet voting system. The survey was conducted online and by phone between 19 April and 1st May 2011. A random sample of registered users was selected from a list of iVote registrants. Based on a response rate of 37%, the survey was able to record the opinions of 530 respondents.[63]

When it came to registering for iVote, the vast majority (91%) of respondents were (very) satisfied with the registration process. The main reasons for dissatisfaction with the registration process were that it was difficult to find information on how to register (especially among non-English speaking respondents, those with disabilities, and those living outside NSW), that the registration process was inconvenient (especially among visually impaired respondents) and that the process took too long (especially among respondents from remote/rural areas). Other one-off issues were mentioned, such as the limited availability of computers in rural areas, the need to be at home to obtain a password, and the inconvenience of waiting for authorization.[64]

The vast majority (96%) of respondents to the 2011 post-election survey indicated that they were satisfied with the online voting experience. Indigenous and non-English speaking respondents also reported similar levels of satisfaction. Among the rare negative arguments indicating a certain dissatisfaction, the survey mentions the excessively long voting time, the impossibility of casting an invalid vote, and the lack of available information. On the contrary, the main advantages of using iVote were that the system made voting easier, allowed voting out of state, was more convenient (especially for voters living in more remote rural areas and respondents with a disability), and contributed to acquiring new levels of autonomy and accountability (especially for visually impaired voters and non-English speaking respondents). Respondents also noted that iVote provided greater convenience because it allowed them to

[60] Colmar Brunton (2019).
[61] Smith (2009).
[62] Barry & Brightwell (2011).
[63] Allen Consulting Group (2011)
[64] Allen Consulting Group (2011)

vote from home, allowed them to vote at a convenient time, eliminated travel time and expense, allowed for more careful consideration of voting options and did not require anyone to help with the voting process.[65]

Regarding the use of Internet voting for future elections, the vast majority of respondents (98%) directly supported its use. More than half (56%) of respondents further said they would use the iVote system again if eligible. The survey results also suggest that younger voters were much more likely to use the system in the future than older voters. Of all voters registered to vote via the internet, 8.30% were unable to vote with iVote and 2.9% were unable to vote at all.[66] Regarding voters registered to vote by mail, the figures are higher: 22.17% failed to vote by mail and 11.16% were unable to vote at all. Including the votes rejected during the count, 91.17% of voters registered to vote via internet were able to vote, compared to only 77.82% of voters registered to vote by mail.

Analysis of Overall Voting Failure	iVote		PV	
Registered to Vote	51,103		315,182	
Voted Successfully	46,864		245,295	
Failed to iVote or PV after registration	4,239	8.30%	69,887	22.17%
Vote Rejected at Scrutiny	29	0.06%	13,901	4.41%
Did not vote at the election at all	1,483	2.90%	35,178	11.16%

Source: Barry & Brightwell (2011). Comparison with postal vote (PV)

41% of survey respondents also suggested some improvements to the system. Some respondents suggested that iVote should be extended to a wider population or that the system should benefit from increased promotion and publicity. Among other areas requiring improvement, respondents highlighted the need to make the registration process easier, make the iVote website easier to navigate, provide clearer information, remove the postal paper interface and the correction of technical problems.[67]

On the occasion of the 2019 regional elections, the Electoral Commission commissioned a new electoral survey. This survey, carried out online for 3,088 and by telephone for 1,000 respondents between 12 and 15 April 2019, focuses exclusively on a sample of voters who registered for iVote. Among those who used iVote, the main reason for using the voting system was not being in NSW on election day (72%). Among this group of voters not in NSW on election day, the use of iVote is even higher for voters aged 18-24 (78%), from metropolitan areas (76%), and those who speak a language other than English at home (76%). Among the group of voters living more than 20 km from a voting centre, we also find voters aged 18 to 24 (10%) and those who speak English at home (7%).[68]

Regarding satisfaction with the iVote voting experience, it dropped to 74% in 2019 (49% say they were very satisfied). This result differs considerably depending on the survey method.

[65] Barry & Brightwell (2011); Allen Consulting Group (2011)
[66] Barry & Brightwell (2011).
[67] Barry & Brightwell (2011); Allen Consulting Group (2011)
[68] Colmar Brunton (2019).

Those who responded to the survey by phone recorded a satisfaction level of 82% (which is a significant decrease from 97% in 2015), while those who responded to the online survey had a level satisfaction of 71% (which represents a decrease compared to 96% in 2011 and 94% in 2015). Among the elements mentioned by respondents who felt satisfied was the fact that iVote was a simple, quick and practical process. Conversely, voters not satisfied with iVote cited as arguments the system breakdown as well as the difficulty of the voting process.[69]

Regarding the ease of voting, only 82% of respondents said it was easy to vote (49% very easy and 33% quite easy). 20% of respondents who used iVote indicated they needed help to vote. In comparison, only 9% of voters who used another method of voting requested help. In addition, satisfaction with the help received is lower among responding voters who voted online.[70]

A majority of voters (85%) who used iVote indicated they were confident in the accuracy of the results (52% very confident and 33% somewhat confident), while 72% trusted the Internet voting process (55% trust a lot and 17% trust a little) while the percentage was 90% in 2011. 73% of respondents also said they were satisfied with the security of the iVote process. Among voters who have used iVote, nearly four in five (79%) said they would likely use iVote again in the future, while 76% say they would recommend iVote.[71]

Regarding registration for iVote, 89% of respondents did it online in 2019. For almost two in five respondents (43%), it took them less than 5 minutes to register. What's more, seven in ten respondents (71%) were satisfied with the time it took to register for iVote (40% very satisfied and 32% somewhat satisfied). But not all respondents who registered to vote online took part in the 2019 regional elections. 8% voted via another voting method (for example, by casting a “paper” vote on the day of the election) while 8% did not vote at all. Among the 8% who did not vote, the most common reason (for 43% of them) for not voting was related to problems using iVote, such as technical problems with the website iVote.[72]

[69] NSW Electoral Commission (2019b); Colmar Brunton (2019).
[70] Colmar Brunton (2019).
[71] Colmar Brunton (2019).
[72] Colmar Brunton (2019).

Table 38: iVote usage at NSW State elections (2019, 2015, 2011)

Eligibility criteria	Number of iVotes cast	Percentage of total	iVoted by internet	iVoted by telephone
2019				
Blind/low vision	1,174	0.50%	1,106	68
Reading disability	2,077	0.89%	2,038	39
Disability	12,773	5.45%	12,485	288
20km from a voting centre	7,381	3.15%	7,311	70
Outside NSW (interstate)	160,025	68.27%	158,657	1,368
Outside NSW (overseas)	47,977	20.47%	47,678	299
Silent elector	2,994	1.28%	2,946	48
Total	**234,401**	**100%**	**232,211**	**2,180**
2015				
Blind/low vision/illiterate	4,818	2%	4,609	209
Disability	12,714	4%	12,337	377
20km from a voting centre	8,407	3%	8,270	137
Outside NSW on election day	257,730	91%	255,357	2,373
Total	**283,669**	**100%**	**280,573**	**3,096**
2011				
Blind/low vision/illiterate	668	1.4%	450	218
Disability	1,296	2.8%	1,136	160
20km from a voting centre	1,643	3.5%	1,542	101
Outside NSW on election day	43,257	92.3%	41,477	1,780
Total	**46,864**	**100%**	**44,605**	**2,259**

Source: NSW Electoral Commission.

NSW Electoral Commission (2019).

We can notice a significant increase in the number of registered voters who voted via iVote between 2011 and 2015. 46,862 voters used iVote for the 2011 regional elections (i.e. 1.1% of the total number of votes recorded). These figures quintuple for the 2015 regional elections and rise to 283,669 voters (6.22%) and 234,401 voters (4.97%) for the 2019 regional elections. The statistics for the by-elections follow the same trend, and we observed between 2.8% of iVote voters for by-elections in Clarence in November 2011 and 5.8% of iVote voters for by-elections in three districts in October 2017.

During the 2011 elections, 51,103 voters registered to vote online. The vast majority of these were voters from outside NSW (47,038 – 92%), but also voters living more than 20 km from the polling station (1830), voters with disabilities (1457), and visually impaired or illiterate voters (778). [73] In comparison, 315,182 voters registered to vote by mail. The visually impaired group and the group of voters with other disabilities experienced lower turnout rates than estimated, with only 2,000 people from these groups voting using iVote. Registration from people living in remote or rural areas exceeded initial participation estimates by almost three times.[74]

[73] Barry & Brightwell (2011).
[74] Allen Consulting Group (2011).

Chapter 2. Belgium

2.1. Voting System in Belgium

The electronic voting system used in Belgium consists of two types of voting machines that have been developed by a consortium led by Smartmatic[75], tested on 27 October 2011 in Flanders and Brussels,[76] and used for the first time for the October 2012 elections: the SAES-3370 and the A4-517 (from 2018 onwards). These machines rely on 17-inch touchscreens that allow voters to express their votes and a built-in printer. The voting machines function in all three of the country's official languages (Flemish, French, and German). The printer generates a paper record of the selected choices in plain, human-readable text, as well as a QR code. Smartmatic provided 22,850 voting machines and 235,000 smart cards for the last elections.

The system is also composed of so-called 'president machines' that help polling station staff to conduct the election. In Belgium, two generations of president machines are used: the Clevo Notebook and the VIU-805 (from 2018 onwards). The president machines have four main functions: (1) to activate smart cards that voters use to access the voting machines; (2) to electronically register and store each vote; (3) to count all votes and store the results; and (4) to generate a polling station report. Smartmatic provided 4,338 president machines and 4,338 electronic ballot boxes for the last elections.

The company Smartmatic also provides a series of other services to the Belgian state. These services include an inspection and repair service during non-electoral years and 3 months before elections; warehouse storage services; onsite training sessions for polling station staff; voter education activities, including demos, videos, and printed material; technical support to the electoral administration regarding election data; controlled delivery and collection of voting devices a few days before election day; installation and disassembly of voting devices in the electoral precincts; technical field support on election day including dispatching services for field engineers and voting devices.

The Belgian electronic voting system has two additional characteristics. First, in the municipalities of the Brussels-Capital Region, German-speaking municipalities, and certain municipalities with linguistic facilities, the voter must choose the language of the voting procedure and then confirm their linguistic choice. In the electoral canton of Rhode-Saint-Genèse for the federal elections, the voter must also make a prior choice between the lists of the constituency of Brussels-Capital and the lists of the constituency of Flemish Brabant. Second, the blank vote option is available at the bottom right of the voting screen. An invalid vote is not available to voters even if it is technically possible to cancel your vote, for example by damaging the smart card.

The steps in the electronic voting process are as follows:
- The voter gives his/her identity card and his invitation to the president of the polling station

[75] Since 2012, Smartmatic has been Belgium's exclusive polling station technology provider.
[76] Vegas Gonzáles (2012).

- The voter receives a smart card from the president of the polling station and goes to the voting booth. Each voting booth in a polling station is equipped with a voting computer.
- The voter inserts his/her smart card into the card reader of the voting computer
- The display screen then displays the order number and acronym of all the lists of candidates. The voter indicates the list of his/her choice using his/her finger. He/she can also cast a blank vote. He/she confirms his choice or cancels it and chooses a new list.
- After the voter has chosen a list, the display screen displays, for this list, the first and last names of the candidates. The voter then expresses his/her vote by pressing on the screen.
- The voter confirms the vote cast. As long as the vote is not confirmed, the voter can still modify it (go back) and choose another list of candidates.
- At the last confirmation, a ballot is printed by the voting computer. This records the voter's vote in the form of a QR code and in a typed form with which he/she can check his/her vote.
- The voter folds this/her ballot paper in half (printed side inwards) and collects this/her smart card. The voter leaves the voting booth.
- A scanner is present in each polling station. The voter can scan the QR code on the printed ballot to verify his/her vote
- The voter scans the QR code on this/her ballot using the ballot box reader
- The voter places his/her folded ballot paper in the ballot box. The ballot box is equipped with a flap that opens automatically; it is only possible to insert the ballot after having correctly scanned it.
- The voter returns this/her smart card to the president of the polling station and collects this/her identity card and this/her invitation stamped by the president.

2.2. Socio-Political Dimension

2.2.1. Previous Experiences with Postal Voting and Optical Counting

In the context of a discussion of electronic voting, and particularly Internet voting, it is interesting to look at two specific experiments organized in Belgium: optical counting and voting by mail for Belgians living abroad. First, optical counting experiments were also carried out in two electoral cantons (Chimay and Zonnebeke) for the elections of 1999, 2000 and 2003. In these cases, the voter cast his/her vote on a paper ballot while the counting was done electronically using an optical reading device using a system called “Favor”. It was decided in 2005 to permanently abandon this system, partly due to the cost of the system and the decision to modernize the electronic voting system then in place. In addition, a system of computer-assisted counting system of paper ballots has been used in 35 Flemish and Walloon cantons between 2012 and 2018.

Secondly, Belgian voters have experience with remote voting since Belgians living abroad have had the possibility of voting by post since 1986 for the European elections and since 2002 for the federal elections. This voting method is the most popular among Belgian voters. With the exception of the early federal elections of 2010, almost two-thirds of Belgians living abroad cast their vote by mail: 67.6% in 2003, 62% in 2007, 45.8% in 2010, and 69.5% in 2014.[77] During the last elections held in Belgium (2019), nearly 180,000 Belgians living abroad were registered to vote by mail. In addition to the popularity of this voting method, it is interesting to note

[77] Blaise, P. (2016).

that the participation rate is very low among voters who chose to vote by mail. On average, only a third of Belgian voters living abroad have participated in the elections organized since 2003.

The postal voting system currently used in Belgium involves sending blank ballot papers to voters and returning completed ballot papers to Belgium. These shipments can pose several difficulties. Firstly, the procedure for transporting blank ballot papers is quite complex since the ballot papers – printed in Belgium – must be sent to the consular posts by diplomatic bag and these same consular posts will then send the ballot papers to the voters. Secondly, the time between sending the ballot papers to the voters and the return of the completed ballot papers to the counting office in Belgium regularly proves difficult to maintain.[78] Finally, voters do not always have an address allowing them to receive mail efficiently and securely enough to guarantee that the mail will not be intercepted by a third party.

2.2.2. Implementation of Electronic Voting in Belgium

In 1991, the Belgian government decided to introduce on-site electronic voting and that decision was confirmed in the Legislative by the law of the 19 July 1991. The arguments behind this decision were that it would help reduce the cost of elections (for instance the costs related to the printing of the ballot papers and the payment of polling station staff), accelerate the publication of the results, increase the reliability of the election results and reduce the number of staff in each polling station. A small pilot was run at the local level, and two different electronic voting systems were tested in two cantons (Verlaine and Waarschoot) at the occasion of the 1991 legislative elections. The first system was based on a smart card serving as a ballot, the second system consisted of an electoral panel with lists of candidates on which voters indicated their choice. Based on the success of this first pilot, it was decided to implement an electronic voting system using a smart card at a larger scale and to implement it gradually to a larger share of the population.

The law of 11 April 1994 regulates the implementation and use of electronic voting in Belgium. About 20% of the Belgian voters were allowed to use electronic voting in 76 municipalities at the occasion of the European elections of June 1994 and of the local and provincial elections in October 1994. The law also confirms that electronic voting could be used for all types of political elections. Since then, the system has been used in a large number of municipalities for all local, provincial, regional, community, national and European elections organized in Belgium since 1994. At the time, there were there are two different electronic voting systems in Belgium: the system *Digivote* developed by the company Steria which covered approximately 85% of the municipalites using electronic voting and the system *Jites* developed by the company Stésud which covered approximately 15% of the market.[79]

While the 1994 law regulates the use of electronic voting, the lists the cantons using the system is managed by royal arrests. It means that the enlargement of electronic voting to other cantons is rather simple and does not require a heavy legislative effort. Electronic voting has consequently been enlarged to about half of the cantons in the provinces of Antwerp and

[78] Blaise, P. (2016).

[79] It was up to the municipalities that opted for electronic voting to choose which system they will use, but since the two systems are incompatible, all municipalities within one single canton had to agree on the same system.

Liège and in Brussels, and from 1999 to 2014 about 44% of the Belgian voters have been using electronic voting. The situation varied territorially as all municipalities in the Brussels region and German-speaking community used electronic voting, while it nearly concerns half of the voters in Flanders (49%) and 22% of the voting population in French-speaking Wallonia. With the fifth Belgian state reform, the regions received in 2001 the oversight on provinces and municipalities, implying that the regions can now choose themselves the voting modalities for local and provincial elections on their territory. This reform came into force for the first time at the occasion of the 2006 local elections.

2.2.3. Evolution of Electronic Voting System

The Belgian electronic voting system evolved, partly following the evolution of the technology. For instance, a system of electronic voting with a paper trail was tested in 2003 in two cantons (Verlaine and Waarschoot) and gradually enlarged to all Brussels, Flemish, and German-speaking municipalities. This system presents the advantage of a larger transparency and, by extension, of a higher trust among the voting population. In addition, a manual recount based on the paper trail can be performed in case of a technical problem with the automated counting or an audit of the election results. In December 2007, an inter-university study of electronic voting systems commissioned by the regional and federal governments advocated the establishment of an electronic system providing a paper trail of each vote.[80] This system was gradually implemented starting with the 2014 elections.

Since 2014, the light pen system has been gradually replaced by a touch-screen system. In 2019, Smartmatic developed a system allowing the visually impaired or blind voter to cast their vote independently by following the voice instructions emitted by the voting software via a headset has been tested in two municipalities (Aalst and Mechelen).

The use of electronic voting in Belgium has not been without debate and problems. The equipment used since 1994 became relatively obsolete by the mid-2000s but their lifespan was extended, resulting in additional costs for the maintenance of the equipment. Similarly, the software used at the time was still the one developed by the company Stésud in 1994 and relied on outdated tools such as floppy disks.

In some Brussels and Walloon municipalities, this outdated electronic voting system has been used until the 2014 elections creating an increasing number of small-scale incidents. Among those incidents, we can cite the 2003 problem in the municipality of Schaerbeek where a candidate received more than 4000 additional preference votes, or the 2004 problem in the municipality of Antwerp where a defective floppy disk created counting errors in the results for the election European. In 2018, in one Brussels (Saint-Josse-ten-Noode) and six Flemish municipalities, a recount of the paper trails had to be carried out after aberrant results were observed because of software issues. However, these problems remained local in nature and had little impact on the electoral results.

These technical incidents also caused delays in the transmission and publication of electoral results, as for example during the 2003 and 2010 elections in Brussels or during the 2006

[80] BeVoting (2007).

municipal and provincial elections in Liège. Very often these delays meant that the results of cantons using electronic voting were published after those of cantons using paper voting. These delays contradict one of the main arguments of electronic voting, namely the greater speed of counting and publication of results.

The 2014 elections witnessed a problem of another magnitude: a programming error in the software used in 39 Walloon and 17 Brussels municipalities produced the inconvenience that the ballots of some of the voters who changed their minds during the voting process were not recorded. This problem delayed the publication of the results for three days in Brussels and it was estimated that the votes of 2,250 voters have been lost.

In the days that followed, several political leaders in Brussels and Wallonia declared that they were in favour of returning to paper voting. The regional policy declaration signed by the PS and the CdH in 2004 stipulates that the Walloon Government intends to eliminate electronic voting. This declaration is followed in practice by a resolution from the Walloon Parliament requesting the abandonment of electronic voting. This resolution was adopted by the Walloon Parliament on 3 June 2015. The decree of the Walloon government of 9 March 2017 subsequently implemented the resolution of the Walloon Parliament requesting the abandonment of electronic voting.

Triggered by a technical problem, this abandonment of electronic voting in the Walloon region relies on two main arguments. First, actors complained about the lack of proof for the voter, as well as the absence of democratic control. The voter must rely on a few experts who ensure that the voting software and computers work well. Second, the implementation of updating the electronic voting system was considered too expensive. More generally, the cost of electronic voting was called into question. The cost of the different voting methods was estimated by the Belgian NGO PourEVA (For Ethics of Automated Voting) based on figures provided by the Ministry of Interior.[81] This estimate of the cost of electronic voting includes the purchase of hardware but also usage costs, such as software adaptation, software certification (controlled by an approved body), hardware maintenance, and assistance technique on election day. In total, the electronic voting used in the 2004 elections cost almost 4.5 euros per voter. In comparison, the cost of paper voting was estimated at 1.5 euros per voter, and the cost of paper voting with optical reading (used in the cantons of Chimay and Zonnebeke in 1999, 2000, and 2003) was estimated at 7.6 euros per voter. The cost of electronic voting after paper proof (used in the cantons of Verlaine and Waarschoot in 2003) was estimated at 13.6 euros per voter.

While the software problem had an important impact on the publication of election results in Brussels, it had the opposite impact on the political debates in Brussels and in the German-speaking community (a small German-speaking territory in Wallonia that benefits from a large autonomy). The two sub-national entities decided to completely renew their old electronic voting equipment and replace it with a new electronic voting system with a paper trail. On 25 April 2016, the Parliament of the German-speaking Community voted for a resolution in which it expressed its desire to use electronic voting with paper confirmation. This resolution was voted for by all parliamentary groups, with the exception of Vivant deputies. In the Brussels

[81] https://www.poureva.be/article.php3?id_article=227&lang=en

parliament, the majority of political parties – including the PS – supported electronic voting and its improvement during the 2018 municipal elections.[82]

As a result, and since the 2018 elections, electronic voting with paper trail is used in all Brussels and German-speaking municipalities, as well as in a majority of Flemish municipalities. The remaining Flemish municipalities and all the French-speaking Walloon municipalities exclusively use paper voting.

2.2.4. The Future of Electronic Voting in Belgium

The introduction of an Internet voting system is currently the subject of debate at both political and academic levels.[83] The main issue with Internet voting concerns the voting of Belgians abroad. As early as 2014, the political parties N-VA, MR, and Open Vld expressed themselves in favour of Internet voting for this category of voters and have repeated their position numerous times since. The political parties CD&V, the sp.a, and DéFI have also expressed their support for this proposal for Internet voting for Belgians abroad. Regarding Internet voting on Belgian territory, this idea is mainly promoted by the N-VA, the MR, and the Open Vld. In contrast, Ecolo is the only political party that has opposed Internet voting, although the PS – through its Walloon ministers – has regularly expressed certain fears regarding this voting method.

The federal government agreement signed in October 2014 between the MR, N-VA, the CD&V, and the Open Vld discusses the issue of the vote of the Belgians living abroad. In relation to this category of Belgian citizens, the federal government "will also study the establishment of an electronic voting system during the next regional, federal, and European elections".[84] This element was confirmed by Minister of Foreign Affairs D. Reynders on 13 November 2014 as he affirmed that the possibility of introducing a voting system would be studied with regard to voting abroad. [85] During the parliamentary discussion of this political orientation presentation on 25 November 2014, N-VA parliamentarian P. Luykx welcomed this improvement in voting arrangements abroad and – among other things – the establishment of a system of electronic voting.[86] In 2016, as part of the law amending the electoral code, N-VA parliamentarian B. Vermeulen suggested carrying out a pilot project electronic voting using a secure website and encrypted information from Belgians abroad which will subsequently be extended to the national territory.[87]

The federal government agreement signed in September 2019 between Open Vld, PS, CD&V, MR, sp.a, Ecolo, and Groen also discusses the vote of Belgians living abroad but does not directly speak about electronic voting. Indeed, the federal government "will study the

[82] It is interesting to note that Ecolo and the PS obtained the complete abandonment of electronic voting in the French-speaking municipalities of the Walloon region. But paradoxically, the parliamentarians of these same two parties voted in favour of maintaining electronic voting in 2016 in the parliament of the German-speaking Community while the socialist parliamentarians voted for its maintenance the same year in the Brussels parliament. Ecolo was opposed to maintaining electronic voting in Brussels and in the Walloon region.
[83] See for instance Pilet et al. (2020); Pilet et al. (2021).
[84] Government agreement (2014).
[85] House of Representatives, DOC 54 0020/ (2014/2015).
[86] House of Representatives, DOC 54 0020/029.
[87] House of Representatives, DOC 54 2032/002.

possibilities of making voting for Belgians abroad more accessible to improve the participation rate for all types of elections".[88] During her political orientation presentation on 5 November 2020, Minister of Foreign Affairs S. Wilmès affirmed that she could change the procedures so that ultimately Internet voting for Belgians abroad would be made possible. The minister also specified that this development would eliminate the physical trip to the polling station as well as the risks (loss of mail, shipping delays, etc.) linked to postal voting.[89] Overall, it is interesting to note that positions regarding Internet voting have changed little following the Covid-19 health crisis.

2.2.5. Positions of Political Parties in Relation to Electronic Voting

Even if Belgium is often presented as a successful case of an electronic voting system, the analysis of the positions and party manifestos of the main Belgian political parties on the theme of electronic voting over the period 1999-2019[90] makes it possible to identify significant differences in position between three party groups.

The first group concerns Belgian political parties which do not discuss electronic voting and/or Internet voting in their party manifestos over the period 1999-2019. These mainly concern the Flemish parties N-VA, Vlaams Belang, sp.a, LDD, and Spirit as well as the PTB-PVDA. Given that these parties do not make proposals concerning modifications to the electronic voting system, it is legitimate to extrapolate that they are generally satisfied with the voting system in place. We can add the cdH to this group since the party has never commented on electronic voting and/or Internet voting in its party manifesto, apart from its proposal to establish an electronic voting procedure allowing people with the visually impaired to vote alone.

The second group concerns Belgian political parties that oppose electronic voting and/or Internet voting in their electoral programs. The main opponents are Ecolo and the PS (and to a lesser extent the FN) and these parties want a full return to paper voting. Ecolo's position has remained relatively stable over time although its opposition to electronic voting has strengthened slightly from 2007. The party wanted first of all to maintain paper voting and to stop any investment aimed at continuing the widespread use of electronic voting and was open to a modified electronic voting system under certain conditions, such as reliability and democratic control. From 2007 onwards, the Ecolo party began to demand the restoration of paper voting, while remaining open to a modified electronic voting system under certain conditions. At the same time, the party is asking for voting machines to be adapted for people with reduced mobility in particular for people in wheelchairs and so that blind or visually impaired people can vote independently in polling stations.

Conversely, the PS's position on electronic voting has become more radical over time. The party first wanted an evaluation of the regulations applicable to electronic voting to verify their free and democratic nature before requesting a moratorium on electronic voting, pending an improved system regarding its transparency and accessibility, as well as the publication of the electronic voting software and its source code. In 2007, the PS proposed in its electoral programs the abolition of electronic voting and a full return to paper voting.

[88] Government agreement (2019).
[89] House of Representatives, DOC 55 1610/019.
[90] Pilet et al. (2021).

However, the party remains open to a paper voting system with electronic counting while its 2014 party manifesto no longer mentions this alternative.

The arguments used to justify this opposition to electronic voting mainly concern the absence of control of the ballot by the voters. According to this argument, the voting process must be understood and controlled in a democratic way by any citizen. Electronic voting with a paper trail would also not guarantee a control as democratic as paper voting. According to these parties, electronic voting demonstrates serious limits in terms of the reliability of the voting process and does not offer all the required guarantees against electoral fraud. The argument of the cost of electronic voting is also mentioned and the PS estimates that its cost is five times higher than that of paper voting. Among the other arguments mentioned, we also find the secrecy of the vote, accessibility, and transparency. For completeness, let us point out that the PS sees an advantage in electronic voting, namely that of logistical benefits.

In the third group, we find the Belgian political parties that wish to expand electronic voting and/or introduce internet voting. Groen is in favour of electronic voting, as long as there are enough guarantees of transparency and control, and even wishes to expand it: the party's objective is for all polling stations to use electronic voting "as quickly as possible".

Some parties also wish to extend electronic voting to other categories of voters, namely Belgians living abroad. Although it does not specify whether it wishes to implement electronic voting in consulates or introduce Internet voting, the CD&V is in favour of the use of electronic voting for Belgians abroad during federal elections. and European. The MR is also in favour of this proposal initially, as long as the system meets democratic requirements and guarantees confidentiality, security, and secrecy of the vote. The arguments of efficiency and usability are used to justify this proposal as well as that of increased electoral participation.

Although it initially considered both options (electronic voting in consulate offices and Internet voting) for the Belgians abroad in its 2014 manifesto, the MR then moved fully towards voting by Internet, thus joining the proposal of Open Vld. The system used would be based on a connection, based on the platform Itsme or on the electronic identity card. The main arguments are that voters still do not live near the consulate and that the system of voting from abroad must be simplified. Finally, the PP proposes that citizens who wish to do so can vote while the Open Vld proposes to be able to vote by Internet “in one's own country”, thereby suggesting that Internet voting can be used by all voters and not just those residing abroad.

2.3. Legal Dimension

2.3.1. Adaptation of Belgian Legislation to Introduce Internet Voting

Belgium is currently considering the introduction of Internet voting and various university studies have been commissioned to assess the feasibility of this scenario. The introduction of such a system requires an adaptation of the rules for organizing elections at different levels of government and an adaptation of the electoral system in place. The principles on which an Internet voting system is based are those of remote voting and early voting.

The introduction of early voting – i.e., the possibility for voters to vote before election day – into Belgian legislation would potentially pose two main problems. First of all, that of organizing elections over several days, and not on a specific day. Then, that of the electoral calendar, given that the entire electoral schedule may have to be shifted in order to allow early voting a few days, or even a few weeks, before election day.

Regarding the day of the election, it is determined by articles 46 and 117 of the Constitution. In addition, the Constitution and electoral legislation speak of the “day” of the election and not the “days” of the election. Belgian electoral legislation also mentions “the month” of the election (in the singular) but it is also possible that early voting can be organized across different months. In order to allow early voting, it could therefore be necessary to modify these formulas in the electoral legislation and introduce the idea that elections can be organized over several days or several months. Similarly, some formulas determine the exact day of the week that elections are held and could potentially not allow for early voting held on another day of the week. For example, elections take place on a “Sunday” in the Electoral Code (article 105).

Regarding the electoral calendar, electoral legislation is based on a retro calendar (for example, “the 33rd day before the election”). This retro-calendar is found in certain special laws, royal decrees and decrees, and concerns for example the list of voters, the presentation of candidates, the designations of witnesses, the sending of summons, the drawing of lots, etc. In the event that the vote is brought forward by a few days, it might be possible to keep the current calendar given that it is currently suitable for the vote of Belgians abroad (federal elections and European elections). By following this schedule, this could mean that Internet voting could be brought forward by a maximum of 24 days and by a maximum of ten days in the case of a postal vote.

However, in the context of early elections of the House of Representatives (Electoral Code, article 106), the electoral envelope is sent "at the latest on the 12th day preceding the polling day", which would still make Internet voting possible during this period but would make voting by post more complex. In this hypothesis of an early election, or in that of a system where the vote would be anticipated by more than ten days, it would be appropriate to review a significant part of the pre-electoral calendar. For example, if voting is anticipated by 30 days, the retro-calendar may have to be brought forward by around twenty days in order to allow early voting.

The introduction of Internet voting would also raise the question of the location of the vote. Given that voters can fill their ballots via the Internet from any location or municipality in the national territory, or even abroad, electoral legislation must take into account this important change in the location of the vote. A more serious problem could arise regarding the municipality in which the vote must take place. Thus, according to article 62 of the Constitution, "voting is obligatory and secret. It takes place in the municipality, except for exceptions to be determined by law ». The Electoral Code further specifies that the vote takes place in the municipality where the voter is registered on the voter lists (article 4). It is also this argument from article 62 of the Constitution which was mentioned by the Minister-President of the Walloon government, P. Magnette, on 18 November 2016.[91]

2.3.2. Electoral System

There are six levels of government in Belgium: municipal, provincial, regional, community, federal and European. Each level of government has its legislative assembly elected directly by universal suffrage. The electoral system is identical for all elections: multi-member proportional list voting with multiple preferential voting and a proportional electoral threshold (5%). Note that the Senate and the French-speaking community parliament are not directly elected and there are no executive elections in Belgium, nor instruments of direct democracy at the national level.

The number of elected legislators depends on the nature of the assembly and the size of the electoral constituency: 21 European deputies, 150 national deputies, 124 Flemish community deputies, 25 German-speaking community deputies, 75 Walloon regional deputies, and 89 Brussels regional deputies (all elected every 5 years), 398 provincial councillors and more than 13,000 municipal councillors (all elected every 6 years) The European, regional and community elections, as well as the provincial and municipal elections are organized simultaneously.

The distribution of the seats is done according to the d'Hondt method applied to the results of the lists, by electoral district. Within the same party, seats are distributed according to the popularity of the candidates (preferential votes and devolving votes cast for the list). To simplify, the electoral constituencies are territorial for federal elections (the constituencies correspond to the provinces), for Walloon regional, German-speaking community, provincial and municipal elections (with a few exceptions in municipalities with special status), the electoral constituencies are linguistic for the European and Brussels regional elections, while they have a hybrid status for the Flemish community elections.

2.3.3. Elections and Voters

Voting is compulsory in Belgium, even if no fine has been sent to voters who have not participated in elections since 1999. This voting obligation applies to all citizens, registered in a Belgian municipality and aged at least 18 years, for all elections and all regions of the country.[92] Registration on the voter lists is automatic. From 2024 onwards, young people aged 16 and over will be able to vote for the first time. European citizens have the right to vote in

[91] Walloon Parliament, 22 (2016-2017) 1.
[92] Voting will no longer be compulsory in Flanders for local and provincial elections from 2024 onwards.

Belgium for the European elections. They must register on the voter lists to participate in these elections, but their vote remains optional. Belgians registered in a consular office abroad must vote in the legislative elections. If they reside in a non-EU member state, they must also vote for the European Parliament. Belgians who reside in the European Union can choose to vote either for a list in their Member State of residence or for a Belgian list for the European elections.

Electronic voting was introduced in Belgium on the occasion of the 1991 legislative elections in two cantons (three municipalities). Based on the success of this pilot, it was decided to implement electronic voting at a larger scale and to implement it gradually to a larger share of the population. For the April 1994 European elections and October 1994 local and provincial elections, about 20% of the Belgian voters in 76 municipalities used the electronic voting system (i.e., about 1,400,000 voters). The percentage of voters using electronic voting increased to 44% of the voting population in 1999 (i.e., about 2,000,000 voters), with large differences across regions: 100% of Brussels and German-speaking voters vote electronically but only 49% in Flanders and 22% in Wallonia. This figure will remain stable until the 2018 elections when the 30 French-speaking municipalities in Wallonia that used electronic voting returned to paper voting. In addition, some Flemish municipalities – mainly urban – also joined the group of municipalities using electronic voting in the last elections. Since 1991, electronic voting has been used in every election organized in Belgium.[93]

Currently, electronic voting is used in 159 Flemish municipalities (60%), all 19 Brussels municipalities and all 9 German-speaking municipalities. Overall, about 3,200,000 voters in no less than 4,243 polling stations used electronic voting on the occasion of the last elections (2019). Note that these figures might evolve for the June and October 2024 elections as the current process of municipality merging in Flanders will impact the voting technology used by the newly created municipality. In case of a merger of a municipality using electronic voting with a municipality using paper voting, the municipal council has the liberty to choose which voting technology will be used.

[93] 1991 national elections, 1994 European elections, 1994 local and provincial elections, 1995 European, federal and regional elections, 1999 European federal and regional elections, 2000 local elections, 2003 federal elections, 2004 regional and European elections, 2006 local and provincial elections, 2007 federal elections, 2009 regional and European elections, 2010 federal elections, 2012 local and provincial elections, 2014 European, federal and regional elections, 2018 local and provincial elections and 2019 European, federal and regional elections.

2.4. Belgian Citizens and Electronic Voting

2.4.1. Acceptance by Voters

There are a handful of studies that analyse systematically the impact of the electronic voting system on voting behaviour in Belgium. Several studies demonstrated the negative impact of electronic voting on turnout in local elections for a small set of elections.[94] The conclusions of the BeVoting study are more mixed as the researchers observed a drop in turnout in the Flemish cantons but not in Brussels and one of the two analysed elections in Wallonia

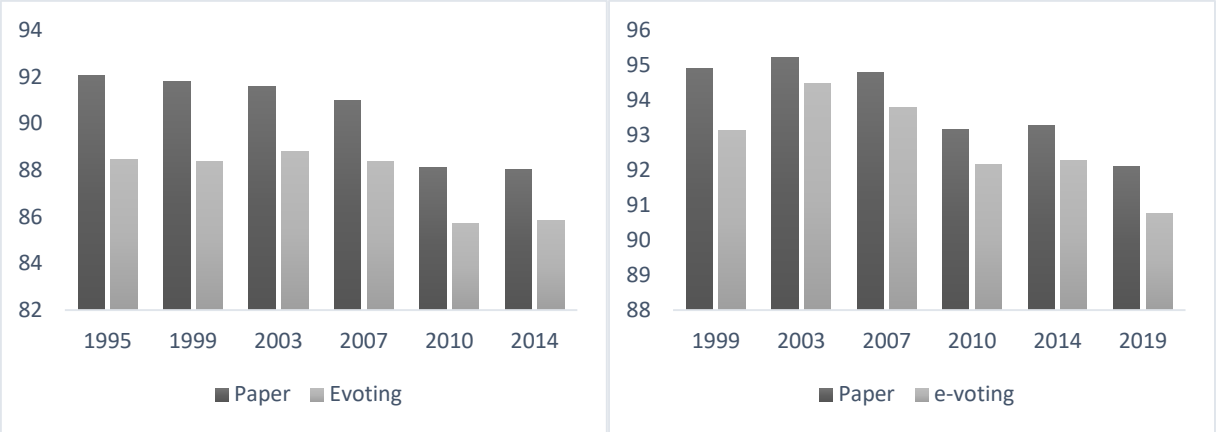
The most exhaustive analysis has been performed based on national election results at the canton level for the provinces of Liège (1995-2014) and Limburg (1999-2019).[95] The analyses indicate that turnout is lower in cantons using electronic voting compared to cantons with paper voting in both provinces. On average in the period 1995-2014, turnout reached 90,35% in the Liège cantons using paper voting while we observed a turnout of 87,56% in the electronic voting cantons. In the Limburg province, cantons using paper voting display an average turnout of 94,07% while this figure drops to 92,61% in the cantons with electronic voting. Overall, the turnout difference between the two voting modalities is 2,79% in the Liège province and 1,46% in the Limburg one (see Graphs 1 and 2).

In the Liège province, the difference in turnout between the two types of voting modalities seems to decrease over time. The difference in turnout between cantons using paper voting and using electronic voting was 3,60% in 1995 while it declined and reached a difference of only 2,17% in 2014. But this evolution is probably the consequence of the overall decline of turnout in the province that affects more particularly the cantons using paper voting. In the Limburg province, the difference in turnout between cantons using paper voting and using electronic voting remains fairly stable over time. In any case, it is interesting to notice that we do not observe that the negative impact of electronic voting on turnout diminished over time in parallel with voters' increasing familiarity with electronic voting and increasing digital skills.

Yet, the differences in turnout cannot be fully attributed to different types of voting modalities and several other factors may come into play such as socio-demographic variables, urbanization, or party competition[96]. Note the importance of the size of the electoral districts as there is an important selection bias in the sample of cantons that used electronic voting in the two provinces and the average number of voters is significantly higher in cantons using electronic voting compared to cantons using paper voting.

Graph 1 and 2. Turnout in national elections (Liège province, 1995-2014; Limburg province, 1999-2019)

[94] Ackaert et al. (2011); Dandoy (2014); Dejaeghere & Vanhoutte (2016).
[95] Dandoy (2021).
[96] Dejaeghere & Vanhoutte (2016); Dandoy (2014).



Source: Dandoy (2021).

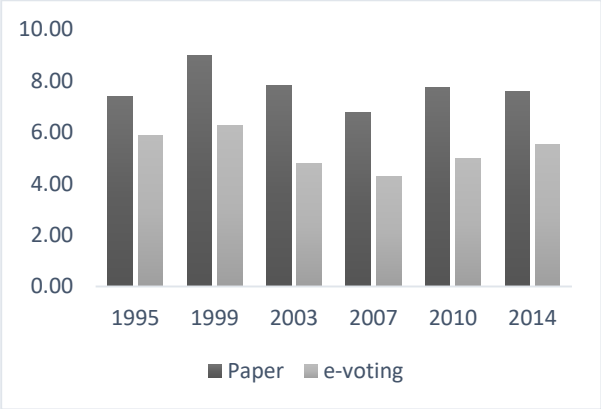
While it is difficult to express an invalid vote, the Belgian electronic voting machine displays a 'blank vote' button on the bottom right-hand of the screen. As the official election statistics do not allow distinguishing between blank from null votes, the share of invalid votes in paper districts represents both types of votes, while it accounts only for blank votes in the case of electronic voting municipalities. Several studies indicated that electronic voting helped reduce the share of invalid votes for the 2009 European elections and the local elections.[97] In their study of local elections in Flanders in 2006, Ackaert and his colleagues (2011) observed the opposite phenomenon: more blank votes in electronic voting municipalities compared to paper-based municipalities.

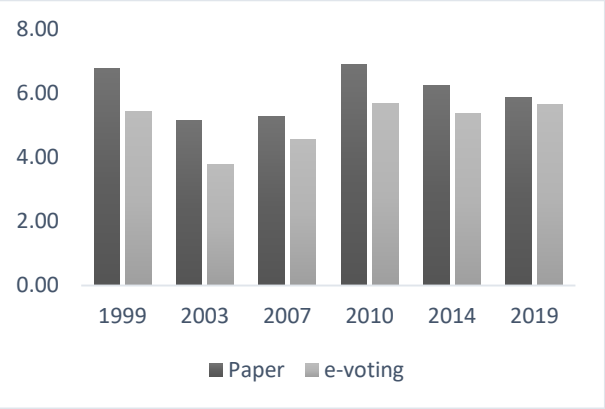
The analyses of national election results in the provinces of Liège and of Limburg provide us with a larger oversight of the invalid voting in Belgium.[98] Cantons using paper voting display a larger share of invalid votes compared to cantons using electronic voting. On average on the period 1995-2014 (see Graphs 3 and 4), the share of invalid votes is larger by 2,42% in cantons using paper voting (7,71%) compared to cantons using electronic voting (5,29%) in the Liège province. Those figures reach respectively 6,06% and 5,13% in the Limburg province, indicating a difference of 0,93% between the cantons using different voting modalities, confirming previous findings for local elections in Flanders.[99] Overall, the observed difference in invalid vote share is rather important and somehow compensates for the difference in turnout observed above: turnout is lower in cantons using electronic voting, but voters from these cantons express a larger share of valid votes.

Over the whole period, the share of invalid votes is always higher in cantons using paper voting compared to cantons using electronic voting. Yet, there seem to be no clear time-related patterns in the Liège province: the largest difference between cantons using paper voting and using electronic voting was in 2003 (3,01%) while the smallest was observed in 1995 (1,53%). On the contrary, the share of invalid votes in the Limburg province declines over time: from a difference of 1,34% in 1999 to a mere difference of 0,22% in the 2019 elections. In any case, we do not observe a clear relation between turnout and the share of invalid votes as the decrease of turnout over time is not followed by a similar pattern concerning the share of invalid votes in the cantons using electronic voting.

[97] Pion (2010); Dandoy (2014); Dejaeghere & Vanhoutte (2016).
[98] Dandoy (2021).
[99] Dejaeghere & Vanhoutte (2016)

Graphs 3 and 4. Share of invalid votes in national elections (Liège province, 1995-2014; Limburg province, 1999-2019)





Source: Dandoy (2021).

Regarding the impact of electronic voting on party vote shares, observed differences regarding party vote shares are mostly explained by socio-demographic variables rather than by the voting modality. However, the split-ticket voting hypothesis can be tested at the occasion of the 2014 elections. On the same day, voters had to choose their representatives in the federal parliament, the Walloon and Flemish regional parliaments and the European parliament. We therefore can compare whether e-voters tend to split their votes more often that voters using paper ballots. We observe that the share of split-ticket voters is larger in cantons using paper voting in both provinces. This in particular true when looking at the differences between the federal elections with the regional and European in the Liège provinces and when looking at differences between the regional and European elections in the Limburg province (See Table 1).

Table 1. Share of split-ticket votes in the 2014 elections (Liège and Limburg provinces)

	Liège		Limburg	
	Paper voting	Electronic voting	Paper voting	Electronic voting
Federal - Regional	3,91 %	1,50 %	2,37 %	1,63 %
Federal - European	6,42 %	5,17 %	7,90 %	7,40 %
Regional - European	4,15 %	4,87 %	9,07 %	7,08 %

2.4.2. Public Attitudes Towards Electronic Voting

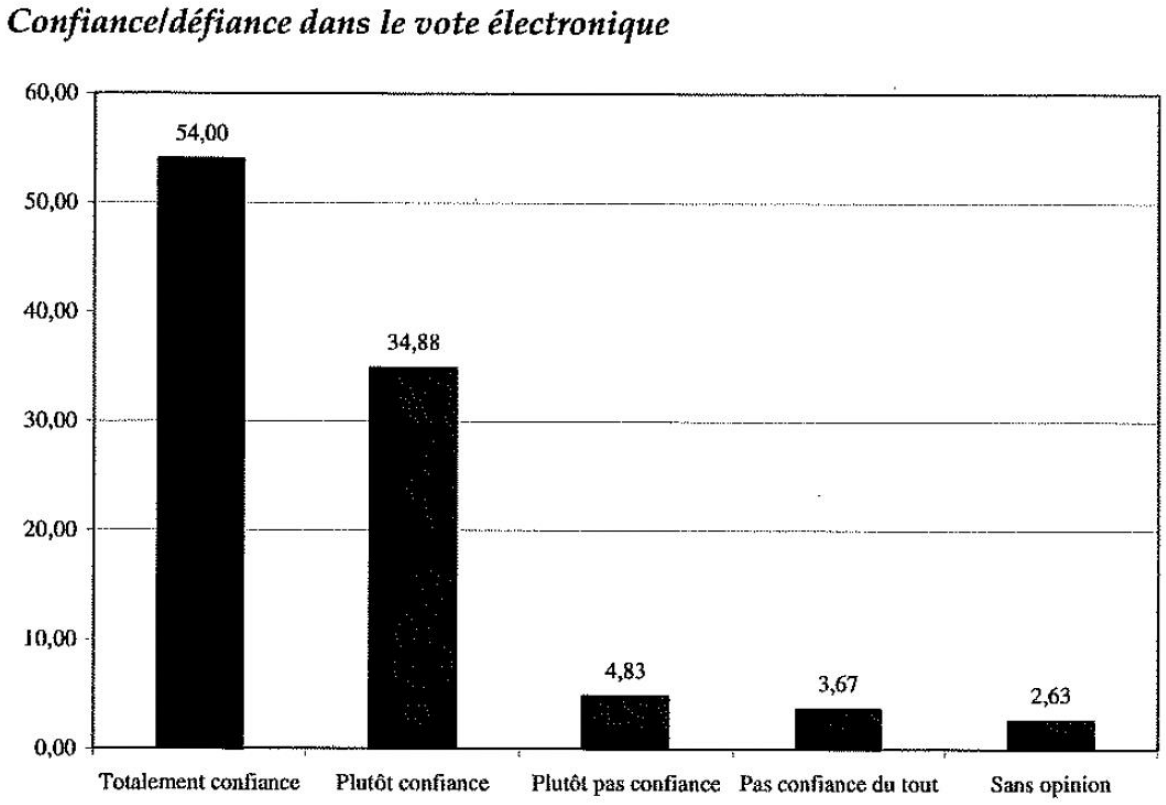
Compared to the number of voters who have used electronic voting since 1991, there are surprisingly very few surveys available about the perception of Belgian voters regarding electronic voting. However, an exit-polls survey was carried out by the Université Libre de Bruxelles during the 2003 elections based on a sample of 1,637 respondents.[100] Overall, voters have a very positive perception of electronic voting and this voting method generates relatively few negative reactions in terms of ease of use, social acceptance, and trust. Thus, a very large majority of respondents (87.84%) responded that they were in favour of electronic voting and less than 10% had an unfavourable opinion (8.43%).

[100] Delwit, Kulahci & Pilet (2004).

95.11% of respondents to this survey indicated that it was easy or very easy to vote electronically. Only 1.04% of respondents said that electronic voting was very difficult. Unsurprisingly, voters who had already used electronic voting in previous elections found voting easier, compared to voters using it for the first time. The highest percentages of ease of use were seen among the most educated voters. Similarly, trust is higher among voters who use a computer almost daily, compared to respondents who say they never use a computer.

Regarding the feeling of trust in electronic voting, it is also very high: 54% of respondents have complete confidence, while only 3.67% do not trust electronic voting at all. Interestingly, trust in electronic voting is highest among respondents with a low level of education, while trust is lowest among the most educated respondents. Confidence is also higher among the oldest categories of respondents, while the youngest show a higher level of distrust towards electronic voting.

Graph. Trust in electronic voting (2003)



Source: Delwit, Kulahci & Pilet (2004)

In order to comparatively measure attitudes relating to electronic voting, respondents were also asked about their perception of paper voting. Voters are thus 'only' 32.19% to declare that they have complete confidence in paper voting and 6.29% have no confidence at all in this method of voting. Overall, the marks of confidence are smaller for paper voting than for electronic voting.

Interestingly, the survey also questioned voters in the two cantons (Waarschot and Verlaine) that used the electronic voting pilot plan with a paper trail. This question is particularly important since a significant proportion of voters used this technology from 2014 onwards.

Voters who have used this method have even more confidence in electronic voting since 70% of these voters say they have complete confidence in this voting technologist (compared to 52% in the other cantons). Regarding the acceptance of electronic voting, nearly 92% of citizens of Verlaine and Waarschot say they are in favour of electronic voting compared to 87.3% of voters in other cantons.

Finally, the survey also looks at regional differences in the population's perceptions of electronic voting. This question is particularly relevant in a more recent context where electronic voting has been abandoned in Wallonia but is maintained in Flanders and Brussels. If a very large majority of respondents responded that they were in favour of computer voting, more of them expressed this opinion in Flanders (91.9%) than in Wallonia (87.6%) and Brussels (85.1%). But it is above all confidence in electronic voting that divides Belgian voters regionally: 73.1% of the Flemish respondents have complete confidence in electronic, compared to 51.1% in Wallonia and 46.8% in Brussels.

Chapter 3. France

3.1. Internet Voting System in France

Relatively little documentation on the French voting system is publicly available. It was therefore difficult to gather a sufficient amount of information to answer the same questions as for the other countries studied. In particular, there is no academic publication concerning the protocol, there is no public review of the source code or voting process, and the assessment report by ANSSI (National Agency for Information Systems Security) is not publicly available.

Internet voting in France is reserved for French people living abroad. It was used in 2012 for the legislative elections, and in 2014 for the consular elections. In 2017, the government followed a recommendation from the ANSSI and cancelled online voting for the legislative elections. ANSSI then cited that despite the continuous improvement in the security of the system used, the "current context, characterized by an extremely high level of threat of cyberattacks" made its deployment dangerous.[101]

After continued security efforts, and a full-scale test in November 2019 with a positive conclusion[102], the Internet voting system went back for the consular elections of 2021[103], the legislative elections of 2022, and the legislative by-elections of 2023. The Spanish company Scytl developed the platform used from 2006 to 2014 and the French company Voxaly-Docaposte implemented internet voting for the legislative elections of June 2022. This implementation was approved in January 2020.[104]

French citizens residing abroad and able to vote (registered on the electoral lists) need to provide an e-mail address and a mobile phone number to their consulate (or at http://www.service-public.fr). They can then participate in the Internet vote by accessing the voting portal (or on the France Diplomatie website). The voting process is as follows:
- The voter specifies his/her electoral district and the associated candidate lists
- He/she then goes to the voting portal and connects by entering two codes: one ("username") which he/she received by email and the other ("password") which he/she received by SMS. These two codes are composed of 12 characters (alphanumeric + special characters), chosen randomly by the voting system.
- The voter then selects a voting option: a list of candidates or a candidate (depending on the voting in the electoral district), or a blank vote.
- He/she then enters a confirmation code which he/she receives by email.
- The voting system finally produces a proof of vote, which is displayed on the screen and sent by email.

[101] Rees (2017).
[102] ANSSI (2019).
[103] Initially scheduled for May 2020, these elections were postponed several times due to the context linked to the health crisis and finally organized in 2021.
[104] Ministère de l'Europe et des affaires étrangères (2020).

3.2. Socio-Political Dimension

3.2.1. Previous Experiences with Electronic Voting and Postal Voting

Postal voting has not been authorized in France since 1975, partly due to electoral fraud. Recently, a postal voting system from prisons was tested for the 2019 European elections but, to our knowledge, there are no other projects to test or implement postal voting in France. As for French people living abroad, they have had the right to vote by mail since 1982 and the first direct elections of the Superior Council of French People Abroad (CSFE). However, postal voting remains little used by French people living abroad. During the first round of the 2012 legislative elections, 1.94% of voters sent a ballot by mail while they were only 7.26% during the first round of the 2017 legislative elections (considering that the vote by Internet had been abandoned for these elections). In addition, the organization of postal voting is particularly complex and is dependent on foreign postal systems. In 2017, this logistical difficulty caused the cancellation of elections in one constituency given that some voters did not receive their voting materials on time.[105]

Conversely, France has significant experience with on-site electronic voting (in polling stations). Since 1969, the French electoral code has authorized municipalities with more than 30,000 inhabitants to use on-site electronic voting.[106] In 1988, this possibility was offered to municipalities with more than 3,500 inhabitants. Electronic voting was first tested during the 1973 legislative elections, but it was quickly abandoned due to numerous breakdowns and failures.

Electronic voting made its comeback in the early 2000s. The first tests of electronic voting were carried out during the presidential and legislative elections of 2002 (in parallel with paper voting) in three electoral districts (Mérignac in Gironde, Vandoeuvre-Les- Nancy and the 18th arrondissement of Paris). In 2003, electoral legislation was amended to introduce the use of on-site electronic voting for different types of elections. Electronic voting was gradually introduced in municipalities with more than 3,500 inhabitants: one municipality (Brest) during the regional and cantonal elections of March 2004, 17 municipalities during the European elections of June 2004, 56 municipalities during the national referendum of 2005, and 82 municipalities during the 2007 presidential elections, representing nearly 1.5 million voters and 3% of the electorate. After this date, the number continued to decline over time, reaching around fifty municipalities during the 2022 presidential and legislative elections.

In parallel with ordinary elections, internet voting is quite widespread in France. For example, it is widely used in non-political elections such as professional elections (banks, chambers of commerce), in mutual societies, unions, and associations, as well as within public services such as National Education or public services. departmental fire and rescue services. Internet voting is also frequently used for elections within political parties, and in particular for their primary elections, such as the UMP in 2014 or EELV in 2016, or for consultations of party members, such as the Socialist Party in 2015. It is also interesting to note that only French people living abroad had the possibility of voting online during some party primaries in 2016.[107]

[105] Commission des lois (2018).
[106] Law n° 69-419 from 10 May 1969.
[107] Cortier (2016)

The UMP party decided on 21 October 2010 to authorize internal party elections to be held online. Primary elections were, for example, organized in Paris for four days (from 21 May to 3 June 2013 via the site https://jevote.primaireparis.fr). 20,074 members of the UMP participated in the internet vote (0.32% of blank and invalid ballots) and N. Kosciusko-Morizet was elected in the first round (58.35%). This primary election was followed by accusations of fraud, including hacking of the registration file and difficulty in identifying voters. During the 2016 primaries, around 50,000 French people living abroad participated in the two rounds of the election of the candidate of the Les Républicains (LR) party. If these primaries were a success on French territory (more than 4 million voters voted physically in a polling station on 20 and 27 November 2016), participation by Internet from abroad was more modest: 53,084 voters during the 1st round and 49,500 during the second round.[108]

Keeping in mind that these are two significantly different electorates, we can compare Internet voting (French living abroad) with paper voting (mainland and overseas). The percentage of blank and invalid ballots is very low and substantially identical for the two types of ballots: 0.1% (1st round) and 0.39% (2nd round) for Internet voting and 0.23% (1st round) and 0.3% (2nd round) for paper voting. When it comes to votes, the differences are much more significant. During the 1st round, the preferred candidate of voters using paper voting was F. Fillon (44.2%), followed by A. Juppé (28.4%) and N. Sarkozy (20.8%). Among voters using Internet voting, the trifecta is made up of A. Juppé (45.5%), followed by F. Fillon (37.3%) and N. Sarkozy (8.7%). The differences between the two types of voting are also significant during the 2nd round: F. Fillon obtains 52.3% with internet voting compared to 67.5% with paper voting. These differences are very significant, but they are probably more the consequence of the type of voter (French living abroad vs. French living on national territory) than of the voting method.

The EELV party organized its primary elections in 2011 and 2016 partially via the internet. In 2011, party members were able to vote by post or online (from June 16 to 23, 2011 for the 1st round and from July 1 to 9 for the 2nd round). The participation rate was 77.33% in the 1st round and 69.49% in the 2nd round. According to the website ecolocitoyen.org, 60.47% of ballots were issued via the Internet (39.53% by post) during the 1st round, including 0.39% of blank ballots (2.91% of ballots blank and void for postal voting). There are significant differences in voting behaviour: for example, candidate N. Hulot would have obtained 44.12% of the votes with Internet voting compared to 34.64% with postal voting. However, the two candidates qualified for the 2nd round of the primaries are identical in both types of votes.

These elections aroused a lot of criticism within the party, including the candidate S. Lhomme. An online petition on the platform https://ecolocitoyen.org has collected many signatures against online voting. Among the critics' arguments are the opacity of the system and the difficulties of identifying voters. During the 2016 primaries, residents of mainland France used postal voting while French people living abroad and residents of overseas departments and regions voted by Internet (from 15 to 16 October for the 1st round and from 3 to 4 November 2016 for the 2nd). The participation rate was 73.38% in the 1st round and 80.76% in the 2nd round.

[108] Election results available here: https://resultats.primaire2016.org/#/foreign

EELV also organized consultations exclusively via the Internet for more specific questions such as voting to approve or not the search for convergence and bringing together with B. Hamon and J-L. Mélenchon. This internet vote was organized from 14 to 16 February 2017 and brought together 10,155 voters (participation rate of 59.47% and 2.39% blank votes), as well as from 24 to 26 February 2017 (participation rate of 55.24% and 5.08% of blank votes). In these two examples, 'yes' wins by a large margin. More recently, EELV members were also able to vote online to nominate environmentalist candidates for the European election. These elections took place on the platform https://vote.eelv.fr from 11 to 16 July 2018 (for the head of the list) and from 7 to 13, March 2019 (for the final list of 79 candidates).

3.2.2. Implementation of Internet Voting in France

The Jospin government (1997-2002) created a commission responsible for studying the reform of the Superior Council of French People Abroad (CSFE). This institution was then renamed the Assembly of French People Abroad (AFE) and, in an attempt to increase turnout in the elections of this institution, Internet voting was used for the first time in a pilot program in the two districts of United States in 2003. Its introduction resulted in part from an initiative by Senator R. del Picchia in 2003 (UMP and then LR). At the same time, the association *Forum des Droits sur Internet*, based on public funding, sent recommendations in September 2003 to the Minister of the Interior N. Sarkozy on the future of electronic voting in France and the conditions for its implementation. implemented. This report recommended, among other things, that, for all political elections, Internet voting be authorized for French people living abroad for elections to the CSFE.[109]

Political debates on internet voting in 2003 were polarized. In favour of Internet voting, we find the UMP led by N. Sarkozy, while the Socialist Party and the ecologists were mainly opposed to this voting method. The stated objectives of the introduction of Internet voting were to increase turnout, facilitate accessibility to the ballot, and modernize the public service. The (centre-right) mayor of the town of Issy-les-Moulineaux also contributed - indirectly - to the debate by authorizing his citizens to elect their representatives to neighbourhood councils using Internet voting in December 2003. Nevertheless, these debates did not affect the successive elections to the AFE since Internet voting was then used for these elections in 2006, 2009 and 2010.[110]

In 2009, President Sarkozy published a decree perpetuating electronic voting for elections to the Assembly of French people abroad[111] and advocating a more general use of Internet voting, because it was perceived as "progressive" and inexpensive and consisted into an effective and practical solution to the specific case of expatriate voting. In addition, the electorate outside France is very dispersed and mobile, which poses challenges for maintaining electoral lists and for holding traditional paper voting. This political will must nevertheless be understood in the context of the decision of Sarkozy's government to introduce a reform of the political representation of French people living abroad aimed at establishing directly elected deputies

[109] Forum des droits sur l'Internet (2003); Collard & Fabre (2014); Commission de lois (2018).
[110] Collard & Fabre (2014); Commission des lois (2014).
[111] Decree n° 2009-525 of 11 May 2009.

in eleven newly created constituencies abroad (constitutional revision in 2008 and redistribution of electoral constituency boundaries in 2009).[112]

Although this decision corresponds to certain demands from French people living abroad for better political representation, the previous electoral results demonstrate that this category of voters tends to vote more to the right than French people living on national territory. Despite significant debates once again opposing the left and the right, the bill was adopted in April 2011 and a State Secretariat responsible for French people abroad was created in May 2011. The 2012 legislative elections saw for the first time French people living outside France use internet voting.[113]

Similarly, the legislation was adapted to consular elections (which replaced the elections of the Assembly of French People Abroad) to authorize French people living abroad to vote via the Internet.[114] In 2014, the first consular elections took place with the possibility of voting online. Political reactions following these elections were mixed and the criticism mainly concerned the regulatory vagueness regarding the submission of candidacies and the complexity of the process of constituting and submitting lists; the lack of information for voters and candidates; the various technical problems encountered by voters; as well as technical problems encountered by candidates.[115]

3.2.3. Abandon and Return of Internet Voting in 2017

On March 6, 2017, the Cazeneuve government decided to suspend Internet voting for the 2017 elections and to authorize French citizens living abroad to vote only in polling stations or by mail.[116] The suspension decision is based on a recommendation from the National Information Systems Security Agency (ANSSI). This agency highlights an IT architecture considered insufficiently robust in the context of very high cyber threats. The Ministry of Foreign Affairs had also mentioned risks of hacking and this decision is part of a more global geopolitical context (attacks against the TV channel TV5 Monde, Russian influence in the American presidential elections, etc.).[117]

This government's decision to abandon Internet voting was quite criticized. First of all, it was relatively misunderstood since this same government had promised, less than a year earlier, to design a new Internet voting solution offering voters a solution that was both ergonomic and secure. In addition, this abrupt decision to no longer use Internet voting comes less than three months before the first round of the legislative elections of 11 June 2017, creating a lot of last-minute problems regarding the logistical organization of the elections. Finally, the representatives of French people abroad were not consulted or informed of the difficulties encountered and of this abandonment of Internet voting. The Senate recommended that – in the future – the government consulted the Assembly of French People Abroad before changing the voting methods.[118]

[112] Article L330-13 of the Electoral Law.
[113] Pellen (2013); Collard & Fabre (2014).
[114] Law of 22 July 2013 et Decree n° 2014-290 of 4 March 2014.
[115] Assemblée des Français de l'étranger (2015).
[116] Ministerial decree of 17 March 2017.
[117] Enguehard & Shulga-Morskaya (2017); Assemblée des Français de l'étranger (2019).
[118] Commission de lois (2018).

Regarding the substance of the suspension and despite certain compensatory measures[119], some believe that the internet voting platform nevertheless presented structural imperfections which could have been corrected in a more methodical manner while reducing the risks of hacking. Additionally, evolving security requirements, insufficient resources and inconclusive large-scale tests from December 2016 and February 2017 were also mentioned. Regarding the calendar, the period between the award of the contract to the service provider in May 2016 and the elections in June 2017 also appeared to be too short.[120]

Following the 2017 presidential elections, Internet voting quickly returned to the political agenda. Indeed, Emmanuel Macron's electoral manifesto was in favour of the "generalization of electronic voting by 2022". On 2 October 2017 in front of parliamentarians of French people living abroad and the Assembly of French people living abroad, President Emmanuel Macron committed to ensuring that French people living abroad would be able to vote online in the next consular elections of 2020 and the legislative elections of 2022. The president also stressed that the abandonment of Internet voting could not be repeated and that the improvements to be made would concern not only security but also principles such as the secrecy of the vote, credibility, and sovereignty. In addition, the argument of the low turnout among French people living abroad is once again present in political discourse.[121]

The use of Internet voting was planned for the consular elections of May 2020. Following the health situation due to COVID-19 in France, the Senate and the National Assembly agreed in a joint committee to delay the consular elections until 21 May 2021. On a transitional basis, the renewal of half of the senators representing French people established outside France whose mandate expired in September 2020 is also postponed by one year, to the last Sunday of September 2021, while the mandate of the 443 consular advisors elected in May 2014 is also extended by one year. The agreement reached on these provisions between the Senate and the Assembly finally provided for some additional provisions, including the maintenance of electronic voting subject to a report to be submitted by the government to the Assembly of French People Abroad.[122]

Internet voting was not implemented during the partial consular elections of November 20211 and October 20222, for admittedly different reasons. In the first case, the public contract with the company Scytl had expired in June 2021 and could no longer be extended. In the second case, the service provider of the new market – the company Voxaly-Docaposte _–, which set up internet voting for the legislative elections of June 2022, was not yet able to create a voting portal for the consular elections.[123]

The future of Internet voting in France firstly concerns certain improvements to the current Internet voting platform, including voter identification. Indeed, since several members of a

[119] After the abandon of Internet voting for the 2017 legislative elections, the government announced three compensatory measures: the opening of 152 additional polling stations, the extension of the period during which French people living abroad were able to register to participate in postal voting and the organization of new consular tours during which a public agent collects voting proxies from voters furthest from the polling stations.
[120] Commission de lois (2018).
[121] Electoral manifesto of Emmanuel Macron (2016); Enguehard & Shulga-Morskaya (2017); Commission de lois (2018); Assemblée des Français de l'étranger (2019).
[122] Law No. 2020-760 of 22 June 2020.
[123] Frassa & Leconte (2023).

household sometimes vote on the same computer, it is important to secure the identification of voters, in particular by using biometric techniques. Another improvement would be to simplify the procedure for connecting to the voting platform, by eliminating the sending of identification codes by email and SMS. Some other proposals concerned the organization of Internet voting for the consular elections of 2020 (then 2021), by suggesting increasing the number of large-scale tests and organizing them with sufficient anticipation to correct the difficulties observed. Greater efforts must be made to include a larger number of voters, particularly older people. With regard to the 2022 legislative elections, the Law Commission proposed to strengthen the resources allocated to securing internet voting and to streamline the procedure for purchasing the voting platform (among other things by introducing more competition).

Note that even if the abolition of postal voting could be considered, the extension of Internet voting to other types of ballots was not discussed given that these elections would concern all French people and not just those residing there. abroad (presidential elections, European elections, and national referendums). However, the crisis linked to COVID-19 and the organization of the second round of municipal elections in June 2020 in a worrying health context resulted in several French political figures proposing to expand the use of internet voting for these elections. The arguments used are linked to the health situation of the COVID-19 crisis and the risk of contagion from a vote organized in person. Thus, Senator P. Joly (Socialist Party) proposed to proceed by electronic voting for the second round of the 2020 municipal elections[124] while F. Bayrou (Modem party) proposed to authorize municipalities that wished to use electronic voting. Internet.

The 2022 legislative elections revealed technical flaws linked to internet voting. The election had been cancelled in two electoral constituencies because the malfunctions observed in the reception of identification codes by SMS had undermined the sincerity of the vote. In the 2nd constituency of French people established outside France (Mexico, Central America, the Caribbean, and South America), the rate of delivery of phone messages containing passwords was 38% at the end of the first round regarding voters registered on the consular electoral lists in Argentina. In the 9th constituency of French people living outside France (Maghreb and West Africa), the rate of delivery of phone messages containing passwords was also 38% at the end of the first round for voters. registered on the consular electoral lists in Algeria.

The Constitutional Council considered that the anomalies noted had, given the difference in votes between the candidates, undermined the sincerity of the vote. As a result, the Constitutional Council cancelled the elections in the 2nd and 9th constituencies. By-elections using Internet voting for these constituencies took place on 1 and 2 April 2023 for the first round, and 15 and 16 April 2023 for the second round.

3.2.4. Political Debates and Arguments

The analyses of political discourse regarding Internet voting indicate that the left-right position of the different parties and candidates seems relevant to understanding this debate. It was in fact the centre-right and right-wing parties that promoted Internet voting from the beginning

[124] Written question n° 15385 of Patrice Joly, 16 April 2020.

of the 2000s (presidencies of Chirac and Sarkozy), while this voting method was called into question at the end of the presidency. of Hollande (left) before quickly being forward in 2017 (Macron's presidency). Analysis of electoral results indicates that French people living abroad tend to vote more to the right than French people living on national territory. However, the left-wing parties (Socialist Party and EELV) also organized some of their primary elections and consultations with their members via the Internet. Moreover, the positions of the different actors seem to fluctuate, depending on the socio-political context.

Among the arguments in favour of Internet voting, we find the fact that this voting method allows the electoral participation of a part of the French population residing far from polling stations. Internet voting also makes voting easier in certain countries where security issues and political and social unrest can limit voters' travel to polling stations. In addition, Internet voting allows certain categories of voters (people with disabilities and reduced mobility) to vote from home. The ease of online voting is also an argument that comes up regularly concerning voter registration, among other things thanks to the digitization of electoral lists, and the efficiency of the counting. Finally, Internet voting allows a significant saving of time upstream when setting up the ballot as well as very rapid dissemination of the results. More recently, the health advantage in the context of the COVID-19 crisis has been highlighted in political speeches.

Among the disadvantages mentioned by political actors, the elements that come up regularly mainly concern the risks of computer hacking, such as those that led to abandoning Internet voting for the 2017 legislative elections. Alongside these risks, we find difficulties in ensuring the personal and secret nature of the vote (the vote can be exercised under duress from a third party), as well as the loss of solemnity of the vote. Finally, certain actors highlight the digital gap existing between different categories of voters (given that it is necessary to have a device connected to the internet and a valid e-mail address) as well as the impossibility for voter to supervise the ballot box and the counting of the ballot papers.

Large-scale tests of the Internet voting system are regularly organized by the Ministry of Europe and Foreign Affairs, such as those of February 2012, December 2016, February 2017, or January 2022. These tests aimed to simulate the election in conditions close to the consular election which should have taken place in May 2020, and to verify the technical robustness of the application to various vulnerability and intrusion tests. The 2012 test brought together no less than 15,000 voters (30% participation in the first round and 33% in the second). The 2016 and 2017 tests also included a simulated second round and brought together between 2,144 and 3,039 voters.

The evaluation of these tests carried out by the Senate indicates that they were not satisfactory, both from the point of view of usability and the security of the online voting platform. The connection failure rate was very high (from 50% in the first round of the 2016 test to 11% in the first round in 2018). These connection difficulties were, for example, caused by identification emails not received or classified as spam, errors concerning the voter's mobile number, etc. Among the other elements criticized by the Senate Commission, let us mention the fact that voters had to wait for more than 1h30 after connecting to the voting

portal to receive their second password or that the saturation of the server led to the interruption of voting operations during almost an entire afternoon in 2017.[125]

More recently, two large-scale tests were organized in July and November 2019. The tests were carried out from 5 to 8 July 2019 and from 22 to 26 November 2019 with respectively 3,408 voters (27.2% participation) and 4,302 voters (33%) contacted by email and SMS. According to the organizers of the test, no security incidents were detected on the central servers during it. For the Assembly of French People Abroad, these tests made it possible to confirm the presence of problems concerning the receipt of identifiers and passwords by e-mail and SMS.[126]

3.3. Legal Dimension

3.3.1. Existing Legislation and Adaptation

The implementation of Internet voting for legislative and consular elections required close cooperation between the Ministry of the Interior, responsible for organizing the elections, and the Ministry of Foreign Affairs (as well as of the Secretary of State to the Minister for Europe and Foreign Affairs), responsible for the consular network involved in the electoral process. Both ministries participated in the development of the legal framework, as well as the design of the technical solution. Many independent authorities also participated in the design of the solution, including ANSSI (the National Information Systems Security Agency), the CNIL (National Commission for Informatics and Liberties), and various auditors.

An electronic electoral precinct is responsible for the smooth running of electoral operations. This independent institution is made up of eight members appointed for five years: a member of the Council of State, two representatives of the Ministry of Foreign Affairs, a representative of the Ministry of the Interior, the director of the National Systems Security Agency of information (ANSSI) and the president and the two vice-presidents of the Assembly of French people abroad. The electronic polling station may order the temporary cessation of voting operations if it notices a hacking attempt. Bureau meetings are open to candidates, party representatives, and voters, and the minutes of all meetings have been made available to OSCE/ODIHR, voters, and proxies.

Internet voting is subject to the same judicial control as other voting modalities: the judge can cancel the elections in the event of proven irregularities. However, the decision to abandon internet voting rests with the Minister of Foreign Affairs, for example for the 2017 legislative elections. Internet voting (and in particular the voters' list) is also subject to the control of the CNIL about the protection of individual data while the ANSSI is consulted on questions relating to the security of Internet voting.

French legislation was amended in 2003 to allow the use of electronic voting in polling stations. The electoral code specifies that voters “can also […] vote by correspondence, either in a closed envelope or electronically using hardware and software allowing the secrecy of the

[125] Commission des lois (2018).
[126] Ministère de l’Europe et des Affaires étrangères (2019); Assemblée des Français de l’étranger (2019).

vote and the sincerity of the vote to be respected". The process of introducing Internet voting was carried out in several stages. During the constitutional reform of 2008. French people established outside France received the right to be represented in the National Assembly and the Senate (article 24 of the Constitution) and by specific representative bodies (article 34 of the Constitution): the consular councils and the Assembly of French People Abroad (AFE).[127]

The constitutional revision of 2008 was then supplemented by a series of legislative acts opening up the possibility of Internet voting for legislative elections: an ordinance in July 2009, a law of April 2011 and by a decree signed in July 2011.[128] This legislation does not regulate electoral operations in detail but integrates the constitutional principles of electoral sincerity, secrecy of the vote, and access to the vote. Internet voting for legislative elections is regulated by article L. 330-13 of the electoral code. Ordinances no. 2009-935 and no. 2009-936 of 29 July 2009 specify the number of constituencies, their delimitation as well as the specific provisions for the election of deputies by French people established outside France.

Finally, consular elections, are regulated by a law of July 2013 and a decree of February 2014 [129] Internet voting was thus integrated into the electoral code during the large-scale reform of consular representation in 2013 and is regulated by article 22 of the law of 22 July 2013. From now on, consular elections concern the election of 443 consular advisors for a six-year mandate.

These elected officials participate in the selection of members of the Assembly of French Abroad and senators. Consular Advisors are volunteers and receive a fixed allowance to contribute to their mandate and travel costs. These consular advisors represent French citizens established outside France and represent their constituents on the consular council chaired by the ambassador. The consular council is "responsible for formulating opinions on consular questions or questions of general interest, in particular cultural, educational, economic and social, concerning French citizens established in the district"[130]. Their most concrete missions of consular advisors are the awarding of scholarships to French students from the network of French schools abroad; social assistance to French people in need; support for the voluntary sector; and security issues.

In addition to the objective of alleviating the difficulties encountered by French people living abroad when they go to the polls, the French legislative framework has placed emphasis on various electoral principles such as electoral sincerity, secrecy of the vote and the protection of personal data. In order to preserve the secrecy of the vote, Internet voting is based on a voter identification system. To ensure the fairness of the election, the Internet voting system and ballot box are protected against security breaches to ensure that no one can enter the system while the ballot is still open and modify the ballots or add fake ballots.

With regard to equality between voters, the adoption of the law implementing the constitutional revision in 2009[131] confirms the political choice to limit Internet voting and

[127] Constitutional law No 2008-724 of 23 July 2008, article 9.
[128] Ordinance No 2009-936 of 29 July 2009; Organic law No 2011-410 of 14 April 2011; Decree No 2011-843 of 15 July 2011.
[129] Law No 2013-659 of 22 July 2013; Decree No 2014-144 of 18 February 2014.
[130] Article 3 of the Law No 2013-659 of 22 July 2013.
[131] Ordinance No. 2009-936 of 29 July 2009.

postal voting to legislative and consular elections and therefore not to extend it to other elections for which French people living abroad have the right to vote (such as the presidential election or national referendums). Indeed, the French legislator considered that it would be problematic, with regard to the principle of equality, for French people residing abroad to have more voting options than voters residing in France. According to this same principle of equality, it was decided not to introduce the possibility of modifying one's vote (and therefore voting several times). On election day, the authorities will have the list of voters who have already voted online in order to prevent these voters from also voting in their polling stations.

With regard to data protection, the Internet voting system and the processing carried out on personal data are required to comply with the rules on the protection of personal data, in particular those set by the law of January 1978 relating to the data processing, files, and freedoms, by the legislative texts relating to the implementation of the resulting processing of personal data, as well as by the National Commission for Information Technology and Freedoms. The internet voting solution must also comply with deliberation No. 2010-371 of 21 December 2010 related to the adoption of a recommendation relating to the security of electronic voting systems.[132]

The 2020 consular elections were initially regulated by a decree from the Ministry of Europe and Foreign Affairs in February 2020. This decree included the convocation of voters, the dates of online voting (from 8 May 2020 at noon to 13 May 2020 at noon, while the paper vote took place on 16 May 2020 in embassies and consular posts located on the American continent and on 17 May 2020 for the rest of the world) and the determination of the electoral lists. Following the COVID-19 health crisis, a decree (No. 2020-334 of 26 March 2020) repeals the decree of 4 February 2020 and an ordinance organizes the extension of the mandates of consular advisors and consular delegates. The consular elections were first postponed to June 2020 and then scheduled for 21 May 2021.[133]

3.3.2. Electoral System

The electoral system for legislative and consular elections is relatively simple. French people living abroad gained direct representation in the National Assembly – the lower house of the French Parliament – in 2008. In the 2012 legislative elections, French expatriates were called upon for the first time to elect 11 Members of Parliament (one per extraterritorial electoral district). These 11 MPs are elected by direct universal suffrage and by single-member majority voting in two rounds. These 11 electoral districts were delimited in accordance with article 25 of the law of 22 July 2013 (for example, North America, Benelux, Iberian Peninsula, etc.).

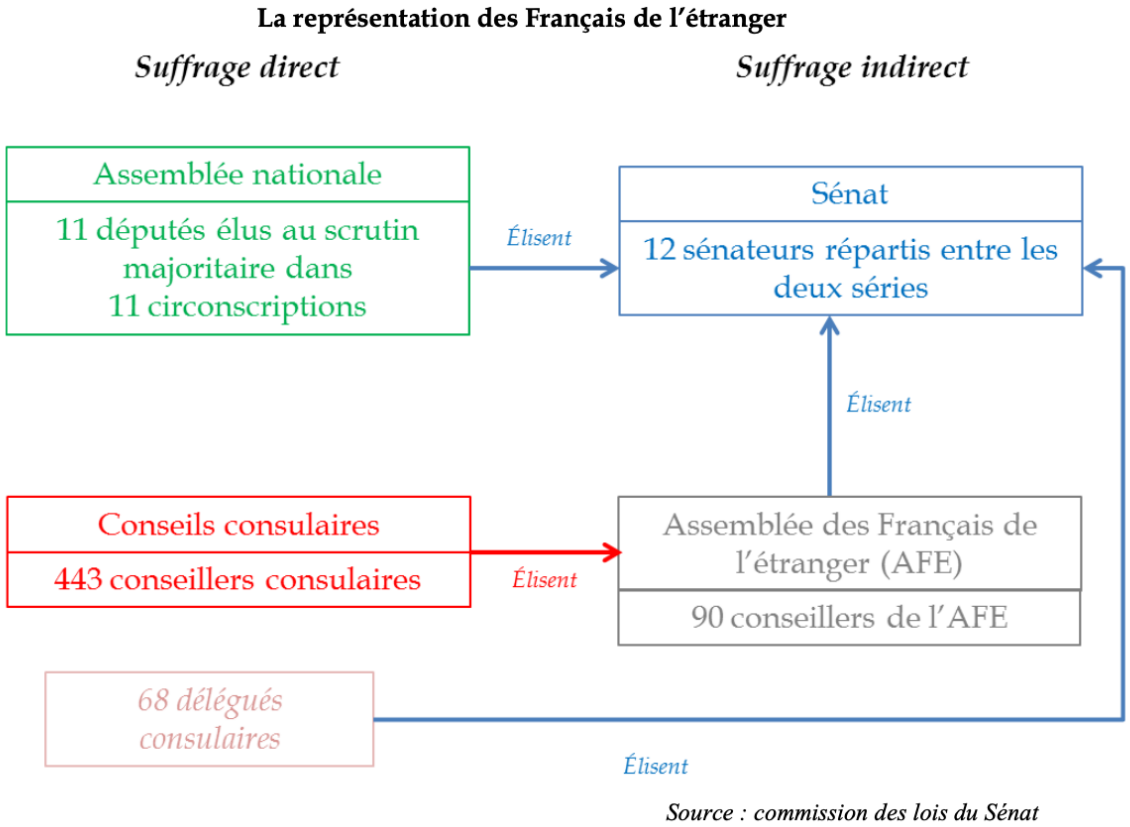
The consular councils were created in 2013[134]. The 443 consular advisors and 68 consular delegates are elected every six years in 130 consular districts.[135] The number of consular advisors varies from one to nine. No less than 22 consular councils are made up of a single consular advisor. Three consular councils are made up of nine councillors: the 2nd district of

[132] Law No. 78-17 of 6 January 1978.
[133] Decree No. 2020-83 of 4 February 2020; Ordinance No. 2020-307 of 25 March 2020.
[134] Law No. 2013-659 of 22 July 2013.
[135] The 68 consular delegates are elected by direct universal suffrage (at the same time as the consular advisors) in order to correct the demographic gaps observed for the senatorial elections. Their role is limited to participating in senatorial elections.

the United Kingdom (including London), the Belgian district, and the 2nd district of Switzerland (i.e. French-speaking Switzerland). In constituencies where a single seat must be filled, the election takes place according to the first-past-the-post system. In constituencies where several seats must be filled, the election is based on a list system, with proportional representation based on the rule of the highest average. In the most populated districts, consular delegates are elected at the same time as consular advisors to correct population differences between districts. They aim to complete the electoral body of senators representing French people established outside France. For example, the second Swiss constituency is made up of 9 consular advisors and 12 consular delegates.

3.3.3. Elections and Voters

French people living abroad have the right to vote in (1) presidential elections; (2) elections of (national) deputies; (3) European elections; (4) elections of consular advisors; and (5) national referendums.[136] For these elections, French people living abroad can vote in paper format in a polling station, often in the embassy or consular post. Voting by paper correspondence, by sending the ballot by post, is only possible for the elections of deputies. Finally, Internet voting is only possible for the elections of deputies and consular advisors. It should also be noted that French people residing abroad can also hold three proxy votes for the same election, compared to only one proxy vote on national territory.



[136] In addition, French people living abroad have been represented since 1946 by 12 senators (out of 348) in the upper house of the French Parliament. These senators are elected in a single electoral district and according to a proportional list system. The electorate is made up of eleven deputies, members of the Assembly of French People Abroad (AFE) and 68 consular delegates.

Internet voting was used for the first time in France during the election of representatives to the neighbourhood councils of Issy-les-Moulineaux in December 2003. Since 2006, Internet voting has been used by French voters abroad on several occasions. First of all, in 2006, 2009, and 2010, concerning the elections of the Assembly of French People abroad (Asia-Europe constituency in 2006, Africa-United States constituency in 2009, and by-election on the East Coast of the United States). United in 2010). Then, Internet voting was used four times for the legislative elections in 2012 and 2013: the first and second rounds of legislative elections in 2012 and the first and second rounds of partial legislative elections in 2013. The consular elections of 2014 also made possible internet voting. Internet voting was finally offered for voters residing abroad during the consular elections of 2021, the legislative elections of 2022, and the partial legislative elections of 2023. Note that this voting method is not available for other types of elections (presidential, European, referendum).

Internet voting takes place in advance and is accessible for six consecutive days, approximately 10 days before polling day. During the 2012 legislative elections, internet voting took place from 23 to 29 May 2012 during the first round (election day was on 11 June 2012) while the second round took place from 6 to 12 June 2012 (the date of the elections being on 17 June 2012). For the 2014 consular elections, voters living abroad voted via the Internet from 14 to 20 May 2014. The elections took place on 24 May (polling stations on the American continent) and 25 May 2014 (polling stations voting in the rest of the world). During the consular elections of 2021, internet voting was open for 5 consecutive days, from 21 to 26 May 2021. For the legislative elections of 2022 and partial elections of 2023, Internet voting was also open for 5 consecutive days (from 26 May to 1st June 2022, from 10 to 15 June 2022, from 24 to 29 March 2023, and from 7 to 12 April 2023).

Voters who voted online cannot vote in paper format on election day. The reason for the delay (three days) between the end of Internet voting and election day is due to the updating of voter lists by election administrators before they are used on election day, eliminating the possibility of voting both online and on paper.

Les modalités de vote prévues pour les Français de l'étranger

<table>
<tr><th>Scrutin concerné</th><th>Vote à l'urne</th><th>Vote par Internet</th><th>Vote par correspondance papier</th><th>Vote par remise de pli à l'administration</th></tr>
<tr><td>Élection du Président de la République</td><td rowspan="8">Oui</td><td rowspan="2">Non</td><td rowspan="2">Non</td><td rowspan="3">Non</td></tr>
<tr><td>Référendum national</td></tr>
<tr><td>Élection des députés</td><td>Oui</td><td>Oui</td></tr>
<tr><td>Élection des sénateurs</td><td rowspan="3">Non</td><td rowspan="2">Non</td><td>Oui</td></tr>
<tr><td>Élection des représentants au Parlement européen</td><td>Non</td></tr>
<tr><td>Élection des conseillers de l'Assemblée des Français de l'étranger (AFE)[3]</td><td rowspan="2">Non</td><td>Oui</td></tr>
<tr><td>Élection des conseillers consulaires</td><td>Oui</td><td>Non</td></tr>
</table>

Source: Commission des lois, 2018

Internet voting for legislative and consular elections is possible for citizens meeting the following conditions: (1) being established abroad; (2) being registered on the consular

electoral list[137]; and (3) when registering on the consular electoral list, having provided an e-mail address and a mobile number (so that an identifier and a password can be communicated to you respectively by e-mail and by SMS). Voters also have the option of voting at a polling station, by mail (only for legislative elections), or by proxy. No less than 126,947 voters voted via the Internet during the first round of the 2012 legislative elections and there were 117,675 during the second round. 80,115 French citizens voted via the Internet during the 2014 consular elections.

3.4. French Citizens and Electronic Voting

3.4.1. Acceptance by Voters

Internet use among the population has evolved significantly between the first Internet elections in France and the situation today. However, there are no statistics concerning access to the Internet and/or a computer among the French population residing abroad. We can nevertheless extrapolate based on figures for the entire French population. In 2003, the year of the first elections in which French people living abroad had the possibility of voting via the Internet, only 36.14% of individuals had access to the Internet. This figure quickly climbed to reach 81.44% in 2012 (legislative elections) and 83.75% in 2014 (consular elections). More recent data indicates that the percentage of households with a computer is 77.5% while 82.4% of households have access to the Internet. At the individual level, the figures are similar: 75% of individuals own a computer while 82% of them have access to the Internet.[138]

The analysis of the results of the 2012 elections indicates that Internet voting did not have the expected positive effect on the participation rate in the elections. Thus, 39.07% of French people living abroad participated in the first round of the presidential election (only by paper vote in consulates and embassies) while 20.71% of them voted during the first round. legislative elections (where three voting methods were available: internet voting, paper voting, and postal voting). However, the participation rate during the 2017 legislative elections was even lower (19.11%) although internet voting was no longer available. The explanation of these different participation rates over time and according to the type of election is mainly due to sociological factors (structural decline in participation) and political factors (campaign issues, candidates in the running, etc.) rather than 'different voting methods.[139]

The analysis of turnout figures for the 2014 consular elections indicates that, on average, the participation rate was rather low (20.61%) but identical to that of the 2009 AFE elections.[140] However, there is a large variation in participation rates from one conscription to another: from 6.79% in the second Israeli district (Tel Aviv) to 51.75% in the second Indian district (Pondicherry). Turnout is mainly explained by two phenomena. Firstly, the turnout rate in consular elections is affected by the number of registered voters, i.e., the turnout rate is lower in large constituencies with a larger population and/or number of registered voters. Then, there is an impact of cultural ties between the country of origin and the host country:

[137] This registration is done automatically on the basis of the Register of French people established outside France which can be done online or physically in French consulates.
[138] ITU World Telecommunication/ICT Indicators Database.
[139] Commission des lois (2018).
[140] Assemblée des Français de l'étranger (2015).

countries belonging to the former French colonial Empire display higher electoral participation in consular elections. This low turnout rate can also be explained by technical factors (insufficiently up-to-date electoral lists, suppression of postal voting, etc.), the existence of a consular electoral list that is not synchronous with the French register from abroad, poor knowledge of voters regarding consular councils, little official information, as well as the organization of the European elections on the same day and which could have overshadowed the consular elections.[141]

The comparison between types of voters (those who voted in paper format at the consulate and those who voted online) makes it possible to analyse whether they display different voting behaviour. Regarding voter turnout, the overall figure (20.85%) can be subdivided between paper voters (13.9%) and internet voters (6.95%). The lowest turnout among paper voters is in New Zealand (3.06%), while the highest is seen in India's second district (49.74%). The online voter participation rate is the lowest in the Comoros district (0.34%) while it reached 14.56% in Denmark. Detailed analysis of these figures indicates that the participation rate of voters who voted online is significantly higher in EU countries, probably due to the indirect impact of the surrounding campaign for the European elections which had took place a few days after the internet vote for the consular elections. Internet voting participation rate is also higher in countries where the Internet is widely used, such as the United States or Japan. The Internet would thus allow emigrant voters to follow political news in their country of origin and take the pulse of electoral dynamics at home.[142]

During the 2014 consular elections, the share of invalid votes (invalid and blank) was on average 4.7% in the 130 districts. The lowest percentage of invalid votes (1.32%) was observed in the second American constituency while the percentage of invalid votes reached 31.31% in the Guatemala constituency (61 blank votes and six invalid votes). Of the 6,867 invalid votes cast during the 2014 consular elections, 70.26% of them concerned blank votes. Analysis of these results reveals that the share of invalid votes is higher in small countries while the percentage of invalid votes is higher in constituencies where there are fewer competing lists. In fact, there was only one candidate in Guatemala. Since the majority of invalid votes are blank votes, this likely means that voters can more easily cast a valid vote (i.e. find a list closer to their personal position) when there are more current lists in the elections.[143]

Unlike the voter turnout figures, there are fewer differences in invalid votes between paper voters and those who voted online in 2014. Paper voters cast an average of 4.5% invalid votes while they represented 5.54% of the total votes for Internet voters. Among paper voters, blank votes represent a little less than half of invalid votes (49.12%), the rest being invalid votes. In terms of explanation, the number of lists participating in consular elections has a negative impact on invalid votes cast by voters who voted online, which means that voters tend to cast fewer invalid votes (in this case, blank votes) when the electoral offer is greater. Interestingly, the proportion of invalid votes is lower in countries where the Internet is widely used.
During the 2003 elections in two US districts, 61% of French people residing in these electoral districts voted by internet, compared to 34% by mail and 5% in polling stations. During the first round of the 2012 legislative elections, no less than 57.39% of French people living abroad

[141] Dandoy & Kernalegenn (2021a); Dandoy & Kernalegenn (2021c).
[142] Dandoy & Kernalegenn (2021a).
[143] Dandoy & Kernalegenn (2021c).

who voted used internet voting, compared to nearly 54% during the second round. This percentage varies greatly depending on the constituency: from 78.71%, in the Northern Europe constituency to 33.93%, in the Middle East and Africa constituency. This geographical variation can be explained by a series of factors, such as the distance from the consulate or embassy, the quality of Internet access, the cost of postal mailings, etc.

Le recours aux différentes modalités de vote
(premier tour des élections législatives de 2012)

Circonscriptions (Français de l'étranger)	Nombre d'inscrits	Votants				Part du vote par Internet
		Urne	*Vote par correspondance*	*Vote électronique*	Total des votes	
Amérique du Nord	156 683	*9 507*	*363*	*22 088*	31 958	**69,12 %**
Amérique du Sud	73 237	*6 509*	*17*	*5 154*	11 680	**44,13 %**
Europe du Nord	88 513	*3 259*	*658*	*14 485*	18 402	**78,71 %**
Benelux	96 959	*8 482*	*492*	*14 358*	23 332	**61,54 %**
Péninsule ibérique	79 386	*6 622*	*324*	*9 299*	16 245	**57,24 %**
Suisse et Liechtenstein	106 695	*8 710*	*656*	*14 024*	23 390	**59,96 %**
Europe centrale	89 033	*6 501*	*1 293*	*13 278*	21 072	**63,01 %**
Pays méditerranéens	109 411	*6 590*	*315*	*7 721*	14 626	**52,79 %**
Maghreb et Afrique de l'Ouest	96 769	*10 736*	*47*	*6 367*	17 150	**37,13 %**
Proche-Orient et Afrique	91 600	*14 059*	*30*	*7 236*	21 325	**33,93 %**
Europe de l'Est, Asie et Océanie	79 171	*9 021*	*99*	*12 997*	22 117	**58,76 %**
TOTAL	**1 067 457**	***89 996***	***4 294***	***127 007***	**221 297**	**57,39 %**

Source : commission des lois du Sénat, à partir des données du ministère de l'intérieur

Source: Commission des lois, 2018

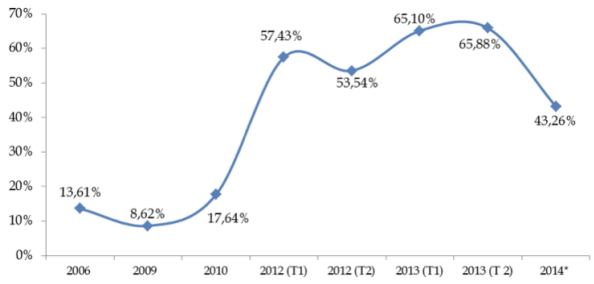
Of the 185,422 French citizens who voted in the 2014 consular elections, a small majority of them voted in consular buildings and 80,115 citizens voted via the Internet. The percentage of voters that used Internet voting in consular elections increased over time: 9% for the 2009 elections, 27.6% for the 2014 elections, and 85.8% for the 2021 elections.[144]

While almost three in ten voters used the Internet to complete their ballots in 2014, there is a huge variation in this percentage between electoral districts: the lowest proportion of voters who voted on the Internet is observed in the Comoros district. (1.68%), while they represented no less than 73.54% of the total number of voters in the fourth US district (Boston). Voters who voted online represented the majority of voters in 29 constituencies mainly located in Western Europe and North America. A higher percentage of voters voting via the Internet is observed in countries belonging to the European Union, in (more) democratic countries, and in countries further away from mainland France (such as New Zealand). Additionally, the share of voters choosing to vote via the Internet is higher in countries with higher Internet usage.

[144] Frassa, Leconte (2023).

Among the other explanations for the figures for the number of voters who chose to vote online (and indirectly for the participation rate) in 2014 is the idea that the French administration is struggling to make voter contact details reliable. For example, around 25% of people registered on the consular electoral list had not indicated an email address. The delivery of SMS messages also remains difficult in certain states such as China and while sending identifiers by post has posed problems in countries where postal services function poorly. In addition, the increase in the number of connections a few hours before the close of the poll saturated the voting platform and made it inaccessible for almost two hours. These technical problems at the end of the voting process likely discouraged some voters. Finally, the reduction in the share of Internet voting during the 2014 consular elections (compared to that of 2012) can be explained by the need for voters to go to consulates to participate in the European elections.[145]

La part du vote par Internet par rapport aux autres modalités de vote



Scrutins correspondants	
2006	Assemblée des Français de l'étranger (AFE)[2] (Asie-Europe)
2009	AFE (Afrique - États-Unis)
2010	AFE (élection partielle, côte Est des États-Unis)
2012 (T1)	Élections législatives (premier tour)
2012 (T2)	Élections législatives (second tour)
2013 (T1)	Élections législatives partielles (premier tour)
2013 (T2)	Élections législatives partielles (second tour)
2014*	Élections consulaires

Source: Commission des lois, 2018

On the occasion of the 2014 consular elections, 101,210 valid votes were cast in person in the premises of the French consulate or embassy while no less than 77,173 valid votes were recorded via the online platform before the election day. The differences observed between voters who voted on paper and voters who voted online are not very significant but remain significant.[146] Overall, the two types of voters display the same voting behaviour and tend to favour the same types of lists. But there are some important differences for all types of lists and candidates. Far-left lists appear to perform better among Internet voters while far-right lists are more successful among paper voters. But the two main groups of lists have the biggest differences. Lists and candidates on the left perform less well among Internet voters (-1.99%) while right-wing lists receive more votes from voters who completed their ballot online (+2.14%) . Finally, independent and unclassified lists are more popular among voters in paper format.

Table. Electoral results by voting modality and left-right position

	Number of lists	Paper voters	Internet voters	Difference
Radical left	12	2.52 %	2.78 %	+ 0.26 %
Left-wing	120	35.62 %	33.63 %	- 1.99 %
Right-wing	183	51.07 %	53.21 %	+ 2,14 %

[145] Assemblée des Français de l'étranger (2015); Commission des lois (2018).
[146] Dandoy & Kernalegenn (2021b).

Radical right	7	1.11 %	1.01 %	- 0.10 %
Independents / No classified	73	9.68 %	9.36 %	- 0.31 %

3.4.2. Attitudes Towards Internet Voting

One way to assess the difficulty of using internet voting is through the analysis of support requests. During the 2014 consular elections, 6% of Internet voters (i.e., around 4,630 people) contacted the technical assistance unit because they were experiencing connection difficulties. This figure is relatively low when we take into account certain weaknesses of Internet voting assistance for these elections, such as for example the lack of staff, the lack of technical knowledge, and the overload on the last days and hours of voting.[147]

A survey in 2015 looked at French attitudes towards Internet voting. The survey was carried out online from 27 to 29 October 2015 with a sample of 1,014 people. This survey concludes that 56% of French people say they are in favour of Internet voting. This favourable opinion is particularly present among supporters of the left and far-left (61%) as well as among abstainers (62%). 58% of abstainers also declared that if Internet voting had existed, they would definitely or probably have voted. Conversely, opinions unfavourable to Internet voting are found more among older respondents and non-abstainers.[148]

During the two large-scale tests organized in July and November 2019, assistance was provided throughout the online voting period. Respectively 7% and 8% of voters used this assistance. The reasons for contacting the assistance are mainly linked to connection problems, difficulties when entering codes, or even because voters have not received one of the two identification codes. These two tests were accompanied by a satisfaction survey. 2,536 and 2,511 voters who participated in the test took part in this survey in July and November 2019 respectively.[149]

The results of this research are striking. 29% of respondents in July and 17% in November encountered difficulties receiving the username or password; 15% and 9% encountered difficulties; 26% and 16% even encountered difficulties in voting. It is also interesting to look at the geographical variation of these difficulties. Regarding difficulties in receiving the username or password, they were encountered more frequently among respondents residing in Oceania, Asia, and South America, while difficulties in connecting to the voting portal were more frequent in Asia and difficulties in voting were more frequent in Oceania. Respondents residing in Europe are those who encountered the least difficulties.[150]

In a more recent survey based on a representative sample of the French population registered on the electoral lists[151], researchers observed that 60% of those questioned say they completely or rather agree with the possibility of setting up a voting mechanism by Internet in France during the presidential elections. In addition, three factors seem particularly important in the propensity to consider or not to use Internet voting: (1) those who are more

[147] Assemblée des Français de l'étranger (2015); Commission des lois (2018).
[148] Harris interactive (2015).
[149] Ministère de l'Europe et des Affaires étrangères (2019).
[150] Ministère de l'Europe et des Affaires étrangères (2019).
[151] Neihouser et al. (2022)

accustomed to using the Internet in their daily life or for administrative procedures, (2) those who have confidence in the political system, in technical infrastructure or in the organization of the vote, and (3) those who have a high level of study or a high level of interest in politics.

Among the reasons given for adopting Internet voting, let us highlight the following arguments: Voting by Internet would take less time than going to your polling station (46% of respondents), the Internet is already frequently used in the lives of all citizens. days (46%), voting via the Internet would be more comfortable than voting in a polling station (42%), respondents think they have the technical skills necessary to vote via the Internet (33%), voting via the Internet is more secure than voting in a polling station (17%), and respondents who have already used Internet voting in other contexts, for example during primary or professional elections (10%).

Chapter 4. Paraguay

4.1. Electronic Voting System in Paraguay

Paraguay has implemented two significantly different systems of electronic voting since 2001 and the following description is based on the system version used in 2021. The system adopted by Paraguay is the on-site electronic voting system developed by the company Magic Software Argentina (MSA). The Superior Court of Electoral Justice (TSJE) issued a call for tenders for companies wishing to provide the voting machines and the tender was won by the consortium made up of the Argentine firm MSA and its local partner Excelsis. The 15,000 voting machines are rented to the TSJE and the amount of the technology lease is USD 21,895,938.

The electronic voting system consists of a touchscreen machine that prints the vote on a ballot with an RFID chip, a technology that allows remote access to the data it contains. During the printing process, the chosen options are recorded both in text on the ballot and in digital form on the chip. The voter can verify that their printed vote matches the electronic record by holding the ballot close to the RFID reader of the voting machine. Voting through the use of the electronic voting ballot provides security to the voter, allowing the verification of the coincidence between the electronic record and the printed form of their vote. These ballots are deposited in conventional ballot boxes and then pass through a machine that reads the chip to compute the votes, which speeds up the availability of the results.

The system allows for a public scrutiny fully witnessed by party representatives. The machine does not store any type of information. The machine acts as a printer and the electronic voting ballot is only valid once it is signed by the president of the polling station and entered into the plastic ballot box. Therefore, if a machine fails, either because the selection is not printed or is not read correctly, it is replaced by contingency one. The system is not intended to replace the advantages of traditional voting but rather to complement them, seeking to reduce human error and speed up the electoral process, especially at the time of counting.

The electronic voting system developed by MSA is composed of paper support that can be printed using thermal printing technology and an associated radio frequency chip for the electronic emission of the vote. The ballot has a metallic paper on the opposite side to the location of the chip, which once the ballot is folded generates a Faraday cage that prevents remote reading of the chip.

The electronic voting terminals are made up of computing equipment that has: an LCD touchscreen monitor (more than 20 inches), a DVD reading unit, and a thermal printer with a radio frequency reader to create the electronic voting ballot during the voting process, a radioelectric screen, a radio frequency masking transmitter and a power unit supported by two internal high-duration batteries of 8 hours each, thus adding 16 hours of autonomy. As for the batteries, if one of them is at a critical level, the machine automatically uses the other.

The shape and weight characteristics of the machine (approximately 12 kilos) simplify logistics tasks.[152]
For voters with visual disabilities, the voting system allows viewing of the screen in high contrast for people with difficulty seeing colours and also has an accessible voting device for those without vision. A numerical keyboard will be displayed on the screen, while the system runs audibly and privately with individual headphones so that the voter follows the navigation instructions and thus can cast their vote, without needing the presence of a third person, ensuring their secret vote. In addition, the ballot has a slot on one side so that people with visual disabilities can guide its introduction into the voting machine and ease its folding once the vote has been completed. This slot is also used by all voters for the correct positioning of the ballot in the voting machine.

The different steps of the voting process are the following:
- The voter presents his/her ID card to the members of the polling station, who will give him/her the electronic voting ballot.
- The voter places the ballot in the slot of the voting machine as indicated by the arrow.
- The options with the different elections appear on the screen. When the voter has chosen his/her candidates - or none of them – he/she presses the option to confirm his/her vote. He/she also have the possibility to modify his/her preference before this step.
-The selection can be modified as many times as necessary. Then the voter presses the "Confirm and print" button.
- Once the ballot is printed, it can be verified that the electronic record of the ballot matches the printed version, by bringing the ballot close to the verification reader of the voting machine.
- The voter folds the bulletin in a way that ensures the secrecy of the vote. The voter goes to the table and gives the president of the station the bulletin to sign.
- A member of the polling station inks the index finger of the right hand of the voter and he/she then receives the signed ballot from the president and places it in the plastic bag
- The voters get his/her ID card back.

4.2. Socio-Political Dimension

4.2.1. Implementation of Electronic Voting in Paraguay

The TSJE decided to gradually implement electronic voting in Paraguay. The first pilot where electronic voting was used in Paraguay was in the municipal elections of 18 November 2001. It was the result of international cooperation between the Superior Court of Electoral Justice (TSJE), the Superior Electoral Court of the Republic of Brazil, and the Organization of American States (OAS). Brazil was the donor and trainer in the use of electronic machines and the government of the United States of America gave financial support via the OAS. The idea was to verify the acceptance by citizens of the proposed on-site electronic voting system before enlarging the system to a larger share of the population.

The TSJE allowed the political parties that competed in the 2001 municipal elections to participate in the entire process of preparation and execution of the pilot project, the

[152] TSJE (2020).

installation of the voting machines, and the digital controls necessary to ensure transparency and trust. Political parties became co-managers of the project as the use of electronic machines would strengthen not only the Paraguayan representative democracy but also the internal democracy of the parties.
On the occasion of the 2001 municipal elections, the first electronic voting pilot concerned 178 electronic voting machines, with a total of 34,098 voters authorized to vote, which corresponds to 1.56% of the total electorate. The municipalities that were chosen were: Atyrá, San Antonio and Maciel, Asunción, Lambaré, Fernando de la Mora, and Pedro Juan Caballero. In the first three municipalities, 100% of the voting was done with electronic machines while electronic voting was partially installed in the other four municipalities. [153]

To select the municipalities where the electronic voting system should be used in this first pilot plan, the following criteria were considered:
- A rural municipality, with little migratory mobility, to measure the behaviour of the "uncontaminated" Paraguayan in front of the electronic ballot box: Maciel, where they installed 7 electronic voting machines for 1,901 voters;
- A municipality with characteristics of a dormitory city where city dwellers, farmers, and migrants coexist, a multiple cultural universe: San Antonio, where they installed 39 electronic voting machines for 11,056 voters;
- A municipality that partially shares the two characteristics mentioned above in its urban and rural sectors respectively, but that also has a high degree of awareness of management capacity: Atyrá where they installed 25 electronic voting machines for 7,093 voters;
- A border municipality that already knew about the electronic ballot boxes used in Brazil: Pedro Juan Caballero, where they installed 8 electronic voting machines for 2,332 voters (which corresponds to 6.52% of its electorate);
- In Asunción (28 electronic voting machines and 8,095 voters) and in 2 municipalities neighbouring the Capital: Lambaré with 8 electronic voting machines and 2,413 voters and F. de la Mora with 4 electronic voting machines and 1,208 voters.

After the positive evaluation of this pilot plan, the Paraguayan legislative branch authorized the TSJE to use electronic voting for internal elections of political parties, municipal and general elections. The legislators wanted to use electronic voting machines even for the political parties' primary elections in 2002. Unfortunately, it was not possible due to administrative and logistical limitations, but, with the support of the political parties, they must be overcome for the next primary elections.

In 2003, the Paraguayan Electoral Justice renewed its agreements with the Superior Electoral Court of Brazil and the OAS, obtaining a loan of 6,000 electronic voting machines from the Brazilian electoral authority, under the guarantee of the OAS. The opposition gave its support to electronic voting machines and their implementation. Among others, the opposition parties *Partido Liberal Radical Auténtico* (Authentic Radical Liberal Party, PLRA), *Partido Encuentro Nacional* (PEN) and *Partido Patria Querida* (PPQ) supported the use of electronic voting machines.

For the 2003 general elections, the TSJE decided that electronic voting would be used in 433 locations located in 33 electoral districts, which would correspond to 4,435 polling stations

[153] TSJE (2002).

with electronic voting machines and 48.39% of registered voters nationwide. The urban coverage of the electronic voting machines reached 72.8% as there were still some doubts about the implementation in rural areas[154]. With their victory in the 2003 general elections, The Colorado Party had momentarily lost its initial fear of the massive use of electronic voting machines.

Electronic voting has also been used for the first time for internal elections of political parties: in 2003 for the elections of the Central Women Commission of the Colorado Party, in 2005 for the internal elections of the Authentic Radical Liberal Party (PLRA) and in 2006 for the internal elections of the ANR (National Republican Association – Colorado Party). These were the first elections in which an attempt was made to reach 100% electronic voting coverage. For the 2007 internal elections that preceded the 2008 general elections, electronic voting has been used by a majority of Paraguayan political parties. The last elections with electronic voting machines in the period 2001-2008 were the internal elections of UNACE, held on 13 January 2008. In the meantime, electronic voting has also been used for the municipal by-elections of the Nueva Esperanza district in Canindeyú on 19 December 2004.

The largest implementation of electronic voting in Paraguay occurred in 2006 on the occasion of the municipal elections. Electronic voting machines have been used by voters in more than 60% of the polling stations. Interestingly, there was a territorial pattern of distribution of the technology. Electronic voting has been used in the departments of Pdte Hayes, Alto Paraguay, and Boquerón, and in the municipalities of Asunción, Encarnación, Fram, Hohenau, Carmen del Paraná, Caazapá, Maciel, Villa Oliva and Pedro Juan Caballero, while paper voting has been used in the municipalities of Ybyyaú, San Pedro de Ycua - Mandyyú, Capiivary, Yatytay, Edelira, Isla Umbú and Jasy Cañy. In the remaining municipalities, exactly half of the voters have been using electronic voting while the other half still use paper ballots. The polling stations with even numbers used the paper voting system while the odd-numbered polling stations used electronic voting.

4.2.2. Abandon and Return to Electronic Voting in 2021

The first doubts about electronic voting arose in early 2003 from the internal structures of the National Republican Association – Colorado Party (ANR). The defeat of the presidential pre-candidate of this party led the candidate and his followers to a series of suspicions about the electoral system in general, but above all to the future application on a larger scale of electronic voting.[155]

Interestingly, the primary elections organized in 2006 in the ANR led to the party's internal opposition making several complaints of electoral fraud and those linked to the use of electronic voting machines. The complaints from the opposition movements within the ANR even escalated with the intervention of the comptroller general of the Republic, which ordered by resolution No 720/06 the audit of the computer system used by the TSJE in the electronic voting machine used in political parties' internal elections. The situation was further aggravated by the appearance of a video that showed how it was supposedly possible to

[154] Fuentes Armadans & Sánchez Casaccia (2022).
[155] Fuentes Armadans & Sánchez Casaccia (2022)

commit fraud with an electronic voting machine.[156] The content of the audio-visual material was later classified as false by the TSJE, but the damage was done.

In this environment, members of the internal movements in the ANR party led open opposition to the use of electronic voting machines, both for reasons of the impossibility of public scrutiny and for accusations of the possibility of electoral fraud. The internal ANR opposition started to campaign for the return of paper-based ballots. In mid-2007, the degree of internal distrust in the ANR was such that 35 of the 36 internal movements that constituted the Colorado Party, asked that electronic voting machines would no longer be used in the following internal party elections. This forced the ANR to carry out its December 2007 internal elections exclusively based on paper ballots. This is the moment when civil society also begins to show concern about the correct use of electronic voting.

This loss of trust in the political parties, and particularly of the ruling party, combined with growing criticism from academics and IT security experts, led to a public debate on the future of electronic voting in Paraguay. Among the numerous technical and political arguments mobilized by these actors[157], we can list the lack of clarity in the explanation of how the voting system works (especially its software part) to the political parties, the incidence of the transition between the Brazilian voting system and the one Paraguay had to develop to replace it, as well as the failures of the machines at some points in the primary elections of the parties in mid and late 2007. However, the most pertinent criticism pertains to the absence of a printed paper trail or ballot, as well as the lack of public scrutiny, which renders the process susceptible to potential irregularities and makes it difficult to conduct an effective audit.

Following this public debate, the TSJE decided to return to paper-based voting for all municipalities and all elections. Via its Resolution No 12/08, the TSJE ordered that 100% of the electorate use the paper ballots on the day of the general elections of 20 April 2008. While the victory of the opposition in these elections put an end to more than sixty years of the Colorado Party in power, it is difficult to assess the impact of the change in voting technology on voting behaviour.

But the public debate and the criticisms from opposition parties also concerned elements that were not directly related to the voting technology, such as the allegations of electoral fraud and vote theft, the unfair composition of the polling station staff (dominated by the largest parties) and their lack of neutrality, as well as the lack of transparency of the manual counting of the ballots.[158] In particular, the main opposition party (Party Colorado) denounced some fraud based on the differences between the figures mentioned in the polling station records and the preliminary results published by the electoral justice for the 2018 general elections. The party identified that the problem was in the counting process, not the voting process. As a result, one of the solutions suggested by these actors to face these human-related problems was the use of an electronic voting system.

[156] Fuentes Armadans & Sánchez Casaccia (2022)
[157] Thompson Jiménez (2009), Fuentes Armadans & Sánchez Casaccia (2022)
[158] Villalba Portillo (2018).

On the other side, the changes to the electoral system approved by the Paraguayan Legislative concerned mainly the implementation of open lists and proportional representation for multi-member elections. The main argument of the promoters of the change of the voting technology, such as the Patria Querida party, is that the unblocking of electoral lists cannot be applied without electronic voting and that this technology could counteract fraud. Once again, an electronic voting system was viewed as a potential solution to accelerate the scrutiny in the context of open lists (that would require an important amount of time to scrutinize, due to the complexity involved in manually counting the preferential votes).[159] Consequently, on 23 May 2019, law No. 6318/19 was enacted, which allows the unblocking of closed lists and authorizes the use of electronic voting machines in Paraguay.

Since 2019, the electronic voting system no longer relies on Brazilian machines, but on the system developed by the Argentinian company Magic Software Argentina (MSA). This electronic voting system has been used for nearly all municipalities and all recent elections in Paraguay, including the 2021 party primaries, the 2021 local elections, the 2022 party primaries, and the 2023 general elections.

Globally, there have no longer been major technical problems reported since 2021, except for some local incidents.[160] Similarly, researchers Alcaraz, Carrillo, and García (2021) made requests for access to public information to the TSJE about the internal elections of the Authentic Radical Liberal Party (PLRA) and the National Republican Association (ANR) and identified 'only' 23 technical failures experienced by voting machines. Among experts and representatives from civil society, the debate on issues such as secrecy of the vote, integrity or possibility of external audit, and transparency is still going on.[161] Distrust about the transparency and reliability of electronic voting scrutiny increased in 2023, especially after the accusations of fraud raised by the presidential candidate Paraguayo Cubas. Two former presidential candidates (Efraín Alegre and Euclides Acevedo) also momentarily expressed suspicions about the counting and called for an international audit of electronic voting machines.[162]

International organizations also observed the 2021 and 2023 elections in Paraguay. The EU election observation mission observed that the electronic voting machines worked correctly in most cases, although controversial situations occurred, such as 19% of assisted voting and the organized transportation of voters by political parties. Similarly, the OAS electoral observation mission observed some confusion regarding technical defects with the voting machines and insufficient training of the technical personnel in polling stations. Both organizations made recommendations to improve the security and efficiency of the electronic voting system, for example, the requirement to systematically carry out rigorous analyses and the establishment of a risk mitigation strategy. More specifically, the OAS recommends that the technical staff of the TSJE must be better trained and reduce its dependence on the company providing the electronic voting devices.[163]

[159] Sánchez-Gómez &, Najenson (2023).
[160] For example, during the Colorado Party primary elections on 20 June 2021, they had to replace the electronic voting machine two times due to technical problems in a polling station in Villarrica.
[161] See for instance *Busaniche (2020).*
[162] Rivarola (2023).
[163] Najenson & Sánchez-Gómez (2023).

4.3. Legal Dimension

4.3.1. Existing Legislation and Adaptation

Created in 1992, the Superior Tribunal of Electoral Justice (TSJE) is the supreme authority in electoral matters and is responsible for the direction and supervision of the electoral registry and the administration of the resources allocated in the general budget of the Nation for electoral purposes. The TSJE has the exclusive jurisdiction of calling, judging, organizing, directing, supervising, and monitoring the acts and issues arising from general, departmental, and municipal elections, as well as the rights and titles of those who are elected. Issues arising from all types of popular consultation are also within its jurisdiction, as well as matters related to internal elections and the functioning of parties, political movements, and electoral alliances.

In order to implement the electronic voting pilot for the 2001 municipal elections, the Paraguayan legislative branch voted the Law No 1825/01 on 18 October 2001 – that is just 30 days before the elections. This law "establishes electronic voting in certain municipalities, electoral precincts, and the number of polling stations for the 2001 municipal elections."

After a positive evaluation of this pilot plan in 2001, the legislative branch authorized the TSJE to use electronic voting for all types of elections, including general and internal elections of political parties. Law No 1890/02 of September 2002 states that “the use of electronic ballot boxes in internal, municipal, and general elections is also authorized.”

It is important to notice that this provisional law of 2002 was the basis for all decisions and administrative measures for the organizations of elections occurring between 2003 and 2006, including the 2003 general elections. Once again, it was only a few weeks before the municipal elections of November 2006 that the legislative branch approved Law No 3,017/06 on 5 October 2006. This law “regulates the use of electronic ballot boxes, provided in article 351 of the Paraguayan Electoral Code”, providing a stronger legal basis for the use of electronic voting technology in the country.

Regarding the international cooperation between the TSJE, the Superior Electoral Tribunal of Brazil, the Organization of American States (OAS), and the United States of America, a first agreement was reached in 2001 for the implementation of a planned pilot of the use of electronic ballot boxes in seven municipalities during the municipal elections of November 2001. In December 2002, this agreement of international cooperation was deepened to extend electronic voting in the general elections of 2003. Later on, new agreements of international cooperation between the OAS and the TSJE have been signed in August 2003, October 2004, and April 2005.

While the end of electronic voting did not require a legislative change but merely a resolution by the TSJE (Resolution No 12/08), the return to the use of an electronic voting system in 2019 required a new law. Voted by the legislative in May 2019, law No 6318/2019 established the application of the system of incorporating closed and unlocked lists for multi-member elections. The same law also re-introduced electronic voting in Paraguay.

Compared to the 2001, 2002, and 2006 legislation, specific features of the electronic voting system are specified in Law No 6318/2019. The requirements established in the 2019 law are that the electronic voting system must issue "a printed version of the vote cast by the voter, which immediately, duly signed by the polling station authorities, will be deposited by the voter in the conventional ballot boxes intended for voting with ballots or bulletins, which must be duly protected." In other words, the type of voting machine to be used should allow the printing of ballots that can be deposited in physical ballot boxes and, consequently, enable public and manual scrutiny, as well as the possibility of safeguarding the ballots as archives or documentation in case of a dispute.

Since the Paraguayan electoral code establishes in its article 221 that "the vote is secret but the scrutiny is public", it explains why the electronic voting system to be implemented obliges the TSJE that the voting machine must issue a printed version of the vote of the voter and save it electronically, in this case in the RFID chip located inside the voting bulletin, for subsequent public and audited scrutiny, where anyone can control it without the need for special technical knowledge.

In 2021, the TSJE established audit mechanisms for technical representatives of political organizations to review voting machines (hardware) as well as the software before the internal and municipal elections (TSJE Resolution No. 21/2021). However, the TSJE denied two requests for public information where they were asked if the results of these inspections would be public and accessible to anyone and what the TSJE do in case vulnerabilities were detected.[164]

4.3.2. Electoral System

Elections in Paraguay are clustered in three different electoral moments. Local elections consist of the direct election of the municipal intendants and the members of the municipal council in all 261 municipalities of the country every five years.[165] General elections consist of the direct election of the president and vice-president, Chamber of Deputies and Senate representatives, departmental governors, and representatives in department councils every Given its status as the Capital District, the inhabitants of Asuncion do not participate in gubernatorial and departmental council elections. Finally, political parties have the obligation to organize internal primaries before election day but based on a different electoral calendar for each political organization.

Paraguay relies on two different electoral systems depending on the type of elections at stake. As far as the uninominal – or single-member - elections are concerned, the president, the governors, and the municipal intendants are elected based on a plurality system, i.e., a simple majority of the valid votes. There are no run-off elections.

[164] Fuentes Armadans & Sánchez Casaccia, 2022).
[165] Note that, due to the Covid-19 pandemic crisis, the TSJE decided first to postpone the 2020 local elections to the 28 November 2020 and later on to the 10 October 2021. An additional consequence is that the previous local mandates were extended to six years (period 2015-2021 instead of 2015-2020) and that the next local mandates will be reduced to four years (period 2021-2025 instead of 2020-2025).

The system used for all plurinominal - or multi-member - elections (i.e., the elections for senatorial, Chamber of Deputies, department council, and for the members of the municipal council) is fairly different. Up to 2019, the electoral system used in Paraguay relied on closed and blocked lists. In this system, a closed list was chosen where the order of priority of the candidates could not be varied, this order resulted from the internal elections of the political parties or movements, where closed and blocked lists were also presented.

After the 2019 electoral reform, the electoral system used for all plurinominal elections is an open-list proportional one. Voters are allowed to express only one preference vote for an individual candidate, while list votes or multiple preference votes are not allowed. The number of votes attributed to each list will be based on the sum of the preference votes obtained by all candidates on the list. The d'Hondt system is used to allocate seats between lists. There are no electoral thresholds. Within the list, the seat will be given to the candidate gathering the most significant number of votes, independently of his/her position on the list. In case, two or more candidates receive an equal number of preference votes, the candidate located higher on the list will be elected. The same rules also apply to the list of substitute candidates set by political parties.

The number of electronic voting machines used for the different also grew over time. For the 2001 local elections, 178 machines were used while almost 6000 machines were used for the 2023 general elections. For the 2021 and 2023 elections, this figure increased to 15.139 and 15.380 voting machines respectively, given that electronic voting was implemented in the whole Paraguayan territory. The main differences between the paper ballots used until 2018 and the voting machines used from 2021 onwards are threefold: (1) The electronic voting machine displays a 'Blank vote' option ('*Voto en blanco*') on the bottom right of the screen similarly as any other option for a party or candidate, (2) the options to emit an invalid vote are very limited and (3) there is an option to go back to modify your vote.

4.3.3. Elections and Voters

Since 2001, Paraguayan voters have had the opportunity to use an electronic voting system to express their vote in the following elections (see Table below): 2001 local elections (34,098 voters used the electronic voting system), 2003 general elections (1,102,250 voters), 2004 partial local elections (1,904 voters), 2006 local elections (2,758,076 voters), 2021 local elections (4,644,536 voters), 2023 elections (4,782,940 votes), and a large majority of the party primaries between 2004 and 2008 and since 2021.

Table. List of elections in Paraguay (2001-2023), excluding partial elections and party primaries

Year	Election type	Technology
2001	Local elections	Electronic voting (1.5%)
2003	General elections	Electronic voting (45.83%)
2006	Local elections	Electronic voting (60%)
2008	General elections	Paper voting
2010	Local elections	Paper voting
2013	General elections	Paper voting
2015	Local elections	Paper voting
2018	General elections	Paper voting

2021	Local elections	Electronic voting (100%)
2023	General elections	Electronic voting (100%)

Voting is formally compulsory for voters between 18 and 75 years and, since 2023, a small fine is applied (14 USD). Since 2012, voters who reach 18 years are automatically registered on the voting lists. For all other voters, registration is not automatic, meaning that younger voters are potentially over-represented in the electorate. Foreigners who reside in the municipality for at least 3 years have voting rights in the local elections.

Paraguayans living abroad are allowed to participate in the presidential and senatorial elections but cannot participate in the elections of the Chamber of Deputies, departmental governors, department councils, and the local elections. Interestingly, the electronic voting system is also implemented for Paraguayan voters living abroad. Polling stations are often located in Paraguayan embassies or consulate venues and electronic voting machines are available for the training of the voters a few months before election day.

4.4. Paraguayan Citizens and Electronic Voting

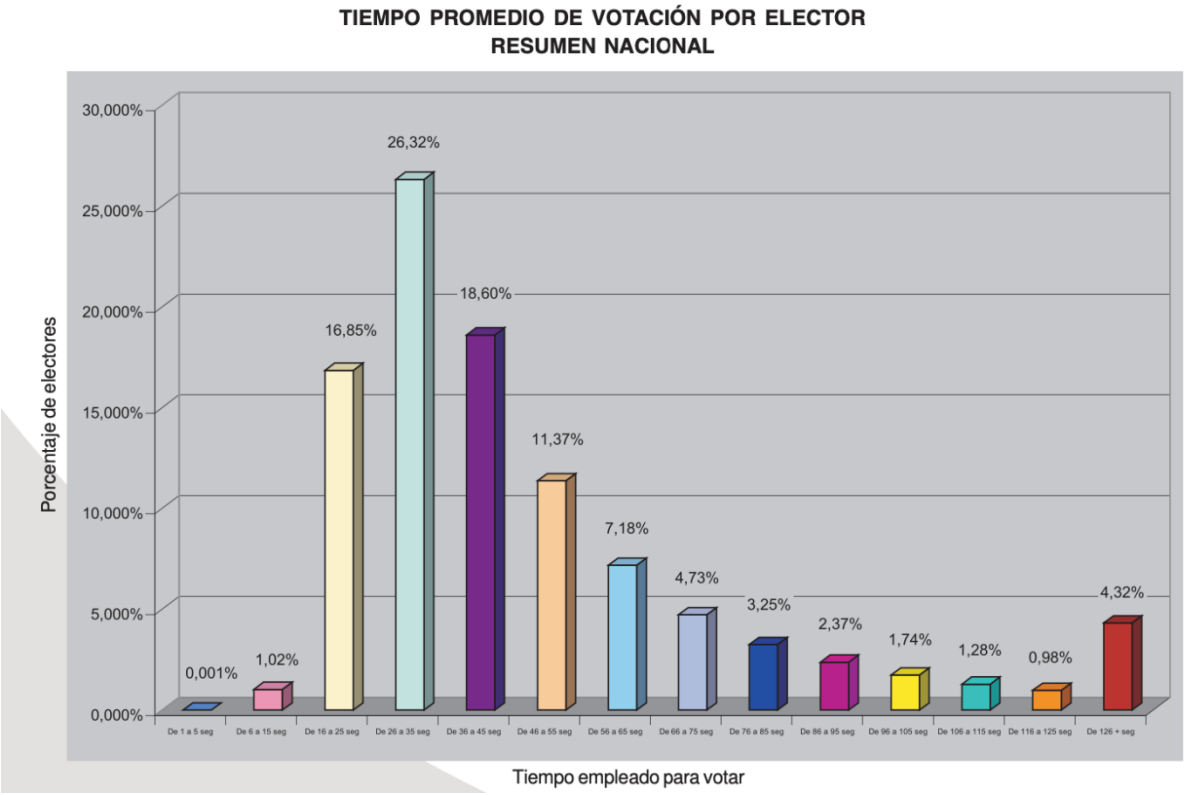
4.4.1. Acceptance by Voters

According to official statistics, the number of Paraguayan citizens aged more than 10 years and with access to the Internet is equal to 76.3%. That percentage increases in urban areas, such as in Asuncion (84.8%).[166] However, the percentage of households connected to the Internet is 68.9% in urban areas and 19.9% in rural areas. Concerning the use of mobile, there is not much of a difference across the country as the percentage reaches 97% in urban areas and 92.8% in rural areas.[167]

In 2001 and 2006, the TSJE analysed the comparative performance of the paper-based and electronic voting systems.[168] The TSJE found out that the average voting time in municipalities with paper voting was of 90 seconds, while the average voting time in municipalities with electronic voting was of 50 seconds for the 2001 local elections. The same figure (50 seconds) was observed for the 2006 local elections. Graph 1 shows that the majority of Paraguayan voters took between 16 and 45 seconds to express their vote using the electronic voting system. It is also important to report that 4.32% of these voters took more than 2 minutes to express their vote using the electronic voting system.

[166] Instituto Nacional de Estadisticas (2023).
[167] Gómez Berniga (2023).
[168] TSJE (2002); TSJE (2007)

Graph 1. The average time used for e-vote (2006 elections)

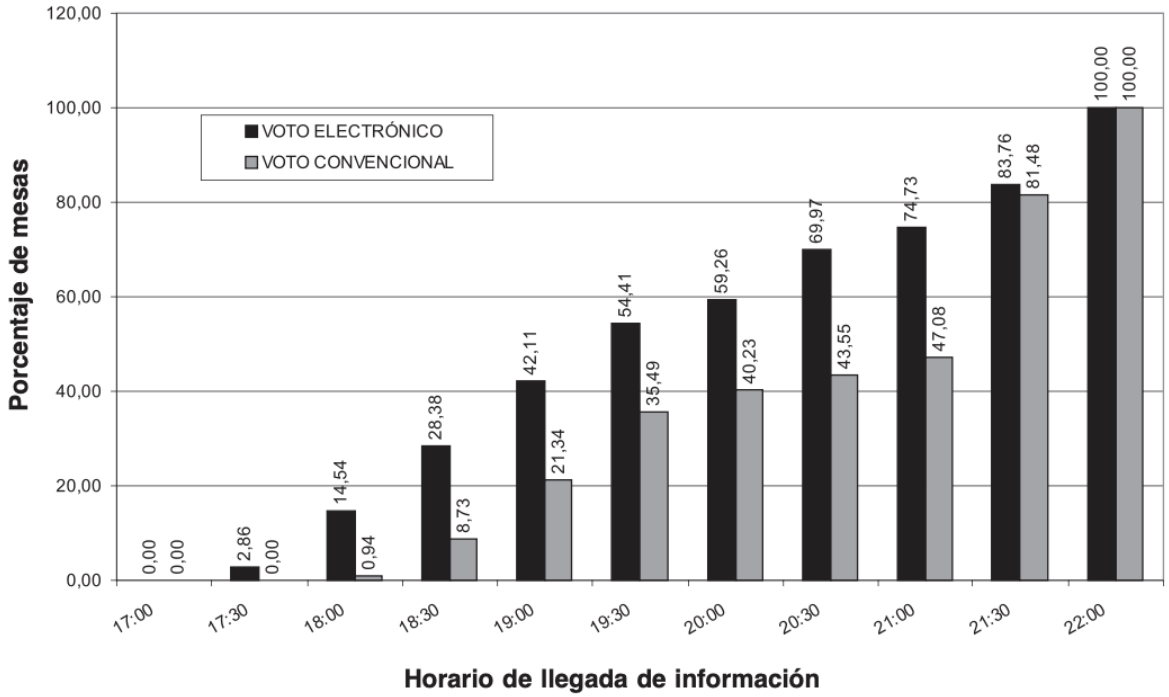


Source: TSJE, 2007.

Similarly, the time spent in the elections in the municipalities using paper ballots was 90 minutes, as compared to the municipalities with electronic voting where only 5 minutes were needed for the 2001 local elections. Finally, the transmission of electoral results was done within 3 hours following the closing of voting in municipalities with paper voting, while the transmission was done within 30 minutes following the closing of voting in municipalities with electronic voting in 2001.

The 2006 local elections produced more detailed statistics about the counting and transmission process on election night. In Graph 2, we observe that the polling stations using electronic voting transmitted their results faster than polling stations using paper ballots. 50% of the polling stations using electronic voting transmitted their results between 19:00 and 19:30, while one had to wait between 21:00 and 21:30 to reach a similar percentage among polling stations using paper ballots.

Graph 2. Time of arrival of election results at the TSJE on election night (2006 elections)



Source: TSJE, 2007.

The analysis of turnout is a good proxy to assess the acceptance of the electronic voting system by the population. The analysis of the election results after the 2001 local elections reveals that turnout reached an average of approximately 75% in polling stations using electronic voting, while with the paper system, it was at a lower level, around 54.2%.[169]. In the three municipalities with 100% polling stations with electronic voting, turnout reached 62.13% in San Antonio, 74.11% in Atyrá and 79.63% in Maciel. This was possibly due to the novelty of the system and this data should be taken with caution as it only applied to 1.5% of the total number of polling stations.

In 2003, turnout in the 33 municipalities using electronic voting increased significantly (+13.09%) as compared to the 2001 elections.[170] On the occasion of the 2006 local elections, turnout in the polling stations using electronic voting (49.32%) was slightly lower than similar figures in the polling stations using paper ballots (50.93%).[171] This difference is probably because the large majority of polling stations using electronic voting were located in urban areas while polling stations using paper ballots were located in rural areas.

On the contrary, the analysis of recent election results presents more valid data as electronic voting was implemented in nearly all municipalities across the Paraguayan territory (see Table 2). On the occasion of the 2021 local elections (intendant elections), turnout significantly as compared to previous elections (+4%) and constitutes the highest turnout since the 1996 local elections. As far as the 2023 general elections are concerned, turnout also increased

[169] TSJE (2002).
[170] ISJE (2003).
[171] TSJE (2007).

compared to previous elections for the presidential elections (+2.04%) and for the elections for the Chamber of deputies (+2.78%). Overall, it seems that electronic voting has a positive impact on turnout in these two elections.

Given that the electronic voting system displays a there is a 'blank vote' button on the bottom right of the scree and the options to emit an invalid vote are very limited[172], the analysis of the share of invalid votes (i.e., the sum of the blank and null votes) also permits to evaluate the impact of electronic voting on voting behaviour. We observe a significant drop of the share of invalid votes in elections where the electronic voting technology is used. As compared to previous elections, the share of invalid votes decreases in the 2021 intendent elections (-2.71%), in the 2023 presidential elections (-2.47%) and in the 2023 elections for the Chamber of deputies (-2.38 %). In the case of Paraguay, it seems that the electronic voting system has a double positive effect on voters' behaviour: voters participate more in elections and express fewer invalid votes.

Table 2. Turnout and invalid votes (2001-2023), excluding partial elections and party primaries

	President		Chamber of deputies		Intendent	
	Turnout	Invalid votes	Turnout	Invalid votes	Turnout	Invalid votes
1996					83.31 %	4.17 %
1998	80.54 %	2.90 %	80.48 %	3.33 %		
2001					54.19 %	3.42 %
2003	64.29 %	3.04 %	64.12 %	4.25 %		
2006					49.95 %	2.63 %
2008	65.48 %	3.54 %	65.43 %	4.25 %		
2010					56.94 %	3.95 %
2013	68.52 %	5.47 %	68.24 %	6.50 %		
2015					56.55 %	4.98 %
2018	61.25 %	5.18 %	60.88 %	8.16 %		
2021					60.55 %	2.47 %
2023	63.29 %	2.71 %	63.66%	5.78 %		

Source: TSJE official election results

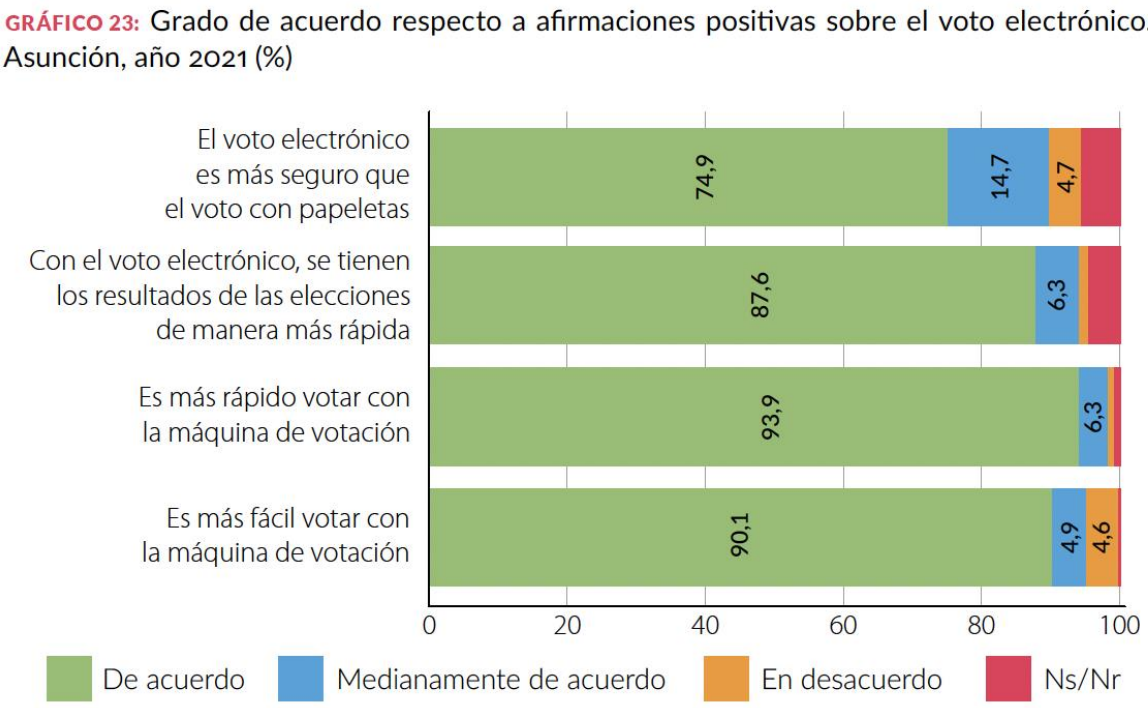
4.4.2. Public Attitudes Towards Electronic Voting

It is difficult to evaluate public opinion on the electronic voting system since very few opinion polls and/or academic surveys on this topic are available. One exception concerns the NGO Tedic which conducted a survey on the occasion of the 2021 local elections based on a small sample of 438 voters located in Asuncion.[173] The survey results indicate that 65.8% of the people surveyed rated it positively while only 4.1% gave negative ratings. Similarly, 94% of the respondents declared that it was easy to find the candidate on the screens of the voting machine.

[172] For instance, only 0.47% and 0.45% of the votes were considered as invalid for the 2021 intendent elections and the 2023 presidential elections respectively. For the 2001 elections, the TSJE affirms that the share of null votes was equal to 0.00% (TSJE, 2002).
[173] Alcaraz, Carrillo & García (2021).

The survey also indicates that, according to 93.9% of the respondents, it is faster to vote with the electronic voting machine as compared to systems based on paper ballots (see Graph 3). They also agree that it is easier to vote with the voting machine (90.1%), that the election results are obtained more quickly with electronic voting (87.6%) and that electronic voting is more secure than paper-based voting (74.9%). Few respondents witnessed technical problems at the moment to express their votes with the electronic voting system. Among the problems mentioned, we can pinpoint the fact that the machine did not grab properly the ballot, leaving it loose and without expelling it (3.4%), the failure to print the ballot (1.5%), or the fact that the voter pressed the screen trying to select his/her option and the screen did not change to the next option (0.3%).

Graph 3. Public opinion on the advantages of electronic voting (2021)



Source: Alcaraz, Carrillo & García (2021).

Several options were offered to voters using the electronic voting system, such as the option to go back to modify their vote or the possibility to verify their vote using the code reader. The same survey indicated that 11.1% of the voters used the 'go back' option at some point to modify their vote, while no less than 52.8% of the voters used the code reader to verify their votes.[174] Interestingly, the survey also investigated assisted voting and found out that no less than 15.8% admitted having been accompanied by a third person in the voting booth, confirming the observation made by the EU election observation mission in 2023. This phenomenon of assisted voting is particularly important among male respondents and respondents with lower education.

Since the first implementation of electronic voting in 2001, the TSJE has made significant to train the voting age population. The TSJE mobilized different tools to inform, familiarize and train the voter with the electronic voting system. Electronic voting machines (so-called 'school

[174] Alcaraz, Carrillo & García (2021).

ballot boxes') were used to train voters and members of voting tables in the precincts using electronic voting.[175] Specific training was also carried out in each of the municipalities, targeting the members of the civic boards, the polling station members, the candidates, and the electoral registry officials. In 2001, door-to-door training was carried out in the municipalities where there was electronic voting at 100% of the polling stations. In 2023, these trainings also took place in bus stations and in the consulates where Paraguayans living abroad could also train. From 2021 onwards, a voting simulator was available online here: https://simuladoroficial.tsje.gov.py/#. The Tedic survey of 2021 revealed that 15.1% of the respondents practiced electronic voting with in-person training while 21% practiced it with the digital simulator.

The TSJE also printed posters with the structure of the voting machine, and posters with the voting procedure. Spots were shown on television informing about the structure of the voting machine and the voting procedure and, on the radio, instructions were broadcast locally in Guaraní, Jopará, and Spanish. These measures can be evaluated as effective as the percentage of voters who knew they would vote with electronic machines was 98.2% in 2021.[176] The main source of information mentioned by these voters who knew they would vote with electronic machines was the media (74.8%), mainly TV and social media, followed by family and friends (10.7%) and political parties (9.7%).

On election day, a voting machine was available at the entrance of each single electoral precinct to reinforce citizen training, and/or to provide information to those people who did not know the electronic voting system. Finally, another successful tool for familiarizing the voting population with the electronic voting system was the fact that, in 2021 and 2022, a large share of the voting population has had the opportunity to test the voting machines in the party primary elections where exactly the same electronic voting system was used.

[175] In March 2021, all in-person training planned in public places was postponed due to the arrival of the pandemic.
[176] Alcaraz, Carrillo & García (2021).

Conclusions and Recommendations

Based on the analysis of four experiences of electronic voting on three different continents, this book investigates three main dimensions of electronic voting: the organizational and political dimension, the legal and regulatory dimension, and the acceptance of electronic voting by citizens. This conclusion provides a brief overview of the main differences observed between the four case studies and, based on the lessons learned from these countries, develops some practical recommendations for the implementation of electronic voting in other countries and contexts.

Thematic Summary

Previous Experiences with Electronic Voting

Before the introduction of Internet voting, electronic voting was frequently used in Australia for internal corporate and NGO elections, and pilots of electronic and Internet voting were conducted in various states and territories. The country also has a tradition of postal voting and early voting for certain categories of voters.

Belgium was one of the first countries in the world to use electronic voting and has, to our knowledge, little prior experience of using this technology in other spheres. Belgian voters have experience with remote voting since Belgians living abroad have had the possibility of voting by mail since 1986 for the European elections and since 2002 for the federal elections. Postal voting is not a complete success, and Belgium is currently investigating the implementation of Internet voting for Belgians living abroad and expanding Internet voting to social elections in private companies.

France had significant experience in terms of postal voting (but little used), especially electronic voting (in polling stations) in around fifty municipalities since 2002 and especially 2004. Internet voting is very widespread and used by many organizations, including political parties and public services.

To our knowledge, Paraguay was not able to benefit from previous experiences in electronic voting before its implementation in 2001. However, the implementation of electronic voting for political elections was accompanied by the use of the same system for primary elections of many political parties. Given the centrality of political parties in the Paraguayan electoral process, these actors contributed to familiarization and confidence in electronic voting.

Genesis and Implementation of the Electronic Voting Projects

In Australia, Internet voting is the result of a court ruling that visually impaired people should be treated like other voters as well as pressure from interest groups representing voters with disabilities. The other objectives of the project were to increase the participation rate of voters living far from polling stations in rural and remote areas, to reduce the number of invalid votes, to reduce the cost of the voting process, and to reduce the risks of failures linked to postal voting. The issue of Internet voting has been highly politicized, but a consensus has been

established between the different political parties. Some were more critical but still constructive. The change in government had no impact on the Internet voting project.

The Belgian government has decided to implement electronic voting to reduce the cost of elections accelerate the publication of the results, increase the reliability of the election results and reduce the number of (paid) staff in each polling station. Although the majority of political parties supported the project, some parties still opposed it. However, the participation in government of these latter parties had no impact on the use of electronic voting, with the exception of the Walloon region. The introduction of an Internet voting system is currently the subject of current debate at both political and academic levels and broadly opposes the same political parties as for on-site electronic voting.

In France, political debates on Internet voting began in 2003, in parallel with the elections of the Assembly of French People Abroad which were already based on Internet voting. Internet voting was strongly supported by centre-right and right-wing political parties and presidents while left-wing parties were more critical. Internet voting was generally well accepted, both by the parties and candidates and by French voters living abroad. Various complaints were filed following online voting, but none were deemed admissible or constituted an attack on the accuracy of the vote.

Paraguay is the only case study in this report where electronic voting is not only the result of a political debate but also of international cooperation. The first electronic voting system used in 2001 came from Brazil (with the support of the OAS), while the second electronic voting system used in 2021 is identical to that used at the sub-national level in Argentina.

Developments in the Electronic Voting Projects

In Australia, the Internet voting project has evolved significantly over time: expansion of the categories of voters authorized to vote via the Internet, possibility of verifying the vote after voting, availability of languages other than English, etc. However, internet voting has not really been extended to other types of elections, such as national elections or other Australian territories. In 2021, delays and technical problems led to the fact that a significant number of voters were not able to cast their vote. Internet voting was subsequently suspended for the following elections and different scenarios are being considered for its return in 2027 or 2028.

The electronic voting system in Belgium has evolved significantly over time, among other things due to the obsolescence of hardware and software but also to technological progress. Over the years, the country has continued to test different systems through various pilot projects (e.g., a system for visually impaired or blind voting). The light pen system has been gradually replaced by a touch-screen system and a system of e-voting with paper trail has been introduced. Unfortunately, this development was not rapid enough and, likely, electronic voting would not have been abandoned in Wallonia if the system had been replaced more quickly.

In France, Internet voting was suspended by the left-wing government in 2017 for security reasons (less than three months before the first round of legislative elections). The legislative elections were therefore organized entirely with paper ballots. Internet voting was relaunched

in October 2017 by President Macron with regard to the legislative and consular elections. After this break, the first consular and legislative elections using Internet voting for French voters living abroad took place in May 2021 and June 2022 respectively.

Political parties played a key role in the evolution of the Paraguayan e-voting system, and in particular the governing party ANR. Complaints and suspicion created a large distrust about e-voting among political actors, that rapidly extended to the civil society and the overall public opinion. The electoral tribunal decided to go back to paper voting. After the suspension of electronic voting between 2008 and 2021, Paraguay decided to adopt a relatively different voting system: the numerical keyboard was replaced by a touch-screen system and the e-voting system now relies on printing of the ballot paper which allows physical counting using an RFID chip and a textual version of the voter's preferences.

Existing Legislation and Adaptation

In Australia, the introduction of Internet voting in NSW was carried out very quickly (in almost 2 years) but the schedule was very tight. The legislative amendments were passed in December 2010 and the elections took place on 26 March 2011. To simplify the legislative work, it was decided that many aspects related to Internet voting would be left to the discretion of the Electoral Commission. The legislation was subsequently adapted numerous times given the 2015 and 2019 elections and took into account the recommendations of the Council of Europe.

The adoption of legislation allowing the use of electronic voting in Belgium was very rapid and the pilots of 1991 quickly gave way to more developed legislation in 1994. The main regulatory challenge was at the level of impact of the federalization of the country and the transfer of competencies regarding the organization of elections to the regions and communities. A consequence of this transfer is that – as in Australia – the voting system can be different for each region and community, which partly explains the abandonment of electronic voting in Wallonia, unlike other regions. The current debate over Internet voting has highlighted the challenges posed by early voting and voting locations.

In France, the introduction of Internet voting into the legislation began with the constitutional reform of 2008 and a reform of the political representation of French people living abroad. Despite opposition from the left, the process was quite rapid: the legislation was put in place in mid-2011 and the first legislative elections using internet voting were organized in May 2012. For the consular elections of 2014, the legislative process ended a few months before the elections.

The Paraguayan legislation allowing electronic voting was passed only 30 days before its first application during the 2001 local elections. This legislation has been confirmed, clarified, and extended several times (among others in 2002, 2006, and 2019). In this country, the main logistical and technical decisions are nevertheless taken by the electoral court by means of resolutions.

Elections and Voters

In Australia, Internet voting is only permitted for six categories of voters: voters with a disability, illiterate, whose residence is more than 20 kilometres away, who will not be in NSW during voting hours on the day of the ballot, and anonymous voters. Internet voting should be extended to other categories of voters in 2023. Internet voting has been used for regional and local elections since 2011 and for 17 by-elections. 46,862 voters voted by internet (or telephone) for the 2011 elections and this figure increases over time: 283,669 voters in 2015 and 234,401 voters in 2019. The Internet voting period extends over 13 days, until election day.

Electronic voting as used in Belgium applies to the entire population of a municipality, once it has chosen to switch to electronic voting. Unlike in Australia and France, voters voting on Belgian territory do not have a choice of voting technology. Electronic voting has been implemented for all elections since 1991 and the number of voters using this system continued to grow until 2015. Currently, about 3,200,000 voters vote electronically in just under 200 municipalities.

Internet voting has been used since 2003 by French people living abroad, but more significant elections took place from 2012 onwards (legislative elections). Internet voting is reserved for French citizens living abroad and they have special representation in parliament (seats reserved for French people living abroad in the Senate and the Assembly). 126,947 voters voted via the Internet during the first round of the 2012 legislative elections (117,675 in the second round) and 80,115 voters voted via the Internet during the 2014 consular elections. Between 55% and 65% of voters voted via the Internet in 2012 (43% in 2014). Compared to other voting methods, the percentage of Internet votes is higher in EU countries and in countries where the Internet is widely used.

In Paraguay, electronic voting was gradually been applied to a majority of the population (60% in 2006) and the entire electorate in 2021. As in Belgium, voters residing on Paraguayan territory do not have the choice of voting technology. Note that the same e-voting system is also implemented for Paraguayan voters living abroad.

Turnout and Voting Behaviour

In Australia, respectively 6% and 5% of voters voted online in 2015 and 2019. It is not possible to assess the impact of Internet voting on the participation rate given that voting is compulsory. Internet voting is associated with a decrease in blank votes. The vast majority of voters who voted online reside overseas or in another state of Australia. The main explanation for not having used the Internet voting system is the fact that the voters themselves were not aware of this voting method. The vote was quite slow (between 3 and 10 minutes) and only a third of voters voted with their smartphone. Voters voted online in the last days of the voting period and between 4 p.m. and 9 p.m. The ability to verify your vote was very popular: almost two in three respondents (63%) said they had verified their vote.

In Belgium, the impact of electronic voting is very clear: the participation rate is lower in municipalities using this technology compared to municipalities using paper voting, even if

voting in compulsory in this country. We do not observe that the negative impact of e-voting on turnout diminished over time in parallel with voters' increasing familiarity with e-voting and increasing digital skills. However, we also observe fewer invalid votes in municipalities using e-voting and somehow compensate for the difference in turnout observed above: turnout is lower in cantons using e-voting, but voters from these cantons express a larger share of valid votes.

In France, Internet voting had no impact on turnout and had a negative impact on the number of valid ballots. There is little difference between paper votes and Internet votes, although right-wing parties seem more popular among internet voters. A small minority of voters used assistance. Voting difficulties concern, among other things, connection difficulties and voters who have not provided a valid email address and/or mobile number.

In Paraguay, e-voting has a significant and positive impact on turnover. In 2003, turnout in the municipalities using e-voting increased significantly as compared to the 2001 elections. The same phenomenon occurred for the 2021 local elections as turnout significantly as compared to previous elections and constituted the highest turnout since the 1996 local elections. We also observe a significant drop in the share of invalid votes in elections where e-voting technology is used. Overall, it seems that the e-voting system has a double positive effect on voters' behaviour: voters participate more in elections and express fewer invalid votes.

Attitudes Towards Electronic Voting

In Australia, the vast majority of voters were satisfied with the online voting experience. One in five voters (20%) asked for help when voting online. The difficulties mainly concerned the voting process, i.e., receiving the iVote number and requesting to use Internet voting. Few formal complaints have been made regarding Internet voting during regional elections in NSW.

Belgian public opinion is overall very favourable to electronic voting, even if there is a lack of more recent surveys to put these facts into perspective. 95.11% of respondents to a survey done in 2003 indicated that it was easy or very easy to vote electronically and a very large majority of respondents (87.84%) responded that they were in favour of electronic voting. Voters who have used e-voting with paper trail have even more confidence in electronic voting than other voters, and subnational differences might also explain why different technologies have been used in different regions of the country.

French public opinion is not particularly favourable to Internet voting and surveys indicate that a small majority of voters are in favour of this system. This is partly due to the multiple technical problems often encountered by Internet voting in France, whether at the level of receiving the username or password, connecting to the voting portal or simply to vote. These problems were so serious that they led to the repetition of elections in different constituencies abroad, for instance in 2023.

In Paraguay, almost two-thirds of the people surveyed rated the e-voting system positively. A very large majority of the voters also believe that it is easier and faster to vote with the e-voting machine as compared to systems based on paper. Few respondents witnessed technical problems at the moment to express their votes with the e-voting system and the

problem. This positive evaluation is probably due to the constant efforts of the electoral body to train voters and communicate with the population.

Recommendations

Drawing on lessons from the experiences of electronic voting in Australia, Belgium, France, and Paraguay, this report offers recommendations for countries considering the adoption of electronic voting systems. While electronic voting has the potential to enhance accuracy, efficiency, and accessibility in the electoral process, it also introduces challenges that require careful consideration. By following these recommendations, countries can address potential risks and ensure a smooth transition to electronic voting systems.

1. Establish a Legal and Regulatory Framework

A robust legal framework is essential for the successful implementation of electronic voting. Clear guidelines and regulations should address technical, security, and privacy concerns while upholding democratic principles. This framework should mitigate ambiguities and ensure the process aligns with the principles of fair and free elections.

2. Prioritize Transparency

Transparency is critical to fostering public trust in electronic voting systems. Measures such as independent audits, publishing software source codes, and engaging with cybersecurity agencies can ensure the system's integrity. While the complexity of electronic voting systems may present auditing challenges, establishing clear and accessible transparency mechanisms is essential.

3. Collaborate with Experts

Engaging with international organizations, cybersecurity professionals, and independent experts is vital throughout the planning, implementation, and evaluation phases. Their expertise can strengthen and validate the system, ensuring its credibility. Learning from countries with prior experience in electronic voting can help identify best practices and avoid common pitfalls.

4. Establish Contingency Plans

Before deploying electronic voting systems, conduct comprehensive risk assessments to identify potential vulnerabilities and adopt appropriate mitigation measures. Countries willing to implement electronic voting should in particular test the system against potential threats, such as hacking, manipulation, or system failure, to strengthen its resilience. For instance, contingency plans should be developed to address technical failures, power outages, or network disruptions during the voting period. Backup systems and clear protocols for handling such contingencies should be in place to ensure a smooth and uninterrupted voting experience. In addition, manual backup options are important to address any unforeseen technical issues. It is suggested to allow for contingencies such as the capability to switch to paper-based voting in the event of system failures or security breaches.

5. Foster Public Engagement

The introduction of electronic voting has also highlighted the importance of public participation and engagement in the decision-making process. Given the concerns and reservations of the public, policymakers and election authorities should involve citizens in discussions and address their concerns to foster trust and confidence in the electoral process. More globally, is it necessary to have a public debate about the role of technology in democracy and develop a voting system that ensures voter participation and a trustworthy democratic process.

6. Ensure Usability

Traditional paper ballots are deeply ingrained in our democracies, making them familiar and comfortable for voters. Transitioning to electronic voting systems requires a significant shift in user behaviour, which may pose usability challenges for many voters. Countries have to ensure that the chosen electronic voting systems are intuitive, user-friendly, and rapid (at least that electronic voting does not take much more time than paper voting). In addition, electronic voting should be convenient and easily adaptable for voters of all ages and of all socio-economic backgrounds is essential for a successful transition.

7. Enable Verifiability

Develop a trustworthy verification mechanism that allows voters to verify the integrity and accuracy of their votes, and provide an auditable trail for post-election audits and recounts. One solution consists of introducing a voter-verifiable paper audit trail (VVPAT), which allows voters to verify their choices on a printed paper copy, or similar solutions that provide voters with a tangible receipt of their vote while preserving anonymity. This verification mechanism contributes to enhancing transparency and securing citizens' trust in the electronic voting process.

8. Promote Accessibility and Inclusivity

Countries willing to implement electronic voting should ensure that electronic voting systems are accessible and inclusive for all citizens, including voters with disabilities, elderly voters, and voters from linguistic minorities. They should make efforts to implement electronic voting systems to cater to these groups in order to empower all citizens to exercise their right to vote and therefore to promote a more inclusive democratic process. One of the most significant advantages of electronic voting is its potential to improve accessibility for disabled or illiterate voters. Indeed, electronic voting machines can be designed to enhance accessibility and inclusiveness for all voters, for instance by developing features such as adjustable font sizes, audio-guided interfaces, and language selection to accommodate diverse needs. However, some challenges remain in ensuring that electronic voting systems are accessible to all voters without introducing new barriers or exclusionary factors.

9. Evaluate Costs Carefully

Implementing and maintaining electronic voting systems can be a costly endeavour. Several countries have struggled with weighing the benefits of improved efficiency and accessibility against the financial investment required to establish and maintain electronic voting infrastructure. If it is true that electronic voting can help reduce costs associated with supplies, such as paper ballots and ink, and transportation, and leads to automation of certain processes like voter registration and ballot counting, one must not forget the costs associated with ensuring the security, robustness, and sustainability of electronic voting systems. These costs must be carefully evaluated – for instance during the pilot projects - in order to determine the feasibility of broad adoption of electronic voting.

10. Build Voter Trust

Countries willing to implement electronic voting should establish measures to build voter confidence in electronic voting systems, including awareness campaigns, public consultations, and opportunities for citizens to familiarize themselves with the technology. Many citizens and political actors remain sceptical about the accuracy, transparency, and fairness of electronic voting, and this trust deficit poses a significant challenge in gaining widespread acceptance of electronic voting. Building public trust in electronic voting systems requires regular communication with the electorate to address any concerns or reservations.

11. Educate and Train Voters

Successful implementation of electronic voting requires robust public education and training initiatives to build trust, address concerns, and ensure effective use of the technology. Public awareness campaigns should be designed to educate citizens about electronic voting systems, highlighting their benefits, addressing risks, and demonstrating usability. These campaigns should provide information in multiple languages and formats (e.g., television, radio, posters) to cater to diverse populations, including rural and remote communities.

In addition to public education, comprehensive training programs are essential to familiarize voters with electronic voting methods and ensure inclusivity. Training sessions can be held in accessible public venues, such as city halls, shopping malls, and train stations, as well as targeted locations like universities or nursing homes. Special attention should be given to rural and socio-economically disadvantaged areas to prevent exclusion.

Moreover, training should extend to polling station staff, party delegates, election observers, and other relevant stakeholders. This ensures they are equipped with the necessary skills to operate, monitor, and troubleshoot the technology effectively. For Internet voting, it is particularly important to educate voters about options like early voting to enhance their understanding of the process.

12. Conduct Pilot Projects

Conducting extensive pilot projects is key for any implementation of electronic voting. Pilot testing is critical to identify and address any issues with electronic voting systems before full-

scale implementation. The glitches and issues encountered during the implementation highlight the need for rigorous testing and evaluation in order to refine the technology and identify and rectify potential weaknesses and vulnerabilities in the system. These pilot projects allow for assessing dimensions such as the feasibility, security, and usability of electronic voting. Pilots should cover various types of elections and should involve a diverse range of participants to identify potential challenges and address them proactively.

Typically, experience suggests that a gradual and phased implementation of electronic voting can be an effective approach. The first pilots are run on a limited scale, for instance in non-political elections, such as the election of student representatives or labour union representatives, in party primaries and internal elections, or local or second-order elections in small urban and educated areas. In the second stage, pilots are gradually extended to other types of elections and other types of voters, for instance in rural municipalities, less educated areas, or areas with a large share of ethnic minorities, linguistic minorities, or migrant populations. This iterative and gradual approach can help build confidence in electronic voting by addressing concerns and enhancing security measures.

13. Consider a Hybrid Approach

In order not to rush the transition to electronic voting (especially if the population and/or political parties are not fully ready), a solution could be a hybrid approach, combining elements of electronic voting and traditional paper-based voting. This approach allows for the advantages of technology while maintaining more familiar paper-based elements. Implementing a phased approach that gradually introduces electronic elements in the voting process can help mitigate risks and build public trust over time. It may also be interesting to offer electronic voting as an option alongside other options and to aim to gradually increase the share of the population voting electronically.

14. Conduct Evaluations and Improvements

The implementation of electronic voting should be considered as an ongoing and iterative process that requires continuous evaluation and improvement. Regular assessments should be conducted to identify weaknesses, assess the impact on turnout and voter behaviour, and ensure the system's overall efficacy and security. Continuous improvement based on feedback and lessons learned is crucial to adapt the electronic voting process to changing local needs, address emerging challenges, and ensure its successful integration into the broader electoral framework. Countries should also persist in exploring and testing various alternatives to electronic voting machines. It highlights the importance of ongoing research, innovation, and piloting of new technologies to improve the voting experience, enhance security, and increase participation.

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December 2024

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