Positive but Skeptical

A Study of Attitudes Towards Internet Voting in Sweden

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Abstract: *This study explored the attitudes of a broad sample of politically interested Swedish voters towards Internet voting. A total of 5683 participants completed a web-based survey concerning participation and security aspects of Internet voting. Attitudes towards Internet voting were positive on the whole and the acceptance of participation in democratic elections using Internet voting was spearheaded by: women, groups with relatively short education, the unemployed and the self-employed. Unlike previous studies, it was found that age was not a significant factor in determining the attitudes towards participation in elections by means of Internet voting. Concerning the security challenges of Internet voting, men were more optimistic than women and participants' confidence in security increased with age and education length.*

Keywords: Internet voting, electronic participation, security, democracy, digital engagement

Governments continue to invest resources in developing ways to increase voter turnout in elections. For numerous years, Internet voting has been considered by many as a way to remedy this challenge. Internet voting is "the casting of a secure and secret electronic ballot that will be transmitted to election officials via the web" (Smith, 2008) and is a derivate within the research area of electronic voting (e-voting). The area of e-voting encompasses a number of voting technologies, which can broadly be divided into two categories (Dill & Castro, 2008; Sanford & Rose, 2007):

- Electronic voting at polling stations using Direct-Recording Electronic (DRE) voting machines or similar equipment. The procedure is physically supervised by representatives of governmental or independent electoral authorities.
- Remote electronic voting via the Internet that is carried out within the voter's sole influence. The procedure is not physically supervised by any governmental representatives or restricted to a specific location.

This study will focus on the latter, i.e. remote electronic voting using the Internet. After the adoption of Internet voting in countries such as Estonia (Alvarez, Hall, & Trechsel, 2009), Switzerland (Driza-Maurer, 2013), some local elections in Austria (Prosser, Kofler, & Krimmer, 2003), and Norway (Segaard, Christensen, Folkestad, & Saglie, 2014), a growing interest towards it has arisen in the rest of the world, among others in Sweden, which is the particular focus of this study.

In Sweden, a total of 7 million people, or 91 per cent, in the ages 16 to 85 years have access to a computer and an Internet connection in their home. In the ages 16 to 74 years the access to the Internet is 95 per cent (Statistics Sweden, 2014). With the growing demand of online services and the fact that the general election in Sweden remains a manual and costly process (Bränström, 2010), it might become a necessity to introduce Internet voting as a compliment to traditional voting in order to maintain and possibly increase voter turnout in the future. In a recent Swedish Government official report (SOU 2013:24) it was concluded it is a value in itself to make it easier and less costly for voters to exercise their democratic rights by allowing electronic voting over the Internet as a complement to postal voting and voting places. In addition, it was argued that such arrangements could provide voters with disabilities and expatriates the opportunity to be part of an election on equal grounds. Assuming that the high security requirements on the electoral process can be fulfilled (e.g., voter identification and authentication, reliability and availability of the system), other benefits of Internet voting include safer tabulation of votes and quicker reporting of the election results. The report concludes that trials should be conducted in the 2018 General Elections to evaluate the process and outcomes of Internet voting.

However, the Swedish Government official report (SOU 2013:24) does not rely on independent research within a Swedish context, and currently there is no other large scale study that we are aware of that has been conducted in the Swedish context to examine voters' attitudes of Internet voting. Before introducing Internet voting to the public it is essential to explore voters' attitudes in order to unveil potential challenges. In order to fill this gap, gain a better understanding of the inquiry, and support decision-making with regards to the potential introduction of Internet voting in Sweden in 2018, we conducted an exploratory quantitative study with focus on voter participation and security challenges of Internet voting. The questions of interest that the paper addresses are: (1) how disposed are Swedish speaking voters towards Internet voting? (2) How do factors such as age, gender, education, employment, and political background influence participation through Internet voting? (3) What role does security play when engaging with Internet voting?

The section that follows looks at case studies focusing on participation and security aspects of Internet voting. The third sections describes the methodology employed and the fourth the results. Finally, the fifth section provides a discussion of the findings, their implications in practice, limitations of the current study and finally suggestions for future work.

1. Literature review

Internet voting has been a topic of interest since the early 1980s when Chaum (1981) proposed the use of mix nets to ensure secrecy of the vote. Today the interest in Internet voting continues to grow constantly, with its increasing adoption in legally binding elections ranging from university (Adida, De Marneffe, Pereira, & Quisquater, 2009) to parliamentary elections (Alvarez et al., 2009). A number of countries have used Internet voting, for instance Austria, Estonia, Norway and

Switzerland (U.S. Election Assistance Commission, 2011). A large number of Internet voting schemes have also been proposed in the research literature, for instance Civitias (Clarkson, Chong, & Myers, 2008), EVIV (Joaquim, Ferreira, & Ribeiro, 2013), Helios (Adida et al., 2009), Pretty Good Democracy (Ryan & Teague, 2009), VeryVote (Joaquim, Ribeiro, & Ferreira, 2009), and Pretty Understandable Democracy (Budurushi, Neumann, Olembo, & Volkamer, 2013).

The principal rationale of introducing and adopting Internet voting is increasing the number of participants, especially among younger citizens (Bélanger & Carter, 2010; Segaard et al., 2014; Ström, SOU 2000:125) and those living abroad (Loqmane, 2011). Other motivations include enhancing the accessibility for voters, reducing proxy vote applications, providing a faster and more accurate election result, and reducing costs. While the use of Internet voting has been praised as a means to deal with the dwindling participation numbers in elections, other case studies have not only proven the opposite (KITV., 2009; U.K. Electoral Commission, 2007) but it has been suggested that remote voting via the Internet could lead to negative effects on participation due to the loss of ritual and social pressure to vote (Funk, 2008).

Despite the growing interest and advantages, Internet voting introduces a number of challenges with respect to security: (1) secrecy and integrity (confidentiality, voter anonymity, and integrity of the vote), i.e. votes should remain secret with respect to any third party involved in the process, votes should not be able to be modified, forged, or deleted without detection; (2) reliability and availability of the system, i.e. election systems should work robustly, without loss of any votes, even in the face of numerous failures, including failures of voting machines and total loss of Internet communications and; (3) voter identification and authentication, i.e. it should be possible to uniquely identify and authenticate voters, such that each voter can cast only one vote, however without linking a voters' identity to their vote (U.S. National Institute for Standards and Technology, 2011). In spite of these security challenges, a number of countries have used Internet voting in legally binding elections, such as Austria, Estonia, Norway and Switzerland. In the following we will provide descriptions of case studies related to the aforementioned countries. These particular countries were selected on the basis that they have longstanding discussions about e-democracy and share common characteristics with Sweden in terms of a political culture that supports and promotes Internet voting, a developed technological infrastructure, high Internet penetration rates and already proven advancements in the area of Internet voting.

In the case of Austria, Internet voting has been used only once for legally binding elections, namely during the 2009 Federation of Students' Union elections in Austrian universities. The Internet voting system used in this election has been tested in prior non-binding elections in 2003, 2004 and 2006. Currently, the Austrian constitutional prohibits the use of Internet voting for parliamentary elections. In 2003, Internet voting was provided in parallel to the paper-based federation of student elections at the WU Vienna. In this election, 978 students were eligible to participate by casting an additional electronic vote to the paper, and 36 per cent did so. In comparison to the paper-based election where only 26 per cent of all eligible voters participated, voter turnout with Internet voting was 40 per cent higher (Prosser et al., 2003). In 2006, the goal of the test election was to address the Austrians living abroad and evaluate the usability of the Internet voting system. Among the 293 citizens that registered only 148 (50.5 per cent) of them actually cast a vote by means of the Internet (Prosser, Schiessl, & Fleischhacker, 2007). Finally, in the elections of 2009, 2161 voters cast their vote over the Internet. This was approximately 1 per

cent of the 230 479 students that were eligible to vote among 21 Austrian universities (Krimmer, Ehringfeld, & Traxl, 2010).

Regarding voters' attitudes in Austria with respect to the security of Internet voting, Prosser et al. (2007) indicated that 90 per cent of 114 participants who submitted a complete questionnaire after casting their vote were willing to accept a two-stage voting procedure, namely voter registration preceding vote casting, if this was necessary to protect vote secrecy, i.e. voters' anonymity. Finally, while 68 per cent of the participants reported a strong trust for the Internet voting system with respect to the integrity and secrecy of the vote, 12 per cent were strongly concerned. The Austrian Ministry for Science and Research (2010) describes a slightly different picture with respect to the security of Internet voting in a report, which is the complete and longer version of the work presented by Krimmer et al. (2010). Approximately 50 per cent of the 2161 participants were concerned about the security of the Internet voting system. However, the participants did not disclose any specific arguments with respect to their security concerns. Furthermore, less than 10 per cent stated concerns with respect to the integrity of the vote, i.e. manipulation vulnerabilities of the Internet voting system.

Krimmer (2014) provides a comprehensive summary of lessons learned from the Internet voting experience in Austria by identifying a first set of important building blocks for the conduct of Internet voting. The identified building blocks are the following: legal basis, identification, secrecy, control by election committee, certification and transparency. Regarding the legal basis the Austrian case shows that the implementation of legal principles into an ordinance needs to include technical details. When it comes to identification, transaction authentication numbers (TANs), so called predefined codes, can be easily used by the voters, while smart cards might provide a high usability barrier for participation. Vote secrecy was ensured by organizational means, i.e. before the votes were tallied they were anonymised, i.e. separated from voter's identity. The election processes, e.g. start or stop the election, should remain in full control of the election committee, even though they usually have a legal background and only limited technical experience. When it comes to certification technical requirements, which are used to evaluate the Internet voting system, have to be derived from legal requirements by using appropriate methods, like the method proposed by Simić-Draws et al. (2013). Although a number of methods existed, it was necessary to develop a specific one for Austria because existing methods were either limited to specific systems and national (electoral) legislation, or too generic. Last but not least, no means were used in Austria to provide voters with transparency. However, the experiences of Estonia and Norway should be considered in the future.

Shifting focus to Estonia, the country is considered to be the one that has advanced furthest with the deployment of Internet voting. There have been seven elections between 2005 and 2014 where Internet voting has been used (National Electoral Committee of Estonia, 2014). In 2005, Estonia held a local election where a total of 9287 votes were cast using Internet voting, which constituted a total of 1.9 per cent of all eligible votes. In the parliament election of 2007, Internet voting participation increased to 5.5 per cent (30 243 votes) and rose to 14.7 per cent (58 614 votes) in the European Parliament election of 2009. Compared to the 2005 local election, participation in the local election of 2009 increased by 13.9 to 15.8 per cent (104 313 votes). Further, a great boost in participation was seen in the parliament election of 2011 where Internet voting participation was 24.3 per cent (140 764 votes), which is an increase of 18.5 per cent from the parliament election of 2007.

Despite the constant increase over the years since 2005, a decline was witnessed in the local elections of 2013 where 21.2 per cent (133 662 votes) participated using Internet voting. However, the greatest increase seen so far in Estonia was during the European Parliament elections of 2014. A total of 31.3 per cent (103 105 votes) of all participants cast their votes by means of Internet voting, an increase of 16.6 per cent from 2009. By and large, there were negligible differences in Internet voting participation among the age groups and a slight difference between the genders where women were in majority.

Even though Internet voting has been in use for many years in Estonia, not much data exist on voters' attitudes towards participation by means of Internet voting. Nonetheless, a report by Madise and Martens (2006, p. 15) indicates that attitudes towards Internet voting were on the whole positive and that factors such as gender, income, education, type of settlement and age were not determinants in choosing Internet voting from all voting channels. However, neither comprehensive data nor surveys exist that would enable analyses of Estonian voters' attitudes with respect to the security of Internet voting. One important lesson learned from the Estonian case is that an appropriate legal and regulatory framework as well as a deliberate political process that scrutinize the idea of Internet remote voting is needed before the implementation and deployment of an Internet voting system to the public (Alvarez et al., 2009). In addition, there are four key characteristics to the Estonian case that has made Internet voting a success: (1) widespread Internet user penetration (80 per cent of the population); (2) a legal framework that addresses Internet voting issues; (3) an identification system that allows for digital authentication of the voter and; (4) a political culture that support and promote Internet voting. The Estonian Internet voting system allows voters to update their vote any time before the final voting day either over the Internet, or by casting another vote at the polling station, in order to guarantee the voter's independent right of choice. The statistics indicate that on average 4000 voters use these options (National Electoral Committee of Estonia, 2014). This particular solution makes it also hard to transfer results from Estonia to Sweden.

Turning to Norway, the country has used Internet voting in two trial elections in 2011 and 2013. The motivation for introducing Internet voting was two-fold, namely: (1) to enfranchise disabled, elderly, expatriates and military troops serving abroad and; (2) to increase political participation among indifferent and younger eligible voters (Segaard et al., 2014, p. 60). In 2011, Internet voting was available for ten municipalities and approximately 168 000 voters could vote online during the advance-voting period, lasting for 30 days. While in 2013, 12 municipalities participated in the trial elections, giving approximately 250 000 eligible voters the option to vote online during the advanced-voting period. Statistics by Segaard et al. (2014, p. 16) indicate that 26.4 per cent of voters in 2011 participated using Internet voting, while that number increased to 36.4 per cent in 2013. Moreover, the level of trust in Internet voting increased from 76 per cent in 2011 to 81 per cent in 2013. By and large, attitudes towards Internet voting in Norway were positive during both trial elections and remained so after counter-arguments related to privacy, the secret ballot, and technological security were introduced. In addition, analyses of demographics indicate that women, married people, those with higher income and education as well as individuals born in Norway vote to a greater extent compared to men, unmarried people, those with lower income and education as well as individuals born outside of Norway. This difference applies both for paper voting as well as Internet voting. In terms of age, there was a discrepancy between the age groups such that the older age groups preferred paper voting while the younger were more likely to choose Internet voting (Segaard et al., 2014, p. 58).

What is more and closely related to the privacy issue, a majority of the respondents found it acceptable that others could see how a person voted with the proviso that no criminal activity occurred (e.g., buying votes). At the same time, in some situations where an individual would help another cast his or her vote, for instance people with disabilities, was largely perceived as acceptable (Segaard et al., 2014, p. 122). These are two important lessons to bear in mind from the Norwegian experiment. In addition, a key factor behind the success of Internet voting in Norway was to "publish the full logical and technical system documentation" in order to increase transparency and trust "not only among the experts but also among the non-technical audience". This was done by allowing the public to "be informed as early as possible and be able to participate in an open discussion [about the use of Internet voting]" (Spycher, Volkamer, & Koenig, 2011, p. 20).

Finally, Switzerland is considered a pioneer in the area of Internet voting and has since the early 2000s been experimenting with Internet voting. It has been argued that traditional voting channels such as postal voting often fail to empower expatriates for various reasons (e.g., late dispatch of voting materials or problems with postal delivery). There are two reasons behind the development of Internet voting in Switzerland, namely: (1) an increasingly growing demand by the 700 000 Swiss expatriates to participate in the electoral process based on the national principle (i.e., all nationals should have access to the electoral process) and; (2) the trials of Internet voting for Swiss expatriates is considered a precursor to a possible general introduction of Internet voting (Germann, Conradin, Wellig, & Serdült, 2014). A survey of the 2011 Swiss national election indicated that 61 per cent of the 1549 participants strongly supported Internet voting. An additional 28 per cent reported it as rather important, yielding a total 91 per cent support rate for Internet voting (Lutz, 2012). With regards to lessons learned, it has been argued that high adoption rates among Swiss expatriates could generate a positive perception of Internet voting and eventually spill over the domestic debate where Internet voting is frequently challenged by the broad spectrum of political parties (see Mendez & Serdült, 2014). In addition, Switzerland focused on enhancing security and transparency in order to increase voters' trust in Internet voting. Hence, as a first step the 12 years old Internet voting legislation was updated according to current understanding of Internet voting and advances in Internet voting technology. Thus, allowing the development and use of verifiable Internet voting systems (Maurer, 2014).

In sum, Ström (SOU 2013:24) recommended that trials with Internet voting should be introduced in the General Elections of 2018. This recommendation was, however, based on data outside the Swedish context due to the lack of scientific studies that examine Swedish voters' attitudes towards Internet voting. One of the particularly Swedish conditions that facilitates the introduction of Internet voting is that as much as 91 per cent of the population in the ages 16 to 85 years have access to a computer and an Internet connection in their home (Statistics Sweden, 2014).

2. Aim of study and research questions

Departing from the aforementioned considerations, the aim of this exploratory quantitative study is to survey Swedish voters' attitudes towards Internet voting in Sweden and to support decision-making with respect to the suggested introduction of Internet voting in the country by 2018. The research questions of interest are:

- How disposed are Swedish voters towards Internet voting?
- How do factors such as age, gender, education, employment, and political background influence participation through Internet voting?
- What role does security play when engaging with Internet voting?

3. Methods

3.1. Participants

Participants were characterized by demographic variables such as age, gender, education (divided into four groups): compulsory school [nine years of formal education], high school [12 years], college [15 years], and postgraduate education [15+]. In addition, we had data on type of employment (employed, unemployed, self-employed, retired, student), and self-declared political allegiance (three groups constituting a somewhat simplified picture of the political landscape in Sweden: apolitical [voted blank, abstain, other party sympathy], the governing Liberal-Conservative Alliance [Moderate Party, Centre Party, Liberal People's Party, Christian Democrats], and the Red-Green Opposition [Social Democratic Party, Green Party, Left Party of Sweden], see Table 1. In the analysis of political allegiance we excluded a small minority of adherents to parties not represented in the Swedish parliament or not affiliated with any of the major blocks.

Table 1: Demographics of questionnaire sample in relation to the Swedish electorate.

		Questionnaire sample (N = 5237)	**Swedish electorate** (N = 7 201 600)
Gender	Male	52.7 (2761)	49.4 (3 557 590)
	Female	47.3 (2476)	50.6 (3 644 010)
Age	≤ 25	31.7 (1659)	13.5 (972 215)
	26-35	21.9 (1145)	15.5 (1 116 250)
	36-45	18.3 (959)	17.3 (1 245 875)
	46-55	15.7 (823)	16.1 (1 159 460)
	56-65	9.1 (474)	15.9 (1 145 055)
	> 65	3.3 (177)	21.7 (1 562 745)
Education	Compulsory school (9 years)	10.2 (529)	24.7 (1 778 795)
	High school (10 – 12 years)	42.6 (2217)	43.8 (3 154 300)
	College (13 – 15 years)	21.0 (1094)	30.4 (2 189 285)
	Postgraduate (15+ years)	26.2 (1362)	1.1 (79 220)
Employment	Employed	51.5 (2626)	54.4 (3 917 670)
	Unemployed	7.5 (382)	6.1 (439 300)
	Self-employed	6.4 (329)	8.4 (604 930)
	Retired	6.7 (341)	23.2 (1 670 770)
	Student	27.9 (1424)	7.9 (568 930)
Political allegiance	Apolitical (voted blank, abstain, other party sympathy)	23.3 (1122)	22.3 (1 605 955)
	Liberal-Conservative Alliance	35.0 (1686)	41.2 (2 967 060)
	Red-Green Opposition	41.7 (2010)	36.5 (2 628 585)

Notes. Numbers for the Swedish electorate are estimates based on statistics from the government agency Statistics Sweden.

3.2. Materials

A web-based questionnaire was applied to collect data from participants. The questionnaire was administered in Swedish and consisted of four sections: the first, an introduction with the purpose to collect descriptive information such as age, gender, education, employment, political background and three sections with main items. A total of 20 Likert-type items were used and based on a scale ranging from 1 to 5, where 1 referred to disagreement while 5 referred to agreement with the item content. The 20 items were concerned with questions regarding the security of Internet voting (e.g., are you worried that the results could be manipulated in an election when using Internet voting?), individual attitudes towards Internet voting (e.g., do you consider that Internet voting could increase the general tendency to participate in elections?), and opinions about participation through Internet voting (e.g., do your consider that the turnout activity would be higher if Internet voting was offered?).

3.3. Procedure

The questionnaire was sent to participants who had taken part in an experimental polling simulating an election through Facebook preceding the Swedish parliamentary election of 2010 to predict how Swedish electorate would vote in the parliamentary election of 2010 before the actual election day. Participants had given informed consent prior to the polling on Facebook to be contacted in the future. After the actual election was completed, a mailing list containing participants' e-mail address was generated and e-mail was sent to participants inviting them to complete the present questionnaire. This channel provided us with a sample of Swedish voters using the Internet who expressed a degree of political interest. Participation was on a voluntarily basis and no personal information was collected during the questionnaire. Participants were given introductory information regarding the questionnaire upon opening it, for instance how long it would take to conduct the survey and contact information to the authors. Following the closure of the questionnaire, all data were exported for data processing and statistical analyses.

3.4. Data processing

Data were centered on zero by subtracting the number 3 from all item scores. Twenty Likert-type items were factor analyzed for dimension reduction. To secure a reproducible factor structure, we divided participants into two randomly formed groups and performed a factor analysis for each one separately, and then compared factor structure, accepting only factor loadings that reproduced quite closely in both samples. The two factors representing the greater part of the variance proved to be reproducible in both samples. Item content is presented in Table 2.

Table 2: Item content of the attitude scales towards Internet voting: participation and security.

Participation factor items	Security factor items
(1) Believes in a positive effect on participation	(1) Willing to participate in an I-election if security can be guaranteed
(2) Believes in social and emotional presence created by social media (e.g. Facebook or Twitter	(2) Not worried about security issues in terms of poll manipulation
	(3) Rates danger of intrusion as small
(3) Believes in a positive effect on own likelihood to participate	(4) Errors in counting votes diminished by I-election
	(5) Down rates threat to democracy because of uneven

(4) Presenting candidates on interactive web pages will have a stimulating effect	access to the Internet (6) Does not find traditional voting safer than I-voting
(5) Will increase participation by younger citizens	(7) Believes in satisfactory solution of security issues (8) Believes in effect on the experience of voting
(6) Will increase overall participation	(9) Does not believe that reliability of I-election would be in jeopardy

Factor 3 represented only three items and was unstable across samples; hence ignored in further processing. Two strongly reproducible factors emerged, one of which we named "Participation", consisted of six items, having an acceptable consistency (Cronbach's Alpha = .70), and the other of which we named "Security", having nine items and good consistency (Cronbach's Alpha = .87).

4. Results

Overall, participants on average showed a positive attitude towards Internet voting. Grand mean for both scales were reliably on the positive side (M = .88 for the participation scale, and M = .28 for the security scale). Thus, the majority of participants were optimistic about future effects on voter participation, but more cautiously about the prospects of solving security issues, see Table 3.

Table 3: Attitudes towards participation and security of Internet voting by subgroups: gender, age, education, employment and political allegiance.

		N	Participation	Security
Gender	Male	52.7 (2761)	.852*[a]	.354*[a]
	Female	47.3 (2476)	.905*[b]	.191*[b]
Age	≤ 25	31.7 (1659)	.874*[a]	.025[a]
	26-35	21.9 (1145)	.900*[a]	.353*[b]
	36-45	18.3 (959)	.877*[a]	.404*[b]
	46-55	15.7 (823)	.896*[a]	.438*[bc]
	56-65	9.1 (474)	.784*[a]	.337*[bc]
	> 65	3.3 (177)	.911*[a]	.552*[c]
Education	Compulsory school (9 years)	10.2 (529)	.847*[ab]	.115*[a]
	High school (10 – 12 years)	42.6 (2217)	.930*[b]	.218*[a]
	College (13 – 15 years)	21.0 (1094)	.879*[ab]	.345*[b]
	Postgraduate (15+ years)	26.2 (1362)	.807*[a]	.386*[b]
Employment	Employed	51.5 (2626)	.872*[ab]	.372*[bc]
	Unemployed	7.5 (382)	.976*[a]	.236*[c]
	Self-employed	6.4 (329)	.979*[a]	.580*[a]
	Retired	6.7 (341)	.871*[ab]	.446*[ab]
	Student	27.9 (1424)	.839*[b]	.025[d]
Political allegiance	Apolitical (voted blank, abstain, no party sympathy)	23.3 (1122)	.887*[a]	.062*[a]
	Liberal-Conservative Alliance	35.0 (1686)	.894*[a]	.510*[b]
	Red-Green Opposition	41.7 (2010)	.849*[a]	.183*[c]

Notes. Attitude scores for the participation and security scales range from -2 to +2 where positive numbers indicate favorable attitudes towards Internet voting. Items marked with asterisk are significantly different

from zero, where $p < .05$. Means marked with different letters (e.g. ^{ab}) are significantly different from each other as measured by the Scheffé test. Sample size is given as percentage with raw data being presented within parentheses.

For each of our scales, we aimed at predicting a positive attitude from our background variables, age, gender, education, employment and political allegiance. Each background variable was used as a between-subject factor in a one-way Analysis of Variance (ANOVA). The correlation between the two scales was .53 ($p < .001$).

With regards to the participation of Internet voting, there was a significant difference between genders, such that women ($M = .91$) were more positive than men ($M = .85$), $F(1, 5235) = 7.39$; $p = .007$. There were no differences between age groups, $F(5, 5231) = 2.07$; $p > .05$. Education had a significant effect, $F(3, 5198) = 8.70$; $p < .001$. There were both linear and quadratic trends because there was a general decreasing tendency across education length but maximum positivity was reached at the second lowest level of education, i.e. high school. Degree and kind of employment were significantly related to the attitudes, $F(4, 5097) = 4.57$; $p = .001$. Post-hoc tests showed that in relation to the largest group, the employed, there were significant differences in the unemployed and self-employed categories. Both were on average more positive in their attitudes than the employed group. The retired and student groups did not differ significantly from the employed group. There were no significant differences between political groups, $F(2, 4815) = 2.08$; $p > .05$.

Concerning the security of Internet voting, men ($M = .35$) were significantly more optimistic than women ($M = .19$), $F(1, 5235) = 45.47$; $p < .001$. Age had a significant effect on the security scores, $F(5, 5231) = 44.15$; $p < .001$. By and large, participants' confidence in security increased with age. Length of formal education had a powerful effect on the security attitudes, $F(3, 5198) = 18.63$; $p < .001$. The effect was entirely linear with increases tracking length of schooling. Participants' employment status was significantly related to attitude scores, $F(4, 5097) = 52.05$; $p < .001$. Relative to the largest group (employed), there was greater confidence in security among the self-employed and lower confidence in the unemployed and students. Political allegiance was strongly related to security attitudes, $F(2, 4815) = 109.79$; $p < .001$. Followers of the governing Liberal-Conservative Alliance were more positive ($M = .51$) than the followers of the Red-Green Opposition ($M = .18$), who were in their turn more positive than the uncommitted ($M = .06$).

5. Discussion and conclusions

The current study finds that the acceptance of Internet voting for participation was spearheaded by women, groups with relatively short education, and the unemployed or self-employed. Interestingly, this is in conflict with the earlier evidence of Sultan (2002) that early adopters of new technology tend to be male, relatively young and well-educated. The results are also partially in contrast to the Norwegian findings (Segaard et al., 2014), where those with higher education adopt Internet voting to a greater extent than their counterparts. On the one hand, the found attitudes in the current study can be portrayed as being generally positive with respect to participation, but on the other hand there is skepticism about the feasibility of reliable, secure and fair large-scale elections on the Internet.

More noteworthy is that, unlike past studies (Bélanger & Carter, 2010; Kenski, 2005; Segaard et al., 2014; Ström, SOU 2000:125), we found that there was no significant difference between the age classes concerning the interest for participation in elections by means of Internet voting. This is in

line with Findahl's (2013) finding that in Sweden the use of the Internet among the older generations is already quite high, and is thereby potentially removing the digital divide. It is likely that even the older generations may adopt Internet voting, although perhaps not at the same rate as younger ones. However, some care must be taken into account when generalizing the result for the age group >65 because of the relatively few and self-selective online participants in the survey.

Another surprising result in our study is that the entire spectrum of the political parties was by and large equally sympathetic to the use of Internet voting. Although not directly comparable to the very unequal distribution of cast Internet votes in Estonia (National Electoral Committee of Estonia, 2014), the current results imply a drastically different situation in Sweden, perhaps also due to the very high and equal Internet adoption rate.

Regarding the security challenges of Internet voting, it was revealed that men were generally more positive than women. In addition, men's confidence in security increased with age and length of education. Being self-employed and center-left oriented in the political sphere had a positive impact on attitudes towards the security of Internet voting. Further, the young population (≤ 25) considered the security of Internet voting to be a major obstacle compared to the older age classes (25+). This mistrust has been raised in earlier research (Krimmer et al., 2010) and may be due to cultural factors, current events or discussions in the media, e.g. a recent debate concerning risks associated with surveillance of electronic media by the military intelligence community.

Based on the results, confidence in the security of Internet voting increased as a function of education length. Previous findings indicate that the well-educated tend to have generally more positive attitudes towards Internet voting (Kenski, 2005). In addition, confidence in the security of Internet voting and general acceptance of Internet voting correlated. One may also need to make a distinction between concerns of under- and over-security, where the former can jeopardize the results through electronic voting fraud, while the latter can raise concerns about the secrecy of the ballot or prevent participation through an inaccessible voting system as reported by Germann et al. (2014) about the case of Neuchatel.

However, the aforementioned results should be read with a degree of caution with respect to certain limitations in the current study. Additional factors such as income level, technological proficiency, ethnic background, and geographical distribution (rural versus urban and domestic versus expatriate), could have provided a more holistic picture of the results. In addition, we acknowledge a self-selection bias in our sample. In common with almost every other study in social science we shared the limitation that we could only recruit those who could be reached by the information and were willing to participate. Therefore the study only included participants who were acquainted with the use of computers and social networking sites such as Facebook. Although such bias could lead to a polarization of responses, Oostveen and van den Besselaar (2004) have demonstrated that this needs not to be the case. Those who use the computer and the Internet more frequently seem to judge Internet voting in the same way as those who use the computer less (Oostveen & van den Besselaar, 2004, p. 79).

Furthermore, some groups in the sample were over- (students) and underrepresented (retired, those over 65, and those under 25) compared to the actual electorate. While such over- and underrepresentation could have influenced the corresponding parameters in the results, the data showed no significant effects for age or the retired and student groups with regards to the attitudes towards participation of Internet voting but did reveal that participants' confidence in the security of Internet voting increased with age, and that students had lower confidence level

compared to other employment groups. On the whole, the conclusions should be tempered by awareness of the slight misrepresentation. However, no available data jeopardize the overall conclusion that the Swedish population would receive proposals of Internet voting with a positive interest, preparedness to participate, and a cautious optimism regarding the security issues.

In conclusion, citizens' broad adoption of Internet voting may ultimately pave the way towards new forms of participatory democracy. For instance, Internet voting combined with social media could offer citizens democratic opportunities to participate in referendums, protests and initiatives, on local and national levels, for example along the lines of Faraon, Villavicencio, Ramberg, and Kaipainen (2013). Understanding such everyday decision-making behaviors (e.g., forming online groups to work towards a specific aim) and competences can also contribute to the design of participatory online tools that ultimately serve the democratic system by means of active citizenship.

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