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To i-vote or not to i-vote: Drivers and Barriers to the Implementation of Internet Voting

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Abstract. This paper investigates the drivers and barriers of internet voting and the implications of a global pandemic for the development of the respective technology. In contrast to the expected uptake in the early 2000s of internet voting, the technology is still rather seldomly used in election systems around the world. The paper at hand explores the different forces that drive or impede internet voting adoption from a political, social, legal, organizational, contextual, economic and technological perspective. In an exploratory approach, 18 expert interviews and extensive complementary desk research were conducted.

The findings identified 15 general drivers and 15 general barriers for the process of internet voting adoption. The evidence suggests that for a large part, the political features, trust and perception are the most pivotal factors to internet voting development.

Keywords: Internet Voting, Drivers and Barriers, Framework of Internet Voting, Technology adoption, e-Democracy

1 Introduction

From Richard Buckminster Fuller [1] in the mid 20th century over Bill Gates [2], who predicted in his book The Road Ahead that "voters will be able to cast their ballots from home or their wallet PCs" to Apple's CEO, Tim Cook that "dream[s] of [voting on phones]" [3], the idea of deploying remote electronic voting has been envisioned by technology leaders since the first half of the last decade. A vision that was increasingly voiced at the beginning of the early 2000s as the interest in the internet and information and communication technologies (ICT) grew bigger.

Bill Gates' quote translated into present understandings probably refers to what is nowadays called internet voting (i-voting), which is a form of remote voting that is conducted in unsupervised environments such as one's home. If one compares his quote with the quote by Tim Cook, it does not sound very different, despite being said around 26 years earlier. In fact, the technology has been around for over two decades and has not diffused as it was expected that it would be. During the early 2000s, a great interest in novel technology existed, and much investment occurred alongside the general developments of ICTs to enhance democratic processes. Experts and politicians back then were convinced that in the course of the following 20 years, every democratic election would be conducted via electronic voting and even using the internet [4]. Although today that is still not the reality that we live in, the quote by Tim Cook seems to reflect a still present vision for contemporary leaders to be able to conduct elections online.

Therefore, the question can be raised why i-voting has not adopted as it had been expected and what are factors that drive internet voting. Moreover, due to the current global COVID-19 pandemic, several elections that were meant to take place were postponed, and discussions about whether to implement novel, sustainable and long-term voting solutions in response to the current events have appeared [5]. Remarkably, the interest in i-voting technology has heightened due to the global developments in response to the COVID-19 pandemic [6] which makes our research more timely and relevant. The understanding of i-voting's diffusion, its driving as well as impeding forces seem to be common questions that have been raised in academia and yet lack a holistic overview and common first understanding, which this paper aims to provide.

This paper solely focusses on i-voting, which is a specific form of electronic voting (e-voting), but for a better understanding of research intersections between these two topics, the following section depicts previous work related to both issues.

Previous works on e-voting have investigated diffusions of e-voting in Europe and drivers and barriers around e-voting [7] on adoption factors of e-voting by young people [8] the evolution of e-voting [9], the global e-voting status [10] and to provide an e-voting framework [11]. On i-voting, previous studies examined the global status quo [12, 13], studied the origins of remote online voting [4], aimed at providing a historical overview on i-voting usage [14, 15] and facilitating conditions for i-voting implementation on the examples of Estonia and Switzerland [16]. Furthermore, i-voting adoption was explicitly investigated for the Estonian case [17], and respective adoption phases were identified for the Estonian case [18]. Last, another work looked at the adoption stages and on what levels internet voting will occur [19]. This respective paper

identified two levels and five adoption stages of internet voting diffusion on which this paper is building on to investigate the respective drivers and barriers that impact the technology acceptance on these levels.

In conclusion, previous research either looked at part drivers and barriers or facilitating conditions in specific contexts. However, no comprehensive study has been conducted so far that investigates general drivers and barriers that are observable along the various adoption and trialed contexts. In line with that identified research gap, this paper poses the following research question: *What is driving internet voting and what barriers exist to further adoption?* In order to answer this question, the work at hand conducted in an exploratory way some 18 expert interviews and extensive complementary desk research. The applied methodology used for this paper, is explained subsequently.

2 Methodology

In order to study what hinders or benefits the implementation of internet voting, we want to identify its drivers and barriers. To do so, we conducted a qualitative empirical study with a nonexperimental design including expert interviews, as promoted by Brown & Hale [20]. This research was conducted using an inductive epistemological approach to acquire knowledge. The inductive process, as opposed to the deductive method, is a "bottom-up [technique in which] evidence is collected first, [from the observation of the world] and knowledge and theories built from this" [21]. In order to guide the data analysis, a conceptual model was created *ad hoc*[1], integrating propositions included in five innovation diffusion theories. This model (see Figure 1) explains how different dimensions are embedded into one context that shapes the process of diffusion of internet voting, in an evolutionary process that is impacted by perceptions, adopter categories and discourses. Furthermore, it establishes the differentiation of internet voting adoption on two levels: political and individual. The model presents five dimensions, various stakeholders and factors that impact the technology acceptance process within societies.

In order to make this paper better readable, we will briefly introduce some necessary stakeholders. First, the *relevant social groups* [23] which have a need or specific interest in the new innovation which creates a demand within society for the respective technology. Second, *change agents* or *opinion leaders* [24] shape public debate around an innovation due to their privileged position in society. Third, *individual drivers* are the citizens themselves who would be accepting technology based on the expected utility against the expected effort [25]. The following empirical research will explore the drivers and barriers and their allocation on the respective level of adoption

[1] For a better understanding, see: 22. Licht, N.: Insights into Internet Voting: Adoption Stages, Drivers & Barriers, and the Possible Impact of COVID-19. Ragnar Nurkse Department of Innovation and Governance. Tallinn University of Technology (2021)

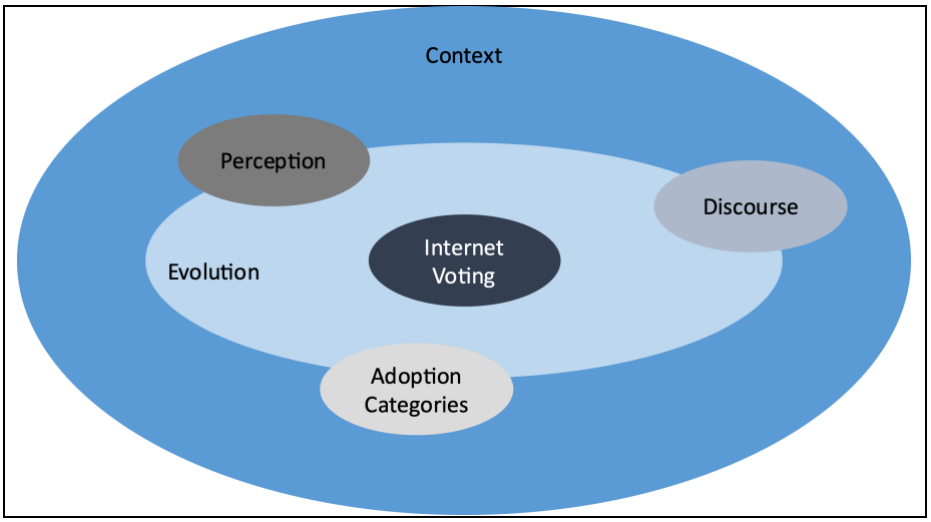

Fig. 1. Framework of Internet Voting

The data collection of this research was conducted via semi-structured expert interviews and complemented by desk research, allowing cross checking experts opinions with other sources. The study followed the framework provided by Krimmer's mirabilis [9] that aids to identify the respective stakeholders involved in the implementation process of e-voting technology. In the context of this research, it was limited to three stakeholders: i) Media/observer, ii) election management and iii) inventors or vendors of voting technology. More precisely, it was focused on practitioners/EMBs/policymakers, scholars and election observers, as well as vendors or inventors of i-voting technology. A total of 18 interviews were conducted, transcribed, confirmed and analyzed in NVivo, via a deductive codification approach proposed by Mayring [26]. Data triangulation is granted through confirming cross-checking answers against either statement of other interviewees or findings from the literature [27][2].

This research has natural limitations with regard to its research design. Primarily, the finding of appropriate experts can limit the findings of the study to the extent that either not the most applicable experts might have been identified or that specific experts did not confirm to participate in the research [28]. In particular, it was more challenging to achieve an even distribution among gender and geographics. Also, during the interview process, issues may arise, mainly due to the lack of testing the human language, which may cause ambiguity and hence distort the originally intended meaning of words by the expert. Furthermore, qualitative research as such, as to their lack of generalizability as it would be the case in quantitative research [29].

[2] The empirical findings will be cited as in-text citations with the interview number in brackets, in the following format: e.g., single citation (1), multiple citations (1;2; 3…).

3 Analysis & Discussion of Drivers and Barriers

Given the dual nature of the process of adoption of technology we divide the information obtained from the expert interviews as well as the desk research in two main framing contexts, on the one hand, the context referring to the Political and Socioeconomic situation and, on the other hand, the Technological one.

3.1 Political and Socio-Economic Context Dimension

In line with the theory, the context is very influential in the establishment of election systems [30]. The findings further resemble the supporting framework and can be divided into social, economic, cultural/historical, political, organizational, legal and procedural elements.

Civil Society.

The different processes of construction of a society favor or disfavor the discussion, critique, and proposition of i-voting technology. A more diverse society consisting of academia, civil society organizations (CSO) and experts, enable a more varied discourse about i-voting and can be either driving or impeding diffusion. These groups are drivers if they, for example, promote the inclusion of excluded voter groups through i-voting or might be barriers if they voice security or transparency concerns. Furthermore, regions with a high number of IT-related content creation and the communication thereof, due to strong CSOs and expert groups, are somewhat reticent to adopting new voting technologies as they have stronger groups driving the discourse around the risks (5;8;10;13&14). However, the presence of solid lobby groups within society, fighting for the rights of visually impaired persons and expatriate voters, have been, on the other hand, identified as strong drivers for internet voting adoption on the political level (7;9;10;11&15).

Vendors.

Also, the lack of expert communities and hence a lack of expertise within society tends to make these contexts more susceptible to be targeted by vendors. High-level lobbyism by vendors is very effective when no counterparties contribute to expertise to the debate (2;8). Technology in elections is considered because of the commercial implications and strong lobbying efforts by vendors that persuade governments to adopt new technologies in their elections (1;2). One of the interviewees (1) specifically mentioned the push of the commercial drive and its implications for voting technology adoption. Moreover, contexts with less regulated procurement methods, and the lack of civil opposition that is run by non-governmental actors, who are knowledgeable in that field, tend to faster purchase new voting technologies (NVTs) and in less sustainable way (1;2). Academia and expert groups have been identified as vital stakeholders in the adoption discussion due to their ability to aid in overcoming suspicions or doubts through investigating challenges, proposing solutions and creating prototypes (5;14).

Economic Situation.

Internet voting systems (IVS) and the respective infrastructure that is necessary to promote i-voting can be very costly in short-term consideration, not only in terms of purchasing but also maintenance of an IVS (4;6;16). From a long-term perspective, the associated costs per vote via IVS are remarkably lower than conventional votes and some cases have considered internet voting for the reason of cost reduction (1;4;11) [31, 32]. However, most cases that have introduced i-voting still provide traditional paper voting, i.e., postal voting, as an alternative option to prevent vote coercion, which in fact adds additional costs (2;6).

Culture and History.

Our findings suggest the existence of differences in the interpretation of vote secrecy and universal suffrage depending on the cultural context, which influences the perception of IVS (6). In more detail we observed that a relatively relaxed understanding of secrecy and a strong approach towards universal access might lead to enhanced i-voting efforts. On the contrary, where a particular emphasis on secrecy is present, further i-voting diffusion might be rejected if not enough proof is given via universal verifiability of how a vote is cast, counted and kept secret. Last, an increased emphasis on universal suffrage, and therefore, a strong focus on the inclusion of diaspora voters or visually impaired people might lead to higher IVS uptake (6;15).

Elections are, in some contexts, seen as a community-based exercise in which the electorate follows their duty to go and vote. That exercise might be perceived as an act of physically convening and voicing one's opinion and would culturally not accept to replace that with technology (5). This case does not describe the opposition of technology per se but the predominant proposition of tradition (3;6). Regarding historical influences, our interviews conclude that post-crisis situations or the newly gained independence of regions impact the creation of new voting systems (1). Often, the act of removing old election systems is an act of trust-building and demonstration of recent ruling in which NVTs are perceived as neutral third party that politicians and administrations have no influence over (1;3;5).

Political Context.

. In nearly all interviews, the political will was identified as both a powerful driver as well as a strong barrier. First, governments use i-voting technology as political agenda to demonstrate modernity and progress in their political activity (17). Some contexts have attributed electoral affairs to a ministry and restructuring the state alongside the electoral system is used for political campaigning purposes (2;18). In essence, political actors aim to appear progressive and modern and wish to use tools like IVS to prove also tech-savviness (18). Significant technological developments can be traced back to politically motivated events and decisions. If technology is perceived to be beneficial for the incumbent party, it is promoted; if not, the same party may become the greatest opponent to NVT development (1;2;3;5;10;15). This observation, also known as the "middleman paradox", refers to the phenomenon that incumbents

resist the move towards e-democracy because they perceive that the altered election system might lead to a decrease of their own political power and control [33]. In line with further evidence, change of government was named to be another influential factor. Two scenarios were identified which have been concrete barriers to IVS diffusions: 1) the election of a new governing party, also ascribable to the middleman paradox (6;14); and 2) a civil conflict in which the transformation of the election system is put on halt (2). Regarding the first scenario: If certain political actors identify that their electorate is opposing the idea of i-voting and that their competitor might benefit from online voting more than they expect to do, evidence shows that this actor tends to discontinue i-voting for purely political reasons [34] (6;11;14). Furthermore, the findings show that i-voting is a highly sensitive subject with attached political risks, associated costs and resources needed; therefore, unless a concrete need requires it, governments tend to refrain from touching that subject (4;6;11;14;15).

The second dimension refers to accessibility and universal suffrage, which have been identified to be among the strongest general drivers for i-voting adoption. Accessibility refers to the idea that "people with disabilities should be able to use all public spaces and services in the same way as other people" [35]. Online voting can enfranchise disabled people as they can more easily register and authenticate themselves and cast their vote from their home (3;7;9;10;15). The provision of universal suffrage identified by the OSCE [36] entails, further, the idea to integrate the entire electorate into the elections. Universal suffrage can be interpreted in different ways, and countries, as well as semi-autonomous regions, have been considering for a significant part to introduce i-voting because of their aspiration to include overseas or territorially challenged voters into their elections more efficiently. Nearly all conducted interviews mentioned the aspect of voting provision for the diaspora, overseas diplomats, consular staff, general populations in extreme territorial conditions or overseas soldiers. Essentially, the intrinsic motivation is political and only promoted if the incumbent expects to gain from including these groups of voters, as sometimes the diaspora consists of political opponents and hence its exclusion from electoral matters is deliberate (5;6;8;9;10;18). Another impact of diaspora voters concerns their foreign impact through campaign donations and exercising of their often-strong socioeconomic status and power on domestic political debate (2).

. Organizational Context

Another element to mention is, that as populations increase and administrative capacities need to be restructured to enable higher procedural efficiency, new technologies allow better election management and further ease electoral processes, especially regarding cumbersome remote voting processes such as postal voting (4;5;8;15;16). And yet, from the study, it is clear that voter coercion and vote-buying in remote and uncontrolled election environments still remain to endanger the integrity of elections, and for that, specific contexts that initially have seen technology as a practical solution refrain from particularly adopting i-voting (4). Also, the context's set-up, procedural traditions and hurdles as well as the degree of digital governance and

the understanding of digital services play a substantial role in driving i-voting adoption due to the spill-over effect that tends to occur in digital ecosystems (2;7;9;14;17).

Legal Context.

The obtained results present evidence that legal frameworks need to be established for an effective i-voting introduction (14;16). Passing appropriate legislation, however, tends to be rather difficult because the law is rigid in nature, and ICT is relatively flexible and needs to be evaluated regularly. Law, once passed, will remain as a reference text for future considerations and cannot simply be changed on demand (14). Specific contexts experience the already written law to be a barrier, and lawmakers would need to pursue passing actively or amending the law, which allows for IVS considerations.

Furthermore, empirical data shows that law is subject to interpretation and that certain regions may therefore understand the legal text differently and hence court interpretations can be essential in the development of IVS (6;7;8). Cases were identified in which important court decisions prevented further NVT adoption and influenced third parties not to adopt (6;8), or judgements existed that paved the way for i-voting to be adopted (15). In the interviews, it was further identified that there is a lack of a general legal and technical framework/design that describes and defines the appropriated provisions of i-voting systems. This lack becomes a barrier because the standard according to which a potentially suitable system would be compared against does not exist, and hence the debate is less structured (9;10;11). The other scenario was described that a legal framework exists, but it is impossible to comply with the requirements, and it makes it merely impossible to proceed with i-voting development (9).

3.2 Technological Context Dimension

The following issue concerning technology and security features mainly concern the adoption process on the pollical level but is influenced by the narratives and discourses on the individual level. Although, during the interviews, it was mentioned that various technology designs exist, we generically refer to ‘the technology’ as such in order to enable a more holistic discussion. Besides the existing technological capabilities to host and conduct elections using i-voting, a threshold for many countries in terms of technology and security is the concrete definition of what technology should be used for the elections in form of a concrete framework (10;14). Furthermore, certain contexts lack respective experts that know how the systems work and that are able to provide the right guidance for it to be successfully implemented (11;13). Hence, a legal framework could also become a barrier, not just a facilitator for sustainable implementation. Legal frameworks can be worded in various ways, promoting or demoting the usage of remote online voting components (9).

Furthermore, technology is considered so complex that most citizens tend not to understand how the vote is being cast, counted, kept secret and how they can verify that their vote was counted as intended (3;16). Therefore, it is technically possible but often not viable to exchange a functioning system that is operating with paper (e.g. postal voting) with a new system that needs to provide transparency, secrecy and integrity proof to all stakeholders. Hence, the complex nature, in cases, is seen to be a barrier (1). It is, moreover, important to differentiate hereby between full-scale adoption and partial adoption. In contexts of partial adoption, technical failures and security breaches seem less concerning than if they were to occur in full-scale adoption contexts. Therefore, imposing the task of expanding with i-voting diffusion is a more complex endeavor than offering it for a share of the eligible electorate (2;15).

One of the biggest challenges from the technology side is to provide either individual or universal verifiability (1). The technical abilities exist to provide these features in a reliable way, but need to be acknowledged by the decision-making party in order to be fully useful (10). Although the demand for such verifiability feature to be present in the election system has increased, barely any state legislator has acknowledged and integrated such features into their requirements which can be both a barrier as well as a driver (14). On the one hand, it facilitates eased implementation efforts as they need to meet fewer requirements. On the other hand, the system is also more vulnerable to criticism of transparency and integrity.

Furthermore, internet voting does require not only the technology but also the infrastructure that would facilitate the execution of the election. Such infrastructure would be broadband networks with high penetration rates, especially in remote areas. If no internet access exists in remote areas, there is no utility gain from adopting IVS for the purpose of including remote areas better into elections (5;16;18). The mentioned issue is subject to the geographical context and is related to the digital divide, which is a term used to describe the gap between contexts that benefit from digital technology and those who do not [37]. The empirical findings suggest that the digital divide, which had been more so visible in the early 2000s, was a barrier to many non-Western contexts (4;16) [38-40].

Hence, these findings suggest that while none sufficient ICT infrastructure seemed to have been a barrier for IVS in non-Western contexts, the increase in broadband penetration with the beginning of the second decade drove IVS development to see the first advent of IVS cases in non-Western contexts [38]. Still, the digital divide remains to exist and further is a barrier to IVS development in certain regions (16;18) [41]. The following section analyzes and discusses the perception and discourse dimension.

3.3 Perception and Discourse Dimension

One of the major findings from the interviews in terms of perception is regarding the issue of trust. Although trust is hard to measure and still subject to ongoing academic investigations, certain parameters could have been identified. The public perception is

mostly referring to the drivers and barriers that impact the diffusion that occurs on the individual level after the political decision has been made to introduce IVS in society.

The findings support the assumption that election systems are as much trustworthy as the people who erected and proposed them. Hence, if people mistrust the government and or EMBs who implement IVS, they tend to mistrust the technology (5). Furthermore, regardless of the previous trust given to one election system, it is not granted that this trust is simply transferable to any novel election system. On the contrary, it seems that strong trust in EMBs in primarily Western democracies might be one of the bigger barriers to i-voting adoption as the primary assumption is to question whether new technology is necessary and simultaneously to endanger a well working system (1;10;14). This may be further supported by the concept of path dependency, which states that individuals would decide to trust and use a system based on previous experiences, decisions and preferences that they made [42, 43]. That phenomenon exists along with all fields of social spheres and might certainly affect the choice of usage of election systems.

Internet voting technology requires a great amount of trust from the electorate since its technological setup is relatively complex, and very few experts do understand the system entirely (1). Whether one may trust in one particular aspect or not is rather incoherent with objective measurements. Regardless of objectively measured and relatable evidence that would suggest that appropriate i-voting technology exists, many cases experience one of the biggest barriers to be the lack of trust (1;3;5;11;14). Additionally, objectivity and trust tend to be fragmented by public discourse and the strong presence of social media that influences public opinion on electoral matters [44]. Moreover, specific expert groups and CSOs have made it their duty to detect and inform about vulnerabilities in i-voting systems particularly, since the 2016's US presidential election, increased interest in cybersecurity around elections (6;7;9;18). Although public discourse has been identified to be a barrier in many instances, there are also cases in which pressure by CSOs and media on politicians have paved the way for the introduction of IVS (15).

Although certain risks had been already present in the early 2000s and cyber hacking and lobbyism against the introduction of i-voting existed since the first hour (10), it was, however, on a much smaller scale. In comparison to nowadays, there was less awareness of the entirety of cyber-risks and also less internet usage penetration in general (6) which can nowadays be seen as a barrier to further diffusion. The perception of technology its potentials and risks has shifted. Common cyber threats and dangers have been put more in focus around the discussion for i-voting introduction than it was the case in the early 2000s. That is mostly due to the fact that the technology was relatively novel and less experimented with than it is nowadays. Hence, more threat and risk awareness exist as common knowledge in the electorate, and hence success stories back then might not be as successful today (6;7).

Since i-voting technology is to a degree somewhat intangible for the large share of people, i-voting demonstrations are used to build trust in the system (1;10;14). Including rhetoric and competence demonstration seem to be useful in convincing the electorate about the system, as suggested by the findings. These demonstrations can be of bureaucratic nature, in which the focus is rather on the institutions and has been proven to be successful in contexts in which a history of malfunctioning of institutions exists. In a context in which previously technical failures in election systems had occurred, trust-building via technology demonstrations have proven to be successful (14). Perception, then, may be impacted by security breaches and technical failures. The identified cases in which that occurred show different results for the degree of usage (6;7;14). Hereby, a necessary differentiation has to be made between the roles that academia or CSOs play and the media. These stewards of discourse certainly have identified to be impacting the diffusion process and certainly media on the individual diffusion level. However, more data is needed to look into the issue impact of trust in election systems as a result of technical failures.

From the empirical findings, we identified the drivers for the political decision level, to be universal access and accessibility for disabled voters, the pursuit of a contactless democracy, they wish to appear modern, the vendor's push, the process improvements, the perception of technology to be a neutral third party, the perception of increased administrative integrity, cost reductions, strong lobby groups, expected increase in voter turnouts and the presence of high socioeconomic power and well-established technical infrastructure. On the individual adoption level, we presented evidence that drivers exist such as convenience voting, spill-over effects within a digital society and the socioeconomic status of voters. Following barriers were identified for the political level adoption process: the middleman paradox, political crisis, change of government, security concerns, theoretical technical vulnerabilities, strong opposition from CSOs and academia, lack of a framework, lack of technological infrastructure, lack of verifiability, procedural barriers and the change of legal requirements. Barriers to adoption on the individual level have been identified as path dependency, cultural traditions, mistrust in technology and mistrust in EMBs and governments.

Table 1. Overview of the Drivers of Internet Voting

Drivers
Political level
Universal access (Expatriate & oversea staff voting, voting in territorially challenging locations)
Accessibility
Political will to appear modern and innovative
Contactless democracy
Vendor's commercial drive
Increase turnout/prevent further decline
Strong lobby groups

Perception of technology as neutral third party
Cost reductions
Process improvements
Integrity improvements in administrative operations
Socioeconomic status and high technological infrastructure (geographics)
Individual level
Convenience voting
Spill-over effect within already digitised societies and their ecosystem
Socioeconomic status of the voter

Table 2. Overview on the Barriers of Internet Voting

Barriers
Political level
Middleman Paradox
Political crisis
Change of government (related to middleman paradox)
Security concerns
Theoretical technical vulnerabilities
Strong opposition from academia & CSOs
Lack of a framework
Lack of technological infrastructure/Digital divide
Lack of verifiability
Procedural barriers
Change of legal requirements
Individual level
Path dependency
Cultural traditions
Mistrust in technology
Mistrust in government and EMBs

4 Conclusion

In order to answer the question on what drivers and barriers exist that prevent further internet voting diffusion, subsequently, the discussion occurs first on the political level and then on the individual level.

The driving or lobbying stakeholders on the political decision level, are the diaspora, territorially challenged voters or disabled voters which resemble the described relevant social groups. Further the groups lobbying for these relevant social groups on the

political level and hence driving stakeholders as for example lobby groups, academia, CSOs or vendors have a resemblance to the change agents and opinion leaders identified in the conceptual model. Further findings suggest that the political will is a major driver for i-voting adoption on the political level as to prevent decreasing voter turnouts or the urgency to provide an appropriate election system for the context of an evolving contactless democracy or to appear modern through the introduction of NVTs. Last, the degree of the socioeconomic status, influences whether the political level even considers the move towards NVTs to be feasible or not.

On the individual adoption level, although, the aspect of convenience voting is still under further academic investigation, the empirical findings suggest that the proposed theory of relative utility in regard to effort can be confirmed for the individual level. Furthermore, the findings have also identified that, although an early interest might exist for i-voting, individuals tend to not maintain that interest if they experience no further usage of the infrastructure than for merely voting online from time to time. In the case of Estonia, this steady interest was achieved through the wider usage avenues of the e-ID for bank transactions for example [45]. In contrast, the Austrian case failed to mobilize enough supporters for its online voting systems because it had no further utility to its voters than to vote [4]. Ergo, a wider-context deployment of ICT technology and the practicality of a digital ecosystem might create a spill-over effect and hence drive i-voting technology for the technology acceptance on the individual level.

From the finding, a central part that impedes further global i-voting adoption has been the middleman paradox. This is a central barrier for many regions as the first adoption decision is made on the political level and later transferred to the individual level. However, the fear of losing one's own power that could only be bypassed if an urgent need for the election reform would appear, impedes further i-voting in many contexts around the world. Further contextual barriers were identified to be security concerns, lack of verifiability and theoretical vulnerabilities. Moreover, mistrust and in combination with public discourse are opposing forces to the development of NVTs as CSOs, academia and expert groups in many cases actively oppose the idea of i-voting implementation due to security and verifiability concerns. Their ability to provide expertise, facilitate communication, to have access to prototypes and further resources such as data and expert knowledge makes them to effective change agents and opinion leaders that frequently lobby against IVS diffusion.

A particular barriers to adoption on the individual level has identified to be path dependency [43, 46]. It being a purely social issue, cultural norms and values amplify the problem of path dependency and confirm the cultural explanation for why technology is adopted. The social construction of society and perception of technology are decisive in explaining adoption and would be confirmed by the issue of path-dependency. Mistrust in technology is strongly depending on perception and consists of the fear that the technology might not be secure, which mostly is related to the fact that the technology is too complex for the average person to understand fully.

Furthermore, the mistrust might also exist towards the decision-makers generally, and therefore the technology might not be accepted.

In conclusion, the research question can be answered through the depicted evidence showing that in total, 15 drivers, 12 on the political and three on the individual level and 15 barriers, with 11 on the political and four on the individual level, have been identified. Strong driving and impeding forces alike were found on the political level to be the absence or presence of political will, necessity and the so-called middleman paradox. Even if the list of drivers and barriers is balanced, the reality shows that the implication of them is not following the same pattern, since the reduced number of adopters of i-voting brings to the conclusion that barriers play a more important role in the process of adoption than drivers. Further detailed case studies in selected countries could shed new light on how these drivers and barriers interact in particular administrative and political contexts and bring to the final decision of implementing or not i-voting. Additional research would be necessary in the field of trust in elections and specifically in election technology as well as the respective roles attributed to building or harming trust through the two discourse drivers that are academia or CSOs and on the other side the media. From the interviews it became apparent that these groups another study is merited but in which their roles especially in the individual diffusion process is further investigated. Possible questions to consider could be how can trust be measured and how can trust-building of new voting technologies be formed and what roles do media and academia play in that process? Last, in order to understand how various contexts, deal with electoral crises and why certain regions stopped their internet voting, while others remain to deploy IVS in their elections, a follow-up study on Estonia's foreign cyber interference, France's discontinuation in 2017 and Norway's case of their technical vulnerabilities may be appropriate. In this proposed study, it would be sensible to look at the positioning of academia and CSOs and the reasons why that may be the case and under what circumstances that might change and impact the adoption and diffusion of internet voting. In summary, internet voting has been around for more than two decades and identified to be a logical tool for democracy and yet lacks large-scale adoption. In this paper we analyzed and presented general drivers and barriers that impact the adoption and diffusion process and illustrated further research areas that merit further investigation. Internet voting, being a process in a political process is also highly impacted by political factors itself and therefore significant qualitative differences between the respective drivers and barriers for the respective contexts might exist.

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