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# POTENTIAL AND CHALLENGES OF E-VOTING IN THE EUROPEAN UNION

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CONSTITUTIONAL AFFAIRS

# POTENTIAL AND CHALLENGES OF E-VOTING IN THE EUROPEAN UNION

## STUDY

**Abstract**

This study was commissioned and supervised by the European Parliament's Department for Citizens' Rights and Constitutional Affairs at the request of the AFCO Committee. It addresses the potentials and challenges of the implementation of Internet voting in European Parliament elections. It considers the social, political, legal, and technological implications of its introduction as an alternative to on-paper ballot and builds on the recent experience of previous trials and successful e-enabled elections to issue technical recommendations regarding Internet voting in the European Union.

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# EXECUTIVE SUMMARY

This report analyses the opportunities of Internet voting and its challenges, namely with regard to legal constraints, political and social implications, and technological and security challenges, discussing the merits of this solution and possible pathways to eliminate threats or minimise their effects. It builds on the latest academic research on the topic and on the previous technical reports developed by the European Parliament, i.e. the "E-public, e-participation and e-voting in Europe - prospects and challenges" final report, and "The Reform of the Electoral Law of the European Union". Furthermore, it includes empirical evidence from the most recent trials of Internet voting and e-enabled elections and evaluates its implementation while bearing in mind the specificity of European Parliament elections.

The implementation of Internet voting carries the promise of elections with more participants, of strengthened efficiency in the electoral process, and the hope of bringing voters and their representatives closer together. In the current context of decrease in participation in many Western democracies and generalised disappointment toward politics, policy-makers have been searching for innovative strategies to reengage citizens and promote a participated democratic process. Internet voting is a particularly attractive innovation in this regard, in the sense that is combines technology to the core of democratic participation. Therefore, it is commonly perceived as a panacea for many of the problems affecting contemporary democracies and great expectations arise concerning its potential impacts on the electoral process.

However, both successful and unsuccessful cases of attempts to develop e-enabled elections are revealing of the complexity associated to a fully operational Internet voting procedure. On the one hand, Internet voting offers many potential advantages such as facilitating the voting process, increased convenience to voters, gains in efficiency and the promise of increase in turnout rates in the long run. Thus, Internet voting consists in an important opportunity to modernise European elections. On the other hand, it also comes with multiple challenges which, if not properly addressed, can undermine the integrity of elections.
Legal challenges are related to the fact that Internet voting must be conceptualised within the broader framework of the European Electoral Law, as well as national legislation. Obtaining a uniform solution across Member States is most challenging, hence the optimal solution seems to consist in a decentralised approach where Member States operate within the restricting confines of an overarching European Law. In this regard, the Reform of the European Electoral Law is an important contribution to harmonise electoral procedures across all Member States. It is of utmost importance to future Internet voting in European Parliament elections.

Politically, it is fundamental to foster a broad consensus among political elites for the implementation of Internet voting. This calls for a transparent, involved and participated process, where the relevant actors have a voice. Internet voting should also be relatively neutral from the political point of view, that is, the new procedure should not benefit disproportionally given factions of the political spectrum. The responsibility for bearing the costs with the design and implementation of the system is another important issue to consider, as well as the role of private actors in e-enabled elections. Finally, Internet voting at the European Parliament level could lead to a call for the dissemination of the new procedure at the national, regional and local level, both by citizens and national political actors.

Technological and security concerns are often pointed at as the main threats to Internet voting. Nonetheless, recent research demonstrates that the multiplication of pilots, trials and number of e-enabled elections has been contributing decisively for the development of more secure Internet voting systems. In addition, recommendations for a coordinated but decentralised i-voting system offer a good solution in terms of damage control in the event of attack or partial system malfunction.

The most relevant social challenge is the digital divide. Although inequality has been a historical determinant of electoral participation long before computers and the Internet saw the light of day, it is a concern that parts of the population remain excluded from these technologies and that a gap persists between European countries regarding computer literacy and household Internet usage and availability. However, recently European countries have been progressing significantly in this regard, inverting these trends and diffusing the use of Internet-based technologies. It is to be expected that, in the medium run, the digital divide – at least in terms of access, but even in a longer perspective with regards to literacy - progressively fades away and becomes negligible.

The success of Internet voting depends largely on how it is perceived by the people meant to use it: citizens. Therefore, it is fundamental to know what their attitudes towards the implementation of Internet voting are. Listening to citizens' opinions and identifying their main concerns provides policy-makers with the opportunity to design the system in a way as to address these concerns and thus be both responsible and responsive. Unfortunately, there is a shortage of data on citizens' attitudes towards Internet voting at the European level. There are a few studies addressing this topic with isolated approaches focused on specific trials conducted in very particular contexts. Hence, this report strongly recommends to develop a cross-country study to adequately measure this important dimension. Note that the few surveys carried out so far indicate a clear majority of public opinion supporting Internet voting. Generally, rather high levels of trust in proposed procedures could be measured.

Internet voting is now beyond the trial stage. It has been gradually spreading throughout European countries – and also to non-European contexts – with successful outcomes. This is an opportunity to modernise European elections and facilitate citizens' interaction with politics through elections. However, should Internet voting be made available to European citizens, it should be proposed as an alternative to on-paper ballot voting. The experience from successful cases highlights the benefits of developing a gradual, step-by-step designing and implementation of Internet voting systems. In this regard, trials are important instruments to measure citizens' reactions to the procedure and to identify possible limitations of the system. It is also highly recommended to opt for a decentralised Internet voting structure which involves all the Member States in the process, with a coordinating role for the European institutions. Apart from the previously mentioned need for more in-depth cross-country studies on citizens' perceptions of Internet voting, it is essential to develop effective voter education campaigns in order to familiarise voters with the new procedure and its particularities. Finally, it is recommended to follow a principle-based approach to legal regulation of Internet voting, with a focus on comparative lenses and building on existing cases of updated voting legislation.

# 1. INTRODUCTION AND DEFINITIONS

**KEY FINDINGS**

- Remote Internet voting has become an increasingly popular alternative to on-paper voting. Trials have multiplied in several countries, as well as the number of successfully fully implemented e-enabled elections.
- Today, Internet voting is experiencing a "second spring".

For the past two decades, the dynamic development of Internet technologies led to the implementation and expansion of Internet voting programs worldwide. The introduction of a novel element into the electoral process has predictably generated wide debates about benefits and risks of Internet voting in the short- and the long-run. However, over the course of the discussion, the supply and demand side of the Internet voting equation[1] is usually perceived from a top-down perspective, often set apart from the interests and wishes of the voters themselves. After an initial "hype" at the end of the 1990s and in the early 2000s, some kind of disenchantment with internet voting set in. It became clear that despite some very promising pilots, Internet voting could not simply replace traditional forms of casting ballots and not even simply add to the latter, due to technical, legal and political problems. However, today, Internet voting experiences some kind of "second spring", as demonstrate not only the examples of Estonia and Switzerland, but also the example of Canada where approximately one quarter of the provincial electorate in 97 municipalities could vote online during the recent Ontario 2014 municipal election, and some 30 of Nova Scotia's 54 municipalities are anticipated to use online voting in 2016[2]. Numerous other constituencies and States, including France, India and Australia offer Internet voting to parts of their electorate – usually citizens residing abroad – for a number of specific elections.

Increasing political participation, reducing the cost of voting and convenience of the process, which makes Internet voting sticky, withstand to security and technological-related challenges. The latter, despite of their ubiquitous nature in the online word, can be minimized through improving the digital competencies of EU citizens and addressing security issues based on the experiences of such advanced digital European democracies as Estonia and Switzerland.

Internet voting in the coming European Parliament elections, along with the traditional paper voting, would allow to measure and compare the popularity and trustworthiness of this new form of voting. Furthermore, it might lead to a possible increase in voter turnout and the share of citizens ready to take up an active part in e-democracy activities on the pan-European level.

Regarding definitions, when we refer to Internet voting in this report, we rely on the approach chosen by the 2011 Final Report on "E-public, e-participation and e-voting in Europe - Prospects and challenges", according to which this encompasses a procedure that "seeks to maximize the convenience and access for the voters by enabling them to cast their ballots from virtually any location that is Internet accessible".[3]

[1] A.H. Trechsel & F. Mendez (Eds.), *The European Union and e-voting: addressing the European Parliament's internet voting challenge*, Routledge, London/New York, 2005
[2] N. Goodman, 'Internet voting in a local election in Canada'. In B. Grofman, A. H. Trechsel, & M. N. Franklin (Eds.), *The Internet and Democracy in a Global Perspective*, Springer, Berlin, 2014
[3] European Parliament, *E-public, e-participation and e-voting in Europe - prospects and challenges*, 2011, p.111

This report is structured as follows: the first section describes opportunities for European Parliament elections from the standpoints of convenience of Internet voting, its potential effects on turnout, the quality of opinion formation, the efficiency of democratic participation and transnational/external voting. It is followed by a section considering challenges and pitfalls of Internet voting. In particular, legal, political, technological and security as well as social challenges are considered here. The third section of this report focuses on the missing element in the previous 2011 report - the voters. It emphasizes required aspects of trustworthiness in Internet voting such as citizens' digital competencies, their trust in the Internet in general and in transactions over the Internet in particular. It also discusses citizens' attitudes toward Internet voting more generally. The final section of the report describes the recent Internet voting experiences in Europe since 2011. Finally, the report provides a number of conclusions and recommendations.

# 2. INTERNET VOTING: AN OPPORTUNITY FOR EUROPEAN ELECTIONS?

**KEY FINDINGS**

- In a context of growing disaffection with politics, Internet voting may operate as an important instrument to reconnect citizens with European politics.
- Internet voting has the potential to increase turnout: it makes voting **less costly and more convenient** for individuals (less time consuming, avoid travelling long distances to the polling stations, minimises obstacles such as bad weather or long queues, facilitates voting for people with reduced mobility or living abroad).
- Increase in turnout rates should not necessarily be expected in the **short- but medium- to long-run.**
- Internet voting offers **gains in efficiency** vis-à-vis on-paper ballot voting.

Over the past decades, representative democracy in Europe has been evidencing signs of crisis: decrease in political interest, drop in party membership, low levels of trust in political institutions and satisfaction with government, general negative feelings towards the political elite, political parties perceived as unaccountable and irresponsive to citizens, and consequently turnout rates have been consistently declining in most European democracies over the last decades[4][5][6]. Attitudes towards the European Union and its political institutions are no exception to this trend[7]. The rise of euroscepticism has undermined the trust in European institutions and has accentuated the democratic deficit. Turnout in elections for the European Parliament has been historically low and, as a consequence of this progressive disengagement from national and European democratic processes, recently has been further decreasing (42,5% in 2014). In the sense that, in representative democracy, political institutions are largely legitimised through voting processes, this reality today questions the role of the European Parliament in adequately representing European citizens[8].

Internet voting has since the beginning been seen as a potentially effective tool to facilitate citizens' participation in elections and, consequently, restore the democratic linkage between citizens and political institutions. Specifically regarding younger cohorts, it is recurrently perceived as a facilitative instrument for the initiation with voting, and as a promoter of a broader engagement with politics. As e-government develops in European democracies and the range of functionalities available to interact with the State over the Internet rapidly and profoundly increases, so do citizens' expectations for innovations which facilitate our current voting procedures. The number of countries assessing the usefulness of Internet voting in Europe has been rising over the past years. Also, the number of elections in which this form of participation has been formally adopted is on the rise. In the context of this report, one important question is, of course, to what extent Internet voting might offer an opportunity to increase turnout rates for European Parliament elections?

[4] L. Bardi, S. Bartolini, & A. H. Trechsel (Eds.), *The Role of Parties in Twenty-First Century Politics: Responsive and Responsible?* Routledge, London, 2014
[5] R. Dalton, & M. Wattenberg (Eds.), *Parties without Partisans: Political Change in Advanced Industrial Democracies*. Oxford University Press, Oxford, 2002
[6] P. Schmitter, & A. H. Trechsel, *The Future of Democracy in Europe: trends, analyses and reforms - a Green Paper for the European Council*. Council of Europe, 2002
[7] O. Cramme, & S. B. Hobolt, *Democratic Politics in a European Union Under Stress*. Oxford University Press, Oxford, 2015
[8] Z. Lefkofridi, & A. Katsanidou, 'Multilevel representation in the European Parliament', *European Union Politics*, 15(1), 2015, 108–131

Internet voting, in general, is deemed to offer increased convenience compared to traditional ballot box voting. It substantially reduces the costs for casting a vote. For instance, with regard to time, evidence from Estonia shows that on-paper voting is 16-times more time consuming than Internet voting[9]. Not surprisingly, the cost of having to go to a polling station is related to the probability of casting the vote over the Internet: Estonians living at least 31 minutes away from polling stations have a 50% probability of using Internet voting[10]. Internet voting eliminates obstacles associated with bad weather, long lines, or confusion over the location of polling places[11][12]. Therefore, it has the potential to boost turnout among the entire population, for whom the voting process is made essentially more convenient. Its greatest potential comes out, however, for voters with limited accessibility to traditional polling stations: people with reduced mobility such as the elderly or disabled citizens, citizens who work on Election Day, travellers or voters from abroad, as well as voters living further away from polling places. Postal voting can be seen as an alternative for some of these voters, of course, but Internet voting is often seen as not being less efficient in terms of costs, logistics (printing, mailing, counting), security and fraud (vote-selling, family voting). Also, while it has become rather simple for Europeans living abroad to inform themselves about their local politics and electoral campaigns, thanks to the Internet, the act of taking part in elections is most of the time rather cumbersome and time consuming. Not surprisingly, turnout rates among citizens living abroad tend to be lower than average, which has also (but of course not exclusively) to do with their difficulties for casting a valid vote from abroad. Specifically in the European context of increased mobility of citizens among Member States, where around 8 million economically active EU citizens live in an EU country other than their own, facilitating transnational/external voting is an important aspect to consider. Among these voters, having a simple access to the ballot box over the Internet can be, as studies have shown, particularly turnout-boosting[13].

Internet voting also carries the potential to reduce information costs by making relevant information available to voters on the Internet voting platform. For instance, information on candidates, parties and their platforms, or issues at stake in a referendum can be an effective mechanism for informing voters without much additional costs. In this sense, Internet voting can also contribute to the promotion of a better quality of opinion formation.

The rational choice literature on individual-level turnout particularly emphasises the role of citizens' costs to cast a vote as an obstacle to electoral participation. The lower the costs – not only financial but also opportunity costs such as the necessary time, the investment in obtaining relevant information about the parties/candidates, the aggravation of having to get to the polling station, etc. –, the fewer disincentives citizens have to participate in elections. From this perspective, Internet voting can offer a substantial contribution to foster turnout by substantially lowering the personal investment citizens have to put into acquiring information and going to the polls.

Nevertheless, the problem of low turnout rates both in European and national parliamentary elections is less likely to be a result of the high costs of voting than of a general dissatisfaction with politics. Numerous studies have documented the relationship between satisfaction with democracy, perceived political efficacy of the vote on policy outcomes, interest in politics,

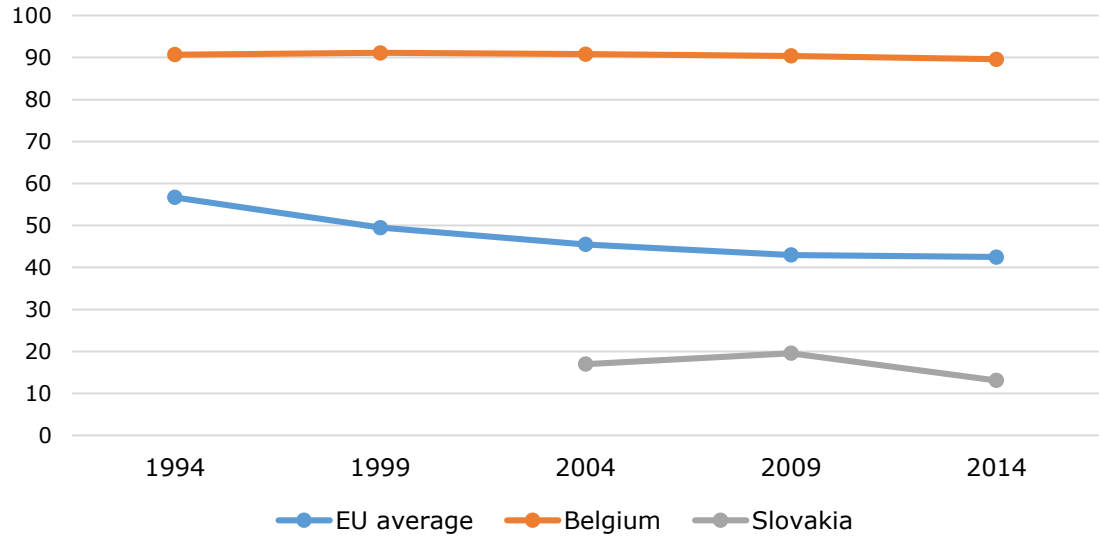
[9] K. Vassil, *Selected Behavioral Evidence on Estonian Internet Voting*. University of Tartu, Tartu, 2015
[10] idem
[11] R. M. Alvarez, & T. E. Hall, *Point, Click, and Vote: The Future of Internet Voting*, Brookings Institution Press, Washington, D.C., 2003
[12] R. M. Alvarez, T. E. Hall, & A. H. Trechsel, 'Internet Voting in Comparative Perspective: The Case of Estonia'. *PS: Political Science & Politics*, 42(3), 2009, 497–505.
[13] For Switzerland, see A. H. Trechsel, & U. Gasser, 'Casting Votes on the Internet: Switzerland and the Future of Elections', *Harvard International Review*, 34(4), 2003

trust in political institutions and turnout. In sum, although reducing the costs of voting would surely increase, or at least stabilize, turnout rates, the core explanation of low turnout rates most likely lies in attitudinal factors which reflect a general distancing from politics. Technological innovations should not be conceived as a miraculous solution: Internet voting will not "provide a digital panacea to what is, in essence, a structural problem"[14]. Nevertheless, while Internet voting might not cure democracy's ills on its own, it might at least help in the fight against voter apathy.

From the administrative point of view, Internet voting offers gains in efficiency vis-à-vis paper ballots. The counting and recording of votes tends to be faster and more accurate because of reduced human intervention. For some proponents of Internet voting, the latter could therefore also be beneficial to fraud prevention in polling stations. Besides, it might be a more cost-efficient technology in the long-run, since it may help reducing traditional costs (personnel, voting material etc.).

An eventual increase in turnout rates is also contingent on whether Internet voting is introduced as a replacement of on-paper voting or as a complementary mean. If the latter option is pursued, a mere addition to the range of voting procedures would hardly have negative consequences on turnout rates, although a differentiated effect across the population could affect democratic representation (see section 4.4.). A reflection on the positive impacts of Internet voting in increasing turnout rates in European Parliament elections also has to consider the heterogeneity of contexts existent in the European Union. This comes, primarily, with the recognition that turnout rates in the EU for the 2014 election have ranged from 13,1% in Slovakia to 89,6% in Belgium (Figure 1).

**Figure 1 - Turnout rates in elections for the European Parliament (1994-2014)**




On the one hand, EU countries have different institutional settings when it comes to election procedures: voting registration, voting age, compulsory voting, days of the week in which the elections take place, number and territorial distribution of polling stations, availability of other means of voting (e.g. mail voting). On the other hand, factors of legal, political and social nature such as the countries' Electoral Law and Constitution, level of European

[14] A. H. Trechsel, & F. Mendez, (Eds.), op. Cit., p.8

integration of the country, citizens' attitudes towards the EU, or the country's age of democracy may impact the perceived relevance of European Parliament elections. These combined factors may mediate – facilitating or posing obstacles – an eventual impact of Internet voting on turnout. Also, evidence from Estonia has shown that Internet voting is a habit-forming process whose impacts on turnout are incremental but diachronic, that is, the introduction of Internet voting has not caused an abrupt change in turnout rates but the effect is to be noted in the long-run. The magnitude and time necessary for it to produce the expected results may vary across countries. In sum, a homogenous increase in turnout rates should not be expected because the growth margin and the conditions of each country are distinct. A further consideration of these aspects will follow in the next section.

# 3. INTERNET VOTING: CHALLENGES AND PITFALLS

**KEY FINDINGS**

- Although most likely Internet voting would have to be implemented in a decentralised fashion, it would be desirable to develop efforts towards a strengthened European Electoral Law.
- **The Reform of the Electoral Law minimizes discrepancies between Member States** regarding the electoral procedures and meets an important requirement for Internet voting at the European level.
- From the political point of view, a **transparent and participated process**, involving the relevant political actors and stakeholders would foster a broader political consensus around the procedure.
- The **political neutrality** of the process, the responsibility for the **investment in the infrastructure**, and the **role of private actors** in e-enabled elections are important political challenges.
- The introduction of Internet voting for European Parliament elections may lead to a growth in e-enabled elections at the national level.
- Technological and security **risks are both human and tech-related.**
- Security of Internet voting can be increased through the design of a coordinated but decentralised i-voting system.
- The digital divide is the most relevant social challenge. However, it is estimated not to have a decisive impact on the voting process and its importance is expected to decrease substantially in the medium-run.

## 3.1. Legal considerations

From a legal perspective, two interrelated, but analytically distinct challenges need to be addressed when considering the introduction of Internet voting in elections for the European Parliament. First, any Internet voting scheme has to designed and evaluated in the light of the core principles of European electoral heritage as embedded in the current legal frameworks of voting in the European Union and in the Member States. From such a principle-based perspective, the legal analysis should focus on Internet voting's impact on the constitutional principles of electoral law: universal, equal, free, secret and direct suffrage. Secondly, it should consider the implications of Internet voting for EP elections according to EU legislation, as well as national legislation. This includes potential transformations of existing legal frameworks in order to embrace and regulate the new voting procedure. For instance, in the Swiss case, "the update of the legal infrastructure (…), required significant amendments to federal and cantonal laws"[15]. Taken together, the analytical and normative challenge is to synchronize legal analyses related to the adherence of Internet voting to existing laws while simultaneously considering adjustments of the legal system to enable and govern Internet voting.

[15] A. H. Trechsel, & U. Gasser, 'Casting Votes on the Internet: Switzerland and the Future of Elections', *Harvard International Review*, 34(4), 2003

Focusing on the first aspect of the challenge—adherence to fundamental principles as enshrined in law—Garrone[16] has conducted an analysis of the consequences of Internet voting for fundamental and political rights, concluding that Internet voting does not pose any threats to the principles of direct suffrage. The principle of universal suffrage according to which everyone is entitled to the right to vote could only be harmed by the introduction of Internet voting as the only modality of voting, since people without access to the Internet could be impeded to vote. The one voter, one vote notion subjacent to equal suffrage cannot be assured as surely as with the traditional means of voting which require identification of voters "on the spot" but this caveat is also common to mail voting. Free suffrage is not significantly threatened by Internet voting, except for family voting, another limitation common to mail voting. Finally, ensuring secret voting is highly contingent on the design and quality of the system – the operations of checking who voted and counting the vote should be independent and the platform should aim for maximum standards of privacy and security. These principles have also been analysed according to the same framework in the 2011 Final Report on "E-public, e-participation and e-voting in Europe - Prospects and challenges"[17].

With regard to the second dimension of the challenge—adjustment of existing legal norms—it is broadly recognized that the implementation of Internet voting "would need to be strictly defined, organised and put into operation, by law"[18]. In other words, establishing a legal basis for the introduction of Internet voting is an important challenge to be addressed when considering extending this new voting procedure to all Member States. This comes with the fundamental question of at what level should the legal basis be developed and implemented: at the European level, Member States, or a combination of the two. Auer and Mendez[19] note that the "Article 190(4) ECT [Article 223(1) TFEU], since its amendment by the Treaty of Amsterdam (TOA), provides that '[t]he European Parliament shall draw up a proposal for elections by direct universal suffrage in accordance with a uniform procedure in all Member States or in accordance with principles common to all Member States'". However the design of a uniform electoral procedure has encountered many obstacles, "the EP being unable to make any headway under this option despite repeated attempts"[20], and the anticipate that the "Council's (read Member States') intransigence that had been the main stumbling block to a uniform electoral procedure in the first place, is unlikely to mysteriously vanish as a result of the conviction of the wonders to be offered by e-voting"[21].

Therefore, the authors conclude that "the search for complete uniformity is largely a chimera" and "e-voting would have to be administered in a decentralised fashion", where "Member States agents would be expected to operate within the restricting confines of an overarching European law, but fleshing out the details would be supplementary state rules and practices with all the scope for differentiation that this entails"[22]. This is not conflicting with the current state of affairs, namely "Article 7(2) of the 1976 Act concerning the election of the representatives of the European Parliament by direct universal suffrage (1976 EP Act), provides that '[p]ending the entry into force of a uniform electoral procedure … the electoral

[16] P. Garrone, P., 'Fundamental and political rights in electronic elections'. In A. H. Trechsel & F. Mendez (Eds.), *The European Union and e-voting: addressing the European Parliament's Internet voting challenge*, Routledge, New York, NY, 2005
[17] European Parliament, op. cit.
[18] A. Auer, & M. Mendez, 'Introducing e-voting for the European Parliament elections: the constitutional problems'. In A. H. Trechsel & F. Mendez (Eds.), *The European Union and e-voting: addressing the European Parliament's Internet voting challenge*, Routledge, New York, NY, 2005, p.125
[19] idem, p.126
[20] For example, the recent European Parliament resolution of 11 November 2015 on the Reform of the Electoral Law of the European Union: http://www.europarl.europa.eu/sides/getDoc.do?pubRef=-//EP//TEXT+TA+P8-TA-2015-0395+0+DOC+XML+V0//EN
[21] idem, p.127
[22] idem, p.128

procedure shall be governed in each Member State by its national provisions'"[23]. Nonetheless, it would be desirable to develop efforts as to have the Member States under the same Electoral law given that the outcome of the election is common to all of them.

Most importantly, the implementation of the Reform of the Electoral Law of the European Union, following the in-depth analysis recently conducted by the European Parliament report on "The Reform of the Electoral Law of the European Union – European Added Value Assessment accompanying the legislative own-initiative Report", consists in an important step towards a common legal framework for EP elections. The report, which "calls for amendment of the Act concerning the election of Members of the European Parliament by direct universal suffrage and submits the Council a proposal to this effect"[24] recognises the added value of Internet voting. The Reform of the Electoral Law minimizes discrepancies between Member States regarding the electoral procedures and meets an important requirement for Internet voting at the European level.

At the Member State level, the substantive changes necessary to enable and regulate Internet voting depend on the particular characteristics of the existing legal framework aimed at regulating voting. That said, the Swiss example might be illustrative for the types of considerations and possible adjustments that are required: According to the analysis of Gasser and Gerlach[25], several adjustments at both the Federal and cantonal level were necessary to address issues related to participation, autonomy, and quality of voting, with a particular emphasis on adjustments of procedural norms to ensure free and secret suffrage. Across these changes, Switzerland has largely followed a principle-based and technology-neutral approach to enable cantonal variations in terms of exact (technical and organizational) implementation of the respective legal requirements. Gasser and Gerlach's analysis also reveals that at least some of the policy issues and concerns related to Internet voting (for instance the question of participation, which is linked to digital literacy) cannot be resolved by changing voting laws, but require broader strategies concerning the general legal and policy framework.

## 3.2. Political considerations

The process of implementation of Internet voting involves political consequences which should be considered in the decision-making process. Concerns regarding the political implications of the process should be tackled at an early stage. A general political will common to the relevant EU political actors is a primary requisite. Previous trials and positive cases of Internet voting demonstrate that trust in the process is a fundamental factor for its subsequent success. The entire procedure should be transparent, participatory, and involve all the relevant political actors and stakeholders in order to foster a broad political consensus around the introduction of the procedure. This increases trust in the process and mobilises the support of the actors implicated for an easy operation. Citizens' attitudes towards the Internet voting procedure, motivation to participate through Internet voting and confidence building may benefit largely from the way in which the process is perceived to be politically consensual and technically supported. The support of political elites has been highlighted as a key aspect to an effective transition to Internet voting. Political consensus may be

[23] ibidem
[24] M. Nogaj, & E. Poptcheva, 'The Reform of the Electoral Law of the European Union', *European Parliamentary Research Service*, 2015 p.10
[25] U. Gasser & J. Gerlach, 'Electronic Voting: Approaches, Strategies, and Policy Issues - A Report from Switzerland'. In S. van der Hof & M. Groothuis (Eds.) *Innovating Government: normative, policy and technological dimensions of modern government*, Asser Press, The Hague, 2011

weakened by security and technical concerns, national disputes between political parties related to the benefits of Internet voting, opposition to the incumbent parties, and/or distrust in the independence of those implementing the system[26].

Another important threat to political consensus may derive from reservations regarding the political neutrality of Internet voting. The political neutrality of the process of Internet voting is guaranteed if citizens' political orientations do not have an impact on the probability to use Internet voting. If, for example, supporters of right-wing parties are found to use Internet voting substantially more than left-wing partisans, and, of course, if they had not participated in the absence of Internet voting, it can be concluded that the process is not politically neutral because it largely benefits a given political faction. The empirical evidence gathered so far is not uniform. While early analyses in Switzerland and in Estonia have concluded that the introduction of Internet voting was politically neutral[27][28][29], more recent analyses show that some parties in Estonia may have benefited from the introduction of Internet voting in the long run. However, as Solvak & Vassil[30] show, the mechanism behind uneven vote shares of parties due to the availability of Internet voting does not primarily stem from the voting technology per se, but is rather determined by political preferences that are independent from the mode of accessing the ballot. In other words, while prima facie the Internet voting experience in Estonia might lead observers to believe there is political bias, the latter, though apparent, remains rather spurious when considering political preferences that precede voters' decision to participate in an election.

An option for Internet voting in elections for the European Parliament needs to consider as well its repercussions at the national level. In a scenario where voters can effectively vote for European Parliament elections through the Internet, with a satisfactory system performance and increased popular support for the procedure, the pressure for national governments to adopt Internet voting in the Member States may rise. This may be desirable if there is political will to proceed with the dissemination of Internet voting at the national level both by the EU and the Member States. In a context where voting online has been successfully implemented in EU elections, maintaining the traditional form of voting unaltered may be perceived by voters as an unnecessary obstacle to advances in democratic participation. Ultimately, it may affect Member States' support for Internet voting in European Parliament elections level or result in a further disengagement of citizens at the national level, possibly followed by a continued decline of turnout rates. Therefore, the process should be carried as to avoid a clinch between technologically sophisticated EU elections and "outdated" national elections. This could be achieved by providing incentives and assistance to the Member States which are favourable to the introduction of Internet voting at the national level.

Although Internet voting might be more cost-efficient in the long-run, the initial investment associated with the development of the system, security procedures, trials, promotion, voter education campaigns, etc. is expected to be substantial. The 2011 Final Report on "E-public, e-participation and e-voting in Europe - Prospects and challenges", highlights the "high expenditures the local authorities had to bear in campaigns promoting the new voting

[26] IDEA, *Introducing Electronic Voting: Essential Considerations*, 2011, p.19
[27] F. Breuer & A. H. Trechsel, *E-Voting in the 2005 local elections in Estonia - report for the Council of Europe*, E-governance academy, Florence, 2011
[28] A. H. Trechsel, 'E-voting and electoral participation'. In C. H. de Vreese (Ed.), *The dynamics of referendum campaigns: an international perspective*, Palgrave Macmillan, New York, NY, 2007, p.173-7
[29] A. H. Trechsel, *Internet voting in the March 2007 Parliamentary Elections in Estonia,* European University Institute, Florence, 2007, p.57-8
[30] M. Solvak & K. Vassil (2016). *E-voting in Estonia. Technological diffusion and other developments over ten years (2005-2015)*, Johan Skytte Institute of Political Studies University of Tartu & Estonian National Electoral Committee, 2016, p.142 ff.

methods"[31] and the scaling component of the cost-effectiveness argument – the more voters are covered by Internet voting, the lower the costs per voter are. Thus, the financial responsibility for the implementation of Internet voting is, of course, a sensitive aspect to consider. Eventual concerns regarding the required initial investment should be countered by the possibility to reduce costs in the long-term and gains in democratic participation and representation. Additional shared benefits, for example with the use of the infrastructure at the national level, are other possible incentives.

Finally, and since the early trials with Internet voting, the debate about whether or not private actors should be involved in the development of voting technology has been flourishing. However, even if some voting systems, such as the Estonian one, are mainly developed and maintained by the state, most other Internet voting experiences have somehow been joint enterprises between the public authorities and private companies. Most aspects of modern Internet voting technology – the development of the online voting platform, cyber security, the implementation of end-to-end verification procedures, the transmission of votes, the counting of votes etc. –, rely ever more strongly on the help from private, specialised businesses. Given that elections in European democracies have been historically organised and controlled rather exclusively by the state, this is seen by some observers as an important change in respect to the traditional election process. Clearly, outsourcing certain key components of elections to private businesses may not be welcomed in all Member States who are used to have this key feature of democracy monopolised by the state and may be concerned about the consequences of involving private actors, with private interests, in such a fundamental feature of the democratic process. But note that traditional forms of voting are also strongly penetrated by public-private partnerships (1). Furthermore, it is common in most Western countries to have private companies – even if indirectly – administrating sensible electronic information, from personal data of citizens, to the motorization of aspects related to national security. As Pratchett et al.[32] highlight, the concerns about the influence of private actors in elections and its potential "threats are not unique to the technology. Rather, they are a feature of the political and economic context in which elections might take place and it is certainly feasible that key workers or companies might seek to disrupt non-electronic elections through other means."

## 3.3. Technological and security challenges

The technological and security challenges are usually viewed as serious threats to implementing Internet voting. In particular, the technologically-related risks can be described along two dimensions - (1) human-related and (2) tech-related.

The human-related technological risks may include the following:

- the lack of adequate technical skills as regards voters to use the remote Internet voting;
- the lack of adequate technical skills as regards election officials, leading to the situation when they can lose control or scrutiny over key areas of the Internet voting process;
- the citizens assurance that their votes remain secret;

[31] European Parliament, op. cit., p.140

[32] L. Pratchett, M. Wingfield, B. Fairweather, & S. Rogerson, 'Balancing Security and Simplicity in E-voting'. In A. H. Trechsel & F. Mendez (Eds.), *The European Union and e-voting: addressing the European Parliament's internet voting challenge*, Routledge, London/New York: Routledge, 2005, p.172

- the lack of transparency when voters cannot be sure whether their votes are correctly counted and stored;
- the danger of interference by someone else in proximity to a voter (for example, at home or at work) during the process of the remote Internet voting in order to control the voting decisions through intimidation, fraud, forcing to vote selling etc.;
- the danger that voters who do not have or want any Internet access will feel themselves discriminated if remote Internet voting is the only option for voting.

The tech-related technological risks may include the following:

- the digital divide - the uneven possibilities of Internet access among different socio-demographic groups; as a result, the danger that internet voters will not represent the general electorate, but only a part of it, skewing the results of the voting in favor of certain socio-demographic groups;
- the possibility of system attack or breakdown, or connection failure;
- the possibility that voter's personal computers are virus- or malware-infected which, in turn, can (1) result in distorting the vote decision or/and (2) affect the whole system of Internet voting;
- the complexity with the correct identification of the voter;
- the provision of the transparency of tabulation;
- the provision of the preventive measures against multiple voting;
- the complexity with a recount of votes by the demand of candidates in the case of very close election outcomes.

There are substantial differences in Internet use across EU countries. Eurostat data from 2013 reveals that whereas in Luxembourg 93% of the individuals were using the Internet "at least once a week" (92% in the Netherlands and in Sweden), only 45% used the Internet with the same frequency in Romania (51% in Bulgaria and 56% in Italy). 42% of the Romanian population never used the Internet (41% in Bulgaria), while in Denmark and Sweden that number is only 4%[33]. This picture reveals sizeable disparities among EU countries and any process towards the introduction of Internet voting should carefully consider that this procedure might only serve a selected part of the EU electorate, and, as a consequence, might have some implications for the democratic representation of citizens in Member States with major disadvantages in Internet connectivity. Nonetheless, the number of households with Internet access has been growing strongly in the past few years, with the strongest growth taking place in the countries that were at the bottom of the Internet-connectivity rankings. In Bulgaria, for example, the number of households with Internet access has doubled in just five years (2009-2014), indicating that in a relatively short period of time the divide between EU countries could decline extensively ("Information society statistics - households and individuals," 2015).

The European Commission is working on improving the situation under the Europe 2020 strategy, emphasizing fast and ultra-fast Internet access, as well as digital literacy skills and inclusion as priorities. Even if not all goals will be met by 2019, a joint availability of Internet voting and traditional means of casting a ballot in the next European Parliament Elections would hardly be problematic from an equality point of view.

[33] H. Seybert & P. Reinecke, *Internet use statistics – individuals,* 2013. Retrieved from http://ec.europa.eu/eurostat/statistics-explained/index.php/Internet_use_statistics_-_individuals

As other dimensions of e-government or e-democracy, Internet voting can be seen as a critical infrastructure of a democratic polity. In the sense that government formation tends to rely on election outcomes (with one notable exception being the European Union polity, despite the Spitzenkandidaten innovation), these infrastructures are potential targets of attacks both from within and outside territorial boundaries, with the objective of destabilising, sabotaging and/or manipulating the results. To a certain degree, the entire Internet infrastructure and its security is at stake and heavily dependent on the system's (but also on the concerned polity's) security capacities. Avoiding to go beyond our expertise of social scientists, we limit ourselves here to mention that among specialists in computer science and cryptography, the debate is alive regarding the ability to design systems fully protected from cyber-attacks – whether it concerns, for example, e-banking, digital systems managing heavy weaponry or e-enabled elections.

In the recent past, a number of Internet voting exercises were the targets of cyber-attacks/hacking. For instance, in 2010, there was an attack on the Washington D.C. Internet voting pilot project – originally intended to allow overseas absentee voters to cast their ballots over the web –, where hackers were able to change votes and reveal secret ballots without detection from officials[34]. In the 2013 Parisian mayoral primaries, reporters from "the news site Metronews proved that it was easy to breach the allegedly strict security of the election and vote several times using different names." ("Fake votes mar France's first electronic election," 2013). Researchers from the University of Michigan claim that they replicated in a laboratory environment the Estonian system using its published code, which was used for the 2013 elections. According to the authors of the study, the Estonian system was vulnerable against their attacks. In particular, the attacks included taking over voters' PCs to cast fake votes, and hacking into the vote-counting servers to install software that would alter the final count. The Estonian National Electoral Committee responded that it was taking any evidence of flaws in the electoral process seriously, but in the past decade its online balloting had stood up to numerous reviews and security tests. The committee concluded that "it is not feasible to effectively conduct the described attacks to alter the results of the voting". The Estonian National Electoral Committee emphasized that it "has numerous safeguards and failsafe mechanisms to detect attacks against the elections or manipulated results." In addition, the committee stated that "the researchers have not discovered any new attack vectors that had not already been accounted for in the design of our system as a whole." Moreover, the committee underlined that the researchers did not "provide technical details on the alleged vulnerabilities in our system"[35].

Despite the reports on attacks and other security issues in a number of Internet voting trials and implementations, most systems have evolved over time and greatly improved their security measures. The gradual implementation of the process, allowing for sufficient trials and proper development of a robust security system, together with a well-developed architecture of the procedure and an ongoing adaptation to new realities are fundamental factors for the resilience of any Internet voting system.

In the current new security paradigm, where offline and online worlds are becoming more heavily intertwined, with terrorism no longer confined to the streets but intruding onto the data highways of modern society, it is the entire world of modern information and communication technology that is being challenged. Moreover, and often forgotten, criminals do not only break into electronic circuits, they may also physically attack the infrastructure. For instance, in the immediate aftermath of the Oslo bombing in 2011, technicians had a very hard time to get into the server rooms located in the government buildings in downtown Oslo in order to guarantee minimal server maintenance in the midst of the Norwegian Internet voting trials. However, it is important to underline the relative rarity of attacks (at least the successful and reported ones) to Internet voting platforms and the fact that most

[34] S. Walchok, E. Wustrow, & J. Halderman (2012). 'Attacking the Washington, D.C. Internet Voting System'. In A. Keromytis (Ed.), *Financial Cryptography and Data Security,* Springer, Berlin, 2012.
[35] C. Arthur, 'Estonian e-voting shouldn't be used in European elections, say security experts', *The Guardian*, 2014, May 12. Retrieved from http://www.theguardian.com/technology/2014/may/12/estonian-e-voting-security-warning-european-elections-research

of the reported attacks occurred during trial periods, when the systems were not yet fully developed.

In this respect, security of Internet voting can be additionally increased through the design and implementation of a coordinated but decentralized i-voting system (or systems). A decentralized architecture may indeed lead to more flexibility and lower levels of vulnerability to external malicious threats and cyber-attacks. This recommendation has been repeated systematically in studies about security of e-enabled elections. Trechsel and Gasser[36] mention the virtuous of a decentralized approach regarding the Swiss case. Decentralizing reduces the risk to have a full-scale attack which could jeopardize the entire electoral procedure.

## 3.4. Social challenges

Arguably, the most frequently mentioned caveat regarding Internet voting is linked to the digital divide, which essentially reflects inequalities in access to Internet and in technological literacy. It comes from the acknowledgement that there are social differences regarding who has a personal computer and internet at home (mainly income related), but also who is sufficiently technologically literate to be able to interact with an online voting platform (mainly age and educational differences). Mossberg, Tolbert and Stansbury[37] propose a more comprehensive notion, as ''an access divide, a skills divide, an economic opportunity divide, and a democratic divide''. Gaps in these domains may inhibit specific groups of the population from participating and consequently exclude them from the democratic process. The degree "in which certain demographic groups gain an advantage over others (…) could easily affect descriptive representation in government and would likely affect substantive representation as well"[38], challenging the value of equality subjacent to voting.

Nevertheless, the historical character of inequality as a determinant of electoral participation should not be neglected. Although originally intended to promote equality in relation to the political system by the "one man, one vote" principle, in practical terms, that could only ever been partially achieved. The literature on electoral participation has systematically documented the historical role socio-demographic factors have played throughout the twentieth century as determinants of turnout. Younger (and very old) people have been found to vote less, men have been found to vote more than women, more educated people have tended to vote more, lower income citizens have structurally abstained more, as well as people from rural regions, to name a few examples. But also if we particularly consider the importance of technology, for example with respect to television and its importance for political communication, acquiring of political information, development of political interest, etc., a digital divide regarding access to this technology – deriving, too, from social inequalities– was initially profoundly marked. More than socially relevant, these social cleavages had political ramifications in the sense that the electoral base of parties was distinct (parties targeted specific social groups with their policy platforms), and democratic consequences, because these groups were historically underrepresented. Still, those social divides have faded away and are, nowadays, irrelevant in most Western democracies as determinants of turnout. Similarly, inequalities concerning the digital divide have been decreasing over the past decades, as more individuals have been gaining access to computers and broadband Internet connections have widespread through European households. Eurostat estimated in 2013 that 62% of the EU citizens were using the Internet, on average, "every day or almost every day" and 72% "at least once a week", and two in five individuals had used e-government services[39]. Notwithstanding the persisting imbalances, it is expectable that over the course of the next decades – like with television – computers,

[36] A. H. Trechsel & U. Gasser, op. cit
[37] K. Mossberg, C. Tolbert, & M. Stansbury, *Virtual Inequality: Beyond the Digital Divide,* Georgetown University Press, Washington, D.C, 2003, p.2
[38] R. M. Alvarez & T. E. Hall, op. cit.
[39] H. Seybert & P. Reinecke, op. cit.

Internet access and the minimum technological literacy indispensable to use online voting have become almost fully diffuse over the population of European countries.

Serdült et al.[40] reviewed the current state of research in 22 empirical studies relating Internet voting with socio-economic variables to assess to what extent would its introduction further underrepresent some segments of the electorate. Although they have identified differences regarding age (second youngest age group are the most frequent users), education (higher educated use more) and income (high income individuals use more), these were strongly moderated by the general use and trust in the Internet. The authors have concluded that the impact of socio-demographic variables on the selection of Internet voting as mean of participation dies out with the use of more comprehensive models and "the real cause for the divide between i-voters and traditional voters is their affinity to the internet". They also add that "with time, i-voters will get older and the age gap will disappear". Therefore, since "socio-economic factors such as age, gender, income and education are only relevant to a certain degree when explaining the choice to vote online and are rather strongly moderated by knowledge and use of the internet", there is margin for attenuating the divide with a progressive dissemination of Internet over each countries' population.

Following Trechsel's et al.[41] findings on the Estonian case, language is another crucial factor to consider particularly in multilingual countries. The authors have discovered that language barriers were causing a "systematic exclusion of the Russian-speaking minority from e-voting"[42] because the Internet voting platform was offered exclusively in Estonian language. Interestingly enough, this problem has been resolved with time, as following the Council of Europe's repeated recommendations regarding potential exclusionary effect of the Estonian Internet voting system, if offered only in Estonian language, the government has gradually implemented a Russian version of the system. As a result, language is not anymore among the determinants of Internet voting.

Finally, a social analysis might also want to consider the impact of Internet voting on the symbolic dimension of voting. First of all, this involves the notion of secrecy in an uncontrolled environment. Apart from the security issues commonly associated with Internet voting, phenomena like family voting, intimidation and vote-buying could occur when any form of remote voting – including Internet voting – is offered.

A rather common discourse about Internet voting tends to perceive voters as consumers and establish analogies between Internet voting and a number of day-to-day tasks which can be done online (shopping, paying bills, etc.). Equating the act of voting to other banal activities may convey the pernicious consequence of disproving voting of its meaningful character. Although the formal function of elections might be assured by Internet voting systems, concerns have been raised about the subjective meaning of voting online. For some observers, the procedural routine of on-paper and above on-site voting helps citizens to become aware of their collective act of electing their representatives. Inasmuch as voting online is to be perceived as thoughtless and ordinary, it may be a peril to the democratic process, so this line of argumentation goes. Critics of Internet voting argue that the elimination of the physical act of going to the polls speeds up an otherwise reflective process, allowing for impulsive decisions[43] and, in addition, turn it into "the antithesis of the community-based electoral process that many believe is desirable"[44]. Conversely, supporters of Internet voting claim this is an effective tool to re-enfranchise citizens who would otherwise be excluded from the election and in this sense it reinforces social cohesion and promotes a better democracy. Also, the effectiveness of queuing up in front of voting booths to create a feeling of collective belonging to democratic ideals is rather questionable. Still, the very act

[40] U. Serdült, M. Germann, M. Harris, F. Mendez, & A. Portenier, 'Who are the Internet Voters?' In E. Tambouris & et al. (Eds.), *Electronic Government and Electronic Participation,* IOS Press, Amsterdam, 2015
[41] A. H. Trechsel et al., *Internet voting in Estonia - A comparative analysis of four elections since 2005*. *Report for the Council of Europe,* Council of Europe, 2010
[42] Idem, p.4
[43] H. Buchstein, 'Online democracy, is it viable? Is it desirable? Internet voting and normative democratic theory'. In N. Kersting & H. Baldersheim (Eds.), Electronic Voting and Democracy, Palgrave Macmillan, Basingstoke, 2004
[44] R. M. Alvarez, T. E. Hall, & A. H. Trechsel, op. cit.

of voting should not be diminished by the introduction of Internet voting – and to our knowledge there is no evidence so far showing that such a problem has occurred in major Internet voting implementation.

# 4. THE MISSING ELEMENT: VOTERS?

**KEY FINDINGS**

- Parts of the European electorate still has underdeveloped digital skills and trust in operations over the Internet. There are also clear differences across countries. However, digital competence and trust in operations over the Internet has been consistently increasing and the gap between the digitally literate and illiterate has been strongly narrowing.
- The scarcity of data on public support for Internet voting in Europe calls for the need to develop thorough cross-country studies to measure citizens' opinion about the introduction of e-enabled elections.
- The existing surveys on citizens' attitudes towards Internet voting indicate a strong majority of support for Internet voting.

In the debates over the implementation of Internet voting, the voices of legislators, politicians and various computer experts usually prevail. At the same time, the voices of the voters are often relegated to the background or even not mentioned in the debates. However, a more complete investigation of the issue requires the 'supply and demand' model to be reversed and explored as the 'demand and supply' one. With that, the 'demand' should not be interpreted here in the narrow sense of the word as a 'wish' only, but, taken as a whole, the wish, the ability or competency to externalize the wish, and trust to the method of the wish externalization. Information on all the three components is provided below. In particular, citizens' digital competencies in the EU, trust to operations over the Internet, and citizens attitudes toward Internet voting.

## 4.1. Citizens digital competencies in the EU

The report "Measuring Digital Skills across the EU: EU wide indicators of Digital Competence", issued in May 2014, presented the new methodology used for the measurement of digital skills in the Digital Agenda Scoreboard 2014[45] (European Commission, 2014). The work represents pilot work carried out by DG CONNECT F4 in relation to action 62 of the Digital Agenda to propose "EU-wide indicators of digital competence". "Digital competence involves the confident and critical use of information Society technology (IST) for work, leisure, learning and communication. It is underpinned by basic skills in ICT"[46]. Data used in the indicator take as their source the Eurostat Community Survey on ICT Use in Households and by Individuals. Over many years this survey has developed a broad set of questions and indicators relating to household and individual ICT access, use and skills and covers a representative sample of the EU population between the ages of 16 and 74.

According to the report, results for all individuals show that 23% of the EU population barely had any digital skills (2012), with figures ranging from 6% in Sweden to 50% in Romania. Considering that to function effectively in the digital society one needs at least medium level or "basic" skills, a sobering low level of skills was measured in the EU as a whole, with 47% of the population either being classified as having "low" or "no" digital skills.

[45] European Commission, *Measuring Digital Skills across the EU: EU wide indicators of Digital Competence*, 2014. Retrieved from http://ec.europa.eu/newsroom/dae/document.cfm?doc_id=5406

[46] Please refer to Annex 1 for a thorough definition of Digital Competence and its Framework areas.

In 2012, the percentage of individuals in the EU who used the internet was 73%. As for November 30, 2015, the percentage increased to 79,3% (Internet World Stats). Unfortunately, new data on Digital Competencies / Digital Skill Indicators, based on the 2015 study, is unavailable. It remains sound, however, to assume that digital skill levels have increased since the 2012 report, with generational replacement and the radically accelerated digital transformation of society taking place. Therefore, prospects for an ever more e-savvy electorate in Europe are rather good, in our view. The introduction of Internet voting at European level should not be seen as fundamentally challenged by the current state of affairs regarding Internet For understanding the technical complexities of a common Internet voting system, such as the one offered to Swiss citizens from certain cantons, a rather low level of digital skills is, today, arguably sufficient for casting one's vote.

## 4.2. Trust to operations over the Internet

The results of a survey on the level of trust in the Internet in EU 28 countries in 2014 (27,901 respondents) shows that 36% of respondents aged 15 and older trust the Internet in the EU. The highest level of trust was measured in Czech Republic (56 percent) and the lowest in Germany (27 percent)[47].

Also, trust in the Internet can be viewed as trust in the operations over the Internet - such as making purchases online or using online banking. In this regard, according to the Digital Economy and Society Index (DESI) - a composite index that summarises relevant indicators on Europe's digital performance and tracks the evolution of EU Member States in digital competitiveness – shows that the "use of the Internet" score is on a uphill slope, in the EU as a whole as well as in the individual Member states. EU citizens clearly become ever more engaged in online activities. When it comes to online transactions, EU Internet users are keen on doing their banking activities online (57%) and close to two-thirds of all Internet users reported to have shopped online during 2014, that is, trust the Internet enough to engage in online shopping. These results are of relevance and are clearly promising – in view of the potential introduction of Internet voting at European level.

## 4.3. Citizens attitudes toward Internet voting

So far, we lack recent cross-sectional data on attitudes of citizens towards Internet voting in the EU28. An earlier, pre-enlargement Eurobarometer survey (54.2 in 2001) had a question on this topic, though. Still, several useful research endeavours were carried out in a number of European countries.

*Greece*

Delis et al.[48] have conducted an Internet voting trial in two polling stations in Greece after respondents having cast a vote for the 2014 European Parliamentary Elections. That trial was followed by a survey about attitudes towards Internet voting. Although this raises some problems regarding self-selection of the (non- representative) sample (N = 648), since it only draws the sample from people who actually went to vote, this is minored by the fact that voting is compulsory in Greece. The sample was particularly skewed regarding age and

[47] Statista, *Trust in the internet in Europe 2014, by country*, 2014. Retrieved from http://www.statista.com/statistics/422787/europe-trust-in-the-internet-by-country/

[48] A. Delis, et al., *Pressing the button for European elections: Verifiable e-voting and public attitudes toward internet voting in Greece*, 2014. Retrieved from http://www.e-voting.cc/wp-content/uploads/downloads/2014/10/evote2014_delis_gavatha_kiayias_p129-135.pdf

education: individuals were, on average, older and better educated than the Greek population.

The survey's results demonstrate that 90% of respondents were "somewhat" or "very satisfied" with the electronic voting experience. 47% of the respondents trusted an e-voting device such as the one used, whereas only 2% had a negative opinion towards a possible implementation. 75% of the respondents were "somewhat" or "very positive" towards the prospect of being able to vote in national elections from home with the use of a similar device, while 12% appeared dismissive.

Older individuals and those who do not use the Internet found the device harder to use. Better educated voters, however, found it easier to use. Ease of use was associated with trust in the instrument and the general positive attitude towards the implementation of an Internet voting system. Older cohorts appeared more trustful, which may be related to a lower awareness of possible security threats. Education was not found to be associated with trust.

*Sweden*

Faraon et al.[49] have conducted an online survey after the 2010 national elections with a non-representative sample of the Swedish population (N=5683) drawn from social media platforms. Their results for the Swedish context reveal overall positive attitudes towards Internet voting, although respondents remain cautious concerning security issues (actual percentages of how the respondents answered are not provided).

Regarding the participation factor (that is, 1. Believing in a positive effect on participation; 2.Believing in social and emotional presence created by social media; 3.Believing in a positive effect on own likelihood to participate; 4.Presenting candidates on webpages will have a stimulating effect; 5 Increasing participation for younger citizens; 6.Increasing overall participation), women have more positive attitudes than men. No differences of age were encountered.

Regarding the security factor (that is, 1. Willing to participate in an I-election if security can be guaranteed; 2.Not worrying about security issues in terms of poll manipulation; 3. Rating danger of intrusion as small; 4.Diminishing errors in counting votes by I-election; 5. Down rates threat to democracy because of uneven access to Internet; 6. Not finding traditional voter safer than I-voting; 7. Believing in satisfactory solution of security issues; 8. Believing in effect on the experience of voting; 9. Not believing that reliability of I-election would be in jeopardy), men were significantly more optimistic than women. Participants' confidence in security increased with age and length of formal education had a powerful positive effect on security attitudes.

Sweden is a case where the potential effects of a digital divide may be mitigated given the high prevalence of Internet access in that country: 95% of citizens between 16-74 years old have access to the Internet from their homes.

*Austria*

68% of the respondents reported a strong trust in the Internet voting system with respect to its integrity and secrecy of vote; 12% were strongly concerned[50].

The survey which followed the voting test among Austrians living abroad in 2006 demonstrated a wide positive feedback as to the usability during the registration and voting phase. In particular, 85% of the respondents evaluated the registration as simply practicable, 83% also advanced this view concerning the voting. 68% of the respondents showed

[49] M. Faraon, G. Stenberg, J. Budurushi & M. Kaipainen, *Positive but Skeptical: A Study of Attitudes Towards Internet Voting in Sweden,* Presented at the Conference for e-democracy and open government, 2015.
[50] A. Prosser, K. Schiessl & M. Fleischhacker, 'E-Voting: Usability and acceptance of two-stage voting procedures'. In M. Wimmer, J. Scholl, & A. Grönlund (Eds.), *Electronic Government*, Springer, Heidelberg, 2007

confidence or big confidence in the system and its ability to correctly conduct the election and to protect voter anonymity[51].

*Norway*

Trust in Internet voting was very high (76% in 2011; 81% in 2013) during both trial elections[52]. Women, married couples, and those with higher income and education were more favourable. Older age groups preferred the traditional voting process, whereas the younger generations preferred Internet voting. Also for Norway, a majority of the respondents found it acceptable that others could see how they voted, provided that no criminal activity occurred. They were also open to people helping others cast their vote whenever that person couldn't do it him- or herself (disabilities, etc.).

Despite the momentary failure of introducing Internet voting in Norway beyond the pilots, mainly due to political disagreements, the trials have proven to be a success in ensuring the trust to the new voting channel. In particular, the eVote project has received more than 94% of trust evaluations by voters.

*Switzerland*

A survey as of the 2011 Swiss National Election Study "SELECTS" found that 61% of the 1'549 participants strongly supported Internet voting. Similarly high levels (and even higher levels) of trust could be found in several research endeavours at the cantonal level.

*UK*

YouGov Plc. surveyed online 1'566 adults in the UK in March 2015. The questions asked were related to respondents' attitudes toward a possibility of smartphone/tablet voting in a general election. The figures have been weighted and are representative of the UK adult population (aged 18+). 63% of all respondents believe the introduction of smartphone and tablet voting would increase turnout. 35% voters oppose introducing smartphone/tablet voting, while 41% support it and 18% remain neutral. 51% claimed they would less trust the result of any election that included smartphone and tablet voting due to security and safety reasons.

The biggest fear of 40% of respondents was that smartphone/tablet voting would lead to elections being rigged/fixed, with voters unable to watch the counting process. Voters aged 60+ have the strongest opposition to the introduction of smartphone/tablet voting (46%), but 52% of this age group still believed it would lead to increased turnout.

In addition, in April 2015, the polling company Opinium conducted a survey and found that, if online voting would be introduced in the future, it would be the most popular method of voting in the UK. Out of over 2000 UK adults aged 18+, 45% would choose to vote by Internet in the future.

In turn, the Digital Democracy Commission set up by Commons Speaker John Bercow made recommendations to incorporate e-voting during the next election in 2020.

The few countries where there have been surveys conducted on citizens' attitudes towards the implementation of Internet voting indicate a majority of support for the new voting technology. Overall trust toward Internet voting in the European context is quite high and even increasing over time. Not surprisingly, the main concerns expressed are related to privacy and security issues. Therefore, efforts should concentrate on ensuring the system's

[51] A. Prosser & R. Steininger, *An Electronic Voting Test Among Austrians Abroad; Nr. 02/2006*, Institut für Informationsverbeitung und Informationswirtschaft - Wirtschaftsuniversität Wien, 2006

[52] S. Segaard, D. Christensen, B. Folkestad, & J. Saglie, *Internettvalg: Hva gjør og mener velgerne?,* 2014 Retrieved from http://www.regjeringen.no/upload/KMD/KOMM/rapporter/ ISF_Internettvalg.pdf

security and in effectively communicating about the latter to the wider public. There were also slight differences mainly across age categories regarding the support, which are probably a reflection of the digital divide. These differences are expected to eventually die out in a few decades.

The scarcity of data on public support for Internet voting in Europe calls for the need to develop more cross-country studies to measure citizens' opinion about the introduction of e-enabled elections. Public support has been named as an important factor for the successful implementation of Internet voting as citizens are the main target of this policy and its positive consequences – for example regarding an increase in turnout – are highly contingent on how it is publicly perceived and welcomed. If Internet voting is largely seen as unnecessary, unsafe or easily manipulated, it is likely that people continue to vote using preferably traditional means. Therefore, more studies comprising more countries would be desirable to understand how European citizens assess the implementation of Internet voting.

# 5. RECENT INTERNET VOTING EXPERIENCES IN EUROPE: A SHORT ASSESSMENT OF THE SITUATION

**KEY FINDINGS**

- **Estonia** is a **successful case** of implementation of Internet voting: the number of individuals voting over the Internet has been increasing consistently, voters who try Internet voting remain loyal to this option, and Internet voting is now entirely diffused over the electorate.
- **Switzerland** has been carrying a **gradual** and **decentralised bottom-up** implementation of Internet voting coordinated at the national level. The results have been extremely encouraging and the plans are to further expand the system.
- **Norway** conducted trials between 2011 and 2013 but cancelled the project in 2014 due to security concerns expressed by political actors and absence of increase in turnout levels.

## 5.1. Estonia

Estonia is, arguably, the most prominent case of successful implementation of Internet voting. In the 2015 Estonian parliamentary elections, around 30,5% of participating voters chose to vote online instead of using the conventional[53]. Bearing in mind that in 2007, when the system was made available for the first time in general elections, these were about 5% of the participating voters, the increase in the popularity of Internet voting is noticeable.

Moreover, after three e-enabled general elections, e-voters stopped to be distinguishable from conventional on-paper voters and Internet voting has diffused across the electorate. Since 2011, the chances of online voting are the same for the young and old, educated and less educated, PC-literate and less PC-literate. According to Vassil[54], "at least three elections are required before internet voting starts to diffuse. Thus, new voting technology is inclusive rather than exclusive means of political participation and has the opportunity to bridge societal divisions". Another finding is that once one started voting online, he/she is highly likely to remain voting online in the future. Empirical evidence[55] on the Estonian case has also confirmed that Internet voting significantly lowers the costs of participation and is particularly preferred for people living further away from polling stations. Finally, it was demonstrated that conventional on-paper voting takes about 16-times more than casting an online vote.

Regarding the future of Internet voting, Solvak and Vassil[56], refer to the vision of the "father of Internet voting in Estonia", Tarvi Martens (Chairman of the Estonian Electronic Voting Committee) according to which one "|…] can safely say that internet voting is here to stay". As these authors also mention, however, is that the system of Internet voting in place will evolve, as it always has. For the local elections of 2017, full end-to-end verifiability should be offered to the voters: "homomorphic cryptography, mix-nets and zero-knowledge protocols |…] will serve to make this possible"[57]. Also, Estonia works towards an outsourced solution for the vote collection part of the system. Finally, the new system should be universally usable and therefore offer great scalability beyond public elections and above all beyond Estonia.

[53] M. Solvak, & K. Vassil, op. cit., p.4
[54] K. Vassil, *Selected Behavioral Evidence on Estonian Internet Voting,* University of Tartu, Tartu, 2015. Retrieved from http://www.ut.ee/kristjan.vassil/wp-content/uploads/E-voting-evidence.pdf, p.2
[55] M. Solvak, & K. Vassil, op. cit., p.109
[56] M. Solvak, & K. Vassil, op. cit., p.174
[57] Ibidem

## 5.2. Switzerland

The first trial in Switzerland was introduced in 2003 in the commune of Anières, in the canton of Geneva. The object was a municipal referendum and 44% of the votes were cast online[58]. One year later, the canton of Geneva introduced Internet voting for cantonal and federal elections in selected municipalities. In 2005, the canton of Zurich initiated its first Internet voting trials. In the same year, the canton of Neuchatel implemented Internet voting for federal elections.

In all of these cantons, the process was implemented quite gradually, either by starting in small selected municipalities (Geneva and Zurich), or by introducing a cap on the number of votes which could be cast online (Neuchatel) in order to contain the damages in case of system malfunction. After the success of the tests, the Swiss government focused on the Swiss citizens living abroad as the main target for Internet voting. In 2007, Neuchatel allowed Swiss citizens living abroad to vote over the Internet. The canton of Basel-Stadt did the same in 2009. In 2010, "the federal government approved for the first time the right of citizens of twelve cantons to vote via the Internet voting system of their respective canton in the context of a federal election[59]. In 2015, 14 cantons offered Internet-voting in either cantonal and/or federal elections. In total, more than 200 binding trials were conducted on the federal level, so far. Up to 65% of the voters chose the electronic channel over the conventional ones. Today's systems are enhanced to second generation systems. Nonetheless, a cap of 10% on Internet voting for the federal electorate and 20% for the cantonal electorate still holds.

Now online voting is open to 60% of the Swiss abroad (about 90,000 voters) and to 3% of the overall electorate. Authorities plan to continuously extend Internet voting to all out-of-country voters and gradually expand it to all eligible voters. In 2015, individual verifiability was introduced ("cast-as-intended") that along with the universal verifiability ('recorded as cast' and 'counted as recorded') makes possible the complete verifiability of Internet voting. Starting in 2016, a slow expansion to more residents, in selected cantons, is being put in practice. In addition, The Federal Council and the Federal Chancellery approved e-voting trials, and the cantons will decide, in collaboration with federal authorities, if and when e-voting should be introduced.

Switzerland is a paradigmatic case of the benefits of an incremental, decentralized bottom-up approach coordinated at the national level. So far there is not much evidence of an increase in turnout as a consequence of the introduction of Internet voting. However, it is still rather early to draw robust conclusions in that regard. In addition, noticeably, an enormously high proportion of Swiss voters (in certain urban areas up to 95%) cast their vote by postal mail, a modality which is not offered in many other European contexts and which naturally dampers the impact of Internet voting on turnout.

## 5.3. Norway

Norway conducted Internet voting trials in the 2011 local elections and 2013 parliamentary elections. Online votes could be cast during the advanced voting period, whereas on Election Day voting was restricted to conventional on-paper voting. The trials comprised 10 municipalities in 2011 and 12 in 2013. End-to-end verifiability was implemented only in the 2013 elections. 26,4% of those who participated in the 2011 local elections have done so through Internet voting, a figure that increased to 36,4% in the 2013 parliamentary elections. The vast majority of advance votes were cast over the Internet - indeed, more than 77% of the advance votes were online votes in the trial municipalities. "Nevertheless,

[58] A. H. Trechsel & U. Gasser, op. cit
[59] Idem, p.55

the fact that Internet voting was used by so many voters did not lead to an increase in the overall voter turnout."[60].

The 2011 trial was monitored by International Foundation for Electoral Systems (IFES) and was found to meet the "Council of Europe's recommendations regarding secrecy both when the vote is cast and when the vote is subsequently stored. The sufficiency of these mechanisms has nevertheless been questioned in the Norwegian debate"[61] and the authorities "cancelled the project in 2014, citing security concerns and the government's conclusion that, contrary to expectations, the new system had not improved turnout. Specifically, Norway's Institute of Social Research said that there was "no evidence that the trial led to a rise in the overall number of people voting nor that it mobilized new groups, such as young people, to vote. Even just a "low-effort" review of the system by computer experts from the Norwegian Computing Center and the Norwegian University of Science and Technology found "significant problems" with security, among other things, to the extent that the experts said the software did "not have acceptable quality for use in an e-voting system".

The OSCE/ODIHR Election Assessment Mission Final Report mentions that "experts on electronic voting expressed satisfaction with the mechanisms to verify the integrity of election results and safeguard the secrecy of electronic votes"[62]. The report also recommends additional resources to "audit the security, integrity and secrecy of the system, and to perform complete end-to-end verification"[63], that preparations for the Internet voting procedure are taken earlier in advance, that authorities promote further voter education and encourage third party verification of the process.

Norway implemented a limited Internet voting system for municipal elections in 2011 and 2013 but cancelled the project in 2014, citing security concerns and the government's conclusion that, contrary to expectations, the new system had not improved turnout. Specifically, Norway's Institute of Social Research said that there was "no evidence that the trial led to a rise in the overall number of people voting nor that it mobilized new groups, such as young people, to vote[64]. Even just a "low-effort" review of the system by computer experts from the Norwegian Computing Center and the Norwegian University of Science and Technology found "significant problems" with security, among other things, to the extent that the experts said the software did "not have acceptable quality for use in an e-voting system"[65].

[60] J. Saglie & S. Segaard, 'Internet voting and the secret ballot in Norway : principles and popular understanding', *Journal of Elections, Public Opinion and Parties*, 26(2): 155-169, 2016, p.160
[61] Idem, p.161
[62] OSCE/ODIHR, *Norway Parliamentary Elections – Election Assessment Mission, Final Report*, 2013, p.7
[63] Idem, p.8
[64] D. Lee, *E-voting experiments end in Norway amid security fears,* 2014. Retrieved from http://www.bbc.com/news/technology-28055678
[65] B. Østvold & E. Karlsen, 'Public Review of E-voting Source Code: Lessons Learnt from E-vote 2011'. In *Norsk informatikkonferanse NIK 2012*, Universitetet i Nordland, 2012. Retrieved from https://www.verifiedvoting.org/wp-content/uploads/2014/09/Norway-2012-Public-Review-of-E-voting-Source-Code-Lessons-Learnt-from-E-vote-2011.pdf

# 6. CONCLUSIONS: ATTEMPTING TO ASSESS THE OPPORTUNITY OF INTRODUCING INTERNET VOTING FOR EUROPEAN ELECTIONS

**KEY FINDINGS**

- Internet voting has been implemented successfully and **has gone beyond the trial stage** in multiple contexts.
- **E-voters are growing in numbers and remain loyal** to Internet voting after having been exposed to it.
- Internet voting for the European Parliament elections could build on the Estonian case.
- Opportunity to **modernise European Parliament elections** and bring them closer to citizens.

This report builds on recent publications and analyses on Internet voting, first and foremost from Europe. Overall we can conclude that we are witnessing a spreading of Internet voting, not so much in geographical terms but horizontally and vertically within the Internet voting pioneers, where ever more experience is gathered. We have also witnessed both success and failure, and the multitudes of different solutions, themselves constantly evolving and adapting over time show that it is difficult to extrapolate from one case to the other. One thing is quite clear, however: where Internet voting has been implemented successfully and beyond the trial stage, it has become an integral feature of the electoral process. Voters having had the chance to become regular e-voters usually remain e-voters. They would hardly appreciate having to go back to paper and pencil. This is not an outcome one can expect within one single trial, but the fruit of repeated efforts to offer Internet voting to an ever-growing number of voters.

Today, the European Union is offered a great opportunity for fostering Internet voting technologies in view of modernising European elections. Estonia, one of the "new" EU member states, can clearly serve here as an example. It offered its voters twice already the chance to elect their European Parliamentarians online, in 2009 and 2014, respectively. And Estonia is willing to share its experience, it is working towards greater scalability and has published the code for its system. Of course, the European Union is not equally prepared as Estonia for introducing Internet voting "à l'éstonienne". For once, it lacks a European digital identity card, a tool so central to the Estonian architecture of e-government services. But digital identity cards in the European Union are fostered, not the least by the eIDAS Regulation of 2014[66] that prepares the digital, continent-wide future of e-commerce. This well-established groundwork could possibly be used for making Estonian Internet voting scalable beyond this small Baltic state's border.

In a sense, and despite legal, security and political concerns that will probably always be there, independently from whether one has introduced Internet voting or not, the European Union now has the opportunity to take up these challenges in order to bring European Parliament Elections closer to the citizens. For sure, Internet voting won't be the panacea for European democracy. But it has the potential to facilitate access to the polls and serve as an example for other constituencies concerned with the modernisation of electoral processes.

[66] Regulation (EU) No 910/2014 of the European Parliament and of the Council of 23 July 2014 on electronic identification and trust services for electronic transactions in the internal market and repealing Directive 1999/93/EC.

# 7. RECOMMENDATIONS

**KEY FINDINGS**

- Need for a coherent **enquiry on European citizens' attitudes toward Internet voting** in order to assess the receptivity of such a new procedure among the general public and, most importantly, identify citizens' main concerns in order to address those specific points when designing the system.
- Advise for a **step-by-step approach** to the Internet voting process, with the holding of **trials** and a **gradual implementation** of the system.
- Internet voting cannot be offered as an exclusive voting method.
- **Voter education campaigns**, able to effectively communicate the advantages of the Internet voting procedure, the overall security of the system, accompanied by clear instructions to voters on how to vote online, are essential.
- Choice for a **decentralised** Internet voting structure.
- Recommendation for a **principle-based approach to legal regulation** of Internet voting.

Existing research highlights the importance of citizens' attitudes towards Internet voting for its successful implementation. A review of the few studies focusing on this aspect provides clearly insufficient information about how European citizens perceive the possibility to vote online. The data collected so far concerns a reduced number of countries and is often linked to specific pilots and lacks a comprehensive approach. A coherent enquiry on European citizens' attitudes toward Internet voting is indispensable to assess the receptivity of such a new procedure among the general public and, most importantly, identify citizens' main concerns in order to address those specific points when designing the system.

The experience from previous contexts of e-enabled elections advises a step-by-step approach to the Internet voting process, with the holding of trials and a gradual implementation of the system. This enhances the control over each stage of the process and facilitates the identification of eventual deficiencies. A prudent, incremental implementation and diffusion of Internet voting is fundamental in this regard.

Hence, Internet voting cannot be offered as an exclusive voting method. It remains essential that voters are given the possibility to participate using traditional on-paper ballots. Generalised scepticism towards the new procedure and the need for time in order to adapt to the new system, for example, might undermine participation in the first e-enabled election. In this regard, voter education campaigns, able to effectively communicate the advantages of the Internet voting procedure, the overall security of the system, accompanied by clear instructions to voters on how to vote online, are essential instruments to minimise problems stemming from the digital divide. Repeated, and information-heavy Internet voting trials may eventually lead to the build-up of trust, which, as several studies have shown remains the most crucial factor for the success of new voting technologies among its users.

The recommendation for an incremental approach comes together with the choice for a decentralised Internet voting structure. Particularly at the European Union level, decentralising the procedure is a prolific strategy to involve the different member-states in the process and taking advantage of the pre-existing structures at the national level to make the implementation faster and more efficient. Importantly, it is also positive from a damage control perspective, by protecting the system against full-scale attacks which could jeopardise the whole procedure. The organisation and holding of elections – even European elections – remain national or local affairs. But the European Union can help electoral administrations on the road towards modernisation. For instance, the European Union may help member states with the development of different Internet voting scenarios (e.g. with different technologies, procedures, organizational set-ups) and evaluate them in the light of

relevant voting laws and regulations across the norm hierarchy to identify best-in-class solutions. Also, experts could help sketching out reforms of existing voting laws and regulations as a means to both enable *and* regulate Internet voting, with a particular focus on the interaction between legal and technological requirements to ensure free and secure suffrage. Legal approaches should be undertaken holistically and manage the interplay of law with technology, social norms, and other relevant factors.

Furthermore, we would recommend a principle-based approach to legal regulation of Internet voting to ensure best practice implementation in a rapidly developing and improving technology environment. Of particular interest are comparative lenses, focusing on experiences and good practices in other jurisdictions, including Switzerland and Estonia, which have already updated their legal frameworks to enable and regulate Internet voting.

While a focus has to be on updating existing legal and regulatory frameworks aimed at governing (Internet) voting, a clear link exists with other important policy areas. Digital signatures and identity cards or education come to mind, i.e. areas in which policies may become formulated in such ways as to link to Internet voting.

From the perspective of the European Union, and in view of its next electoral rendez-vous in 2019, European democracy would greatly benefit from the establishment of a permanent dialogue brining together legal experts, technologists and social scientists in order to prepare the future of elections through novel techniques. With Internet voting being one of them.

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# ANNEX

## 1. Digital Competence - definition

'Digital competence' is defined as follows:

> "Digital competence involves the confident and critical use of information Society technology (IST) for work, leisure, learning and communication. It is underpinned by basic skills in ICT: the use of computers to retrieve, access, store, produce, present and exchange information, and to communicate and participate in collaborative networks via the Internet.
>
> Digital competence requires a sound understanding and knowledge of the nature, role and opportunities of IST in everyday contexts: in personal and social life as well as at work. This includes main computer applications such as word processing, spreadsheets, databases, information storage and management, and an understanding of the opportunities and potential risks of the Internet and communication via electronic media (e-mail, network tools) for work, leisure, information sharing and collaborative networking, learning and research. Individuals should also understand how IST can support creativity and innovation, and be aware of issues around the validity and reliability of information available and of the legal and ethical principles involved in the interactive use of IST.
>
> Skills needed include the ability to search, collect and process information and use it in a critical and systematic way, assessing relevance and distinguishing the real from the virtual while recognising the links. Individuals should have skills to use tools to produce, present and understand complex information and the ability to access, search and use internet-based services. Individuals should also be able use IST to support critical thinking, creativity, and innovation.
>
> Use of IST requires a critical and reflective attitude towards available information and a responsible use of the interactive media. An interest in engaging in communities and networks for cultural, social and/or professional purposes also supports this competence." (European Commission, 2014)

## 2. Digital Competence Framework: areas of digital competence

The Digital Competence Framework contains 21 competences, which are structured according to 5 competence areas. The areas of digital competence are the following:

| | |
|---|---|
| Information | identify, locate, retrieve, store, organize and analyze digital information, judging its relevance and purpose. |
| Communication | communicate in digital environments, share resources through online tools, link with others and collaborate through digital tools, interact with and participate in communities and networks, cross-cultural awareness |
| Content-creation | create and edit new content (from word processing to images and video); integrate and re-elaborate previous knowledge and content; produce creative expressions, media outputs and programming; deal with and apply intellectual property rights and licenses. |
| Safety | personal protection, data protection, digital identity protection, security measures, safe and sustainable use. |
| Problem-solving | identify digital needs and resources, make informed decisions as to which are the most appropriate digital tools according to the purpose or need, solve conceptual problems through digital means, creatively use technologies, solve technical problems, update one's own and others' competences. |

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DIRECTORATE-GENERAL FOR INTERNAL POLICIES

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## CITIZENS' RIGHTS AND CONSTITUTIONAL AFFAIRS

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