Research Note

Interest of Canadians in Internet Voting (2004, 2006, 2008 and 2011)

Prepared by

Pascal Barrette
Policy Analyst
Policy and Research

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Introduction

Elections Canada (EC) has an interest concerning Internet voting in view of its strategic objectives for research into new voting means, as well as provisions from section 18.1 of the *Canada Elections Act* (2001).[1]

Since the 2004 general election, Elections Canada has been polling Canadians on Internet voting by means of questions provided to the Canadian Election Study (CES)[2], as well as its own post-election survey of electors. Furthermore, since 2008, its Survey of Candidates has also included a question on the principle of Internet voting.

The agency has used an incremental approach in developing survey questions on Internet voting. The questions have been gradually fine-tuned to obtain Canadian electors' opinions regarding the following three areas of interest:

- likelihood of voting over the Internet
- perception of risk associated with Internet voting
- principle of Internet voting

With respect to electors, this research note sets out the results obtained for all three areas of interest. The results also report on the impact of three socio-demographic variables: age group, education and employment status.[3]

With respect to candidates, the analysis looks exclusively at the principle of Internet voting and takes into account the impact of having been elected or not.

The presence / absence of statistically significant association between our variables is calculated using the Pearson Chi-Square (X^2).[4] Regarding the measurement to determine the strength and direction of these relationships, we use the Gamma (γ)[5] and Cramer's V.[6] The choice of these tools is based on the

[1] Section 18.1 provides that "[t]he Chief Electoral Officer may carry out studies on voting, including studies respecting alternative voting means, and may devise and test an electronic voting process for future use in a general election or a by-election."

[2] The CES is the only longitudinal study dealing with Canadian federal elections. Introduced in 1965, this university study consists of more than 300 questions related to various aspects of elections. Elections Canada has been involved with the CES since the 1997 general election.

[3] It is worth noting that the choice of socio-demographic variables for this analysis is based on frequencies obtained in the different surveys selected for this research note. Some variables or categories of individuals (e.g. students, Aboriginal people and immigrants) were not included in the analysis because of an insufficient number of respondents.

[4] Pearson's Chi Squared test (X^2) can confirm the presence of a statistically significant association (i.e.: by rejecting the null hypothesis), generalizable to the entire Canadian population when "p" is less than 0. 05.

[5] Gamma (γ) ranges from – 1 (negative association) to 1 (positive association); 0 means no association. Regardless of the direction, the strength of the association is considered weak between 0 and 0.25; moderate between 0.25 and 0.50; strong between 0.50 and 0.75; and very strong between 0.75 and 1. Since Gamma is a measure of the Proportional Reduction of Error (PRE), the absolute value of Gamma makes it possible to indicate the extent to which knowing the independent variable reduces the error that would be made in predicting the values of the dependent variable compared with those obtained by chance (e.g. heads or tails).

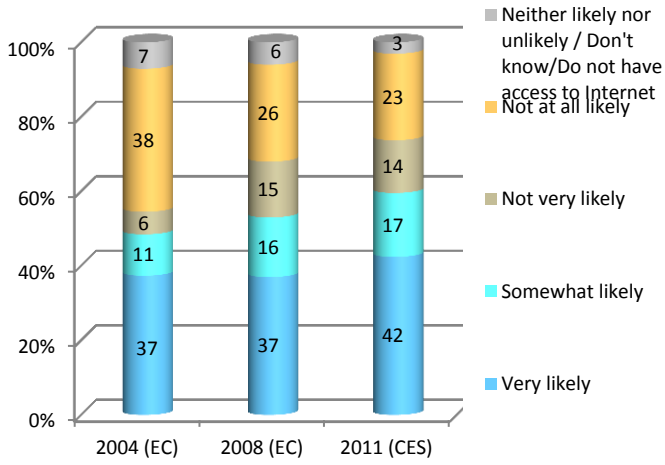
[6] Cramer's V indicates a weak association between 0 to 0.10; moderate association between 0.10 and 0.25; strong association when above 0.25 and perfect association when it reaches 1.0. The Cramer's V does not indicate the direction of the association since

very nature of our dependent variables (i.e.: ordinal or nominal / dichotomous) and the objective is to identify avenues of research that could lead to the development of more advanced studies on the state of relations and inter-related interests of Canadians toward Internet voting.

Likelihood of Voting Over the Internet

Elections Canada introduced its first question relating solely to the likelihood of voting over the Internet in its post-election survey for the 2004 general election.[7] By categorizing the responses using an ordinal scale, it is possible to compare, with some reservation, the results for this question in 2004 with results obtained in 2008 and 2011.[8] As may be seen in Graph 1, the likelihood of electors voting over the Internet has tended to increase over time (from 48% in 2004 to 59% in 2011). We also note that the polarization of opinion seen in 2004 (with 38% indicating "Not at all likely" versus 37% indicating "Very likely") gradually lessened between 2004 and 2011, with a shift toward the middle ground ("Not very likely" / "Somewhat likely") and toward opinions indicating a very high likelihood of voting over the Internet.

Graph 1: Likelihood of Voting Over the Internet (2004, 2008 and 2011)

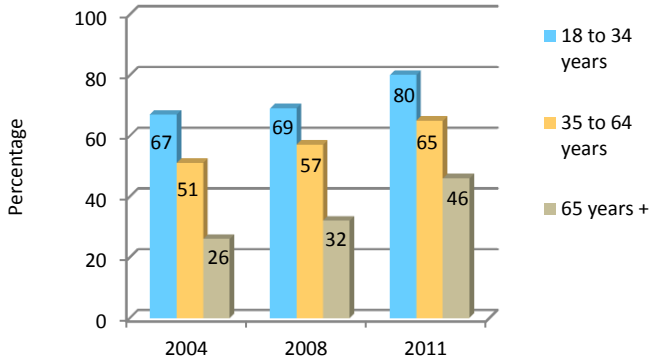


Interest in the likelihood of voting over the Internet is influenced by the different socio-demographic variables selected for this analysis. In regard to the age group variable, Graph 2 shows that the likelihood of voting over the Internet is higher in the 18-to-34 age group (between 67% and 80%) and the 35-to-64 age group (between 51% and 65%) when compared with the 65+ age group (between 26% and 46%).[9] That said, the rise in interest within each age group has been more pronounced in recent years (overall increase of 33 percentage points between 2008 and 2011, compared with 14 percentage points between 2004 and 2008). This rise has been more prominent in the 65+ age group, even though respondents from this group remain the least likely to be interested in voting over the Internet in 2004, 2008 and 2011.

The association between the age group variable and the likelihood of voting over the Internet is statistically significant in 2004, 2008 and 2011. Additionally, we note that this association is negative and of moderate strength from 2004 to 2011. In other words, all things being equal otherwise, the higher an individual's age group, the smaller the chance that this individual will have a positive opinion regarding the likelihood of voting over the Internet.

Graph 2: Age Group and Likelihood of Voting Over the Internet (2004, 2008 and 2011)

(% of respondents indicating that they would likely or very likely vote over the Internet if given the option)



2004 (EC)	2008 (EC)	2011 (CES)
$X^2 = 174.66$ ($p < 0.001$) $\gamma = -0.44$	$X^2 = 131.26$ ($p < 0.001$) $\gamma = -0.39$	$X^2 = 47.95$ ($p < 0.001$) $\gamma = -0.40$

Regarding the education variable, we note that the likelihood of being interested in voting over the Internet tends to increase with the level of education.

the variable being assessed is nominal (i.e.: there is no natural order between categories).

[7] This question used a scale of 1 to 5 (i.e.: 1 = Very likely; 3 = Neither likely nor unlikely; 5 = Not at all likely).

[8] For the 2006 election, the question relating to the likelihood of voting over the Internet indicated "for future elections." In our view, this notion makes it impossible to compare the results for that question with those in the 2004, 2008 and 2011 surveys.

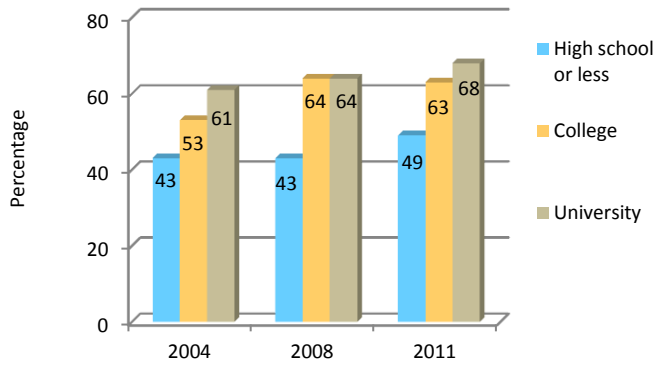
[9] The response categories were recoded using a dichotomous nominal scale (Unlikely/Likely). The "Neither likely nor unlikely," "Don't know" and "Do not have access to Internet" categories were excluded from this analysis.

As shown in Graph 3, this favourable attitude towards voting over the Internet is substantially higher among university graduates (between 61% and 68%) and college graduates (between 53% and 64%) than among respondents with a high school diploma or less education (between 43% and 49%).

The association between education level and the likelihood of voting over the Internet is statistically significant in 2004, 2008 and 2011. Furthermore, we note that this positive association was relatively moderate in strength from 2004 to 2011. In other words, the higher an individual's level of education, the higher the chance that this individual will have a positive opinion concerning the likelihood of voting over the Internet.

Graph 3: Education and Likelihood of Voting Over the Internet (2004, 2008 and 2011)

(% of respondents indicating that they would likely or very likely vote over the Internet if given the option)

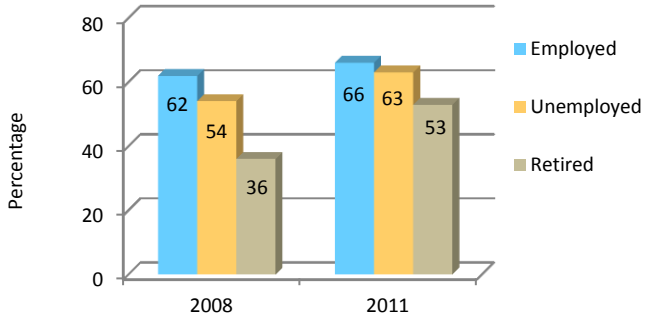


2004 (EC)	2008 (EC)	2011 (CES)
$X^2 = 63.40$ ($p < 0.001$) $\gamma = 0.25$	$X^2 = 89.79$ ($p < 0.001$) $\gamma = 0.28$	$X^2 = 27.93$ ($p < 0.001$) $\gamma = 0.26$

Finally, regarding the employment status variable,[10] Graph 4 shows that, in both 2008 and 2011, the likelihood of being interested in voting over the Internet is higher among those who were employed (between 62% and 66%) than among those who were unemployed (between 54% and 63%) or retired (between 36% and 53%). That said, the gap between the different employment statuses has decreased in 2011, due to a noticeable increase of interest towards Internet voting from retired[11] and unemployed individuals.

Graph 4: Employment Status and Likelihood of Voting Over the Internet (2008 and 2011)

(% of respondents indicating that they would likely or very likely vote over the Internet if given the option)



2008 (EC)	2011 (CES)
$X^2 = 96.88$ ($p < 0.001$) Cramer's V = 0.21	$X^2 = 15.33$ ($p = 0.001$) Cramer's V = 0.12

The association between employment status and the likelihood of voting over the Internet is statistically significant in both 2008 and 2011. However, we note a decrease in the strength of this association between 2008 and 2011.

[10] The "employment status" socio-demographic variable was not included in the 2004 Elections Canada survey.

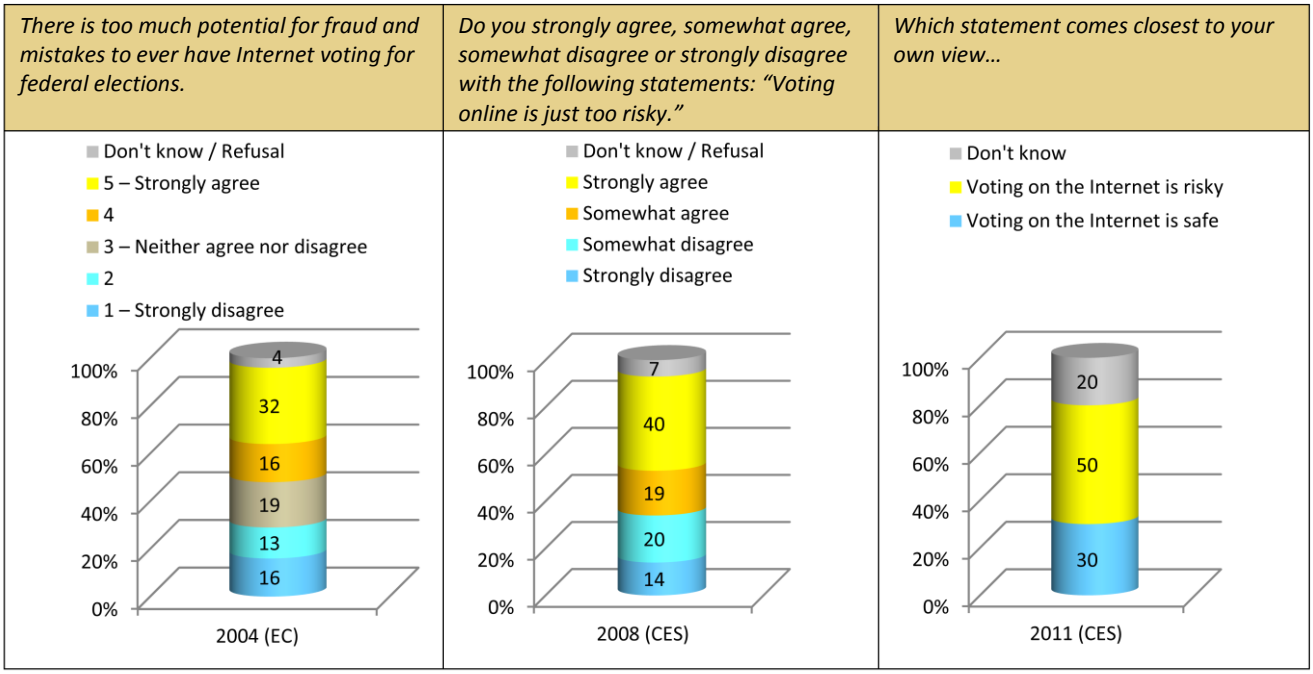
[11] On that note, percentages among retired individuals are somewhat similar to those among persons in the 65+ age group. This similarity stems primarily from the fact that most retirees are 65 years of age or older, and vice-versa.

Perception of Risk Associated With Internet Voting

Elections Canada added a question to its survey following the 2004 general election to examine elector perception of the risk associated with Internet voting. The question asked electors for their opinions on the potential for fraud or error associated with Internet voting. For the 2011 election, in order to check whether measuring only the risk aspect might introduce a negative bias, we asked respondents to indicate which of two statements came closest to their own views: "Voting on the Internet is risky" or "Voting on the Internet is safe." For this reason, the 2011 results cannot be compared with earlier results.

That said, Graph 5 shows that, from 2004 to 2011, about one out of every three respondents indicated that Internet voting was safe, regardless of the wording of the question.

Graph 5: Perception of Risk Associated With Internet Voting (2004, 2008 and 2011)*



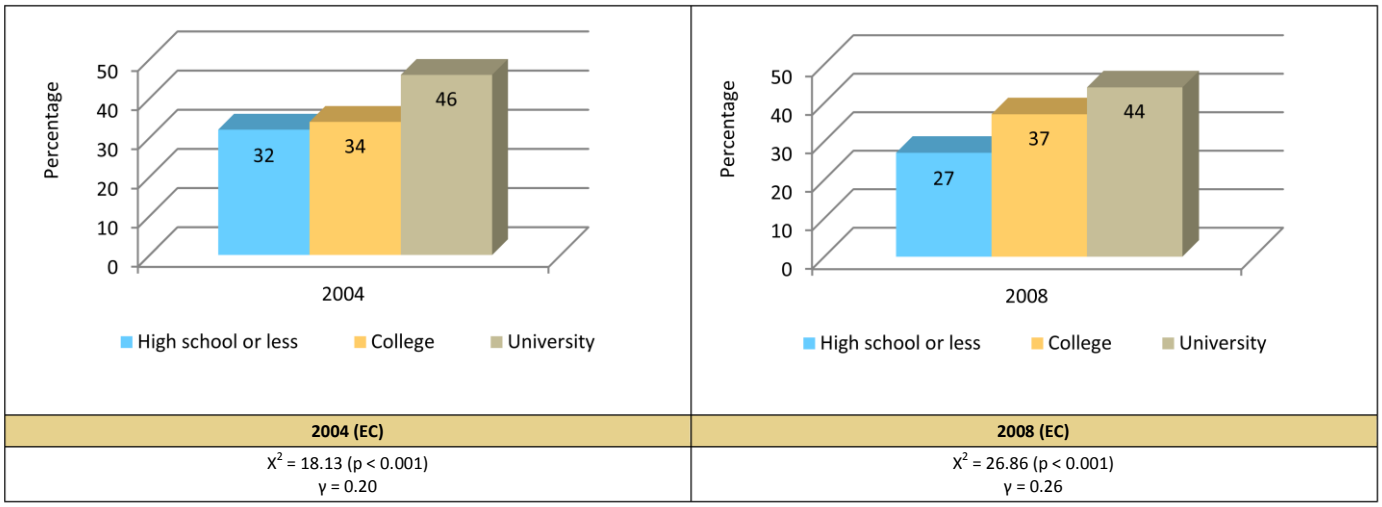
*The question on risk associated with Internet voting was not asked in 2006.

Otherwise, we note that, in 2004 and 2008,[12] university graduates tend to disagree the most with the idea that Internet voting is too risky (46% and 44% respectively), while respondents with a high school diploma or less education tend to disagree the least (32% and 27% respectively). That said, as observed in Graph 6, the gap between the different levels of education has increased slightly in 2008.

The association between education and perception of risk is statistically significant in 2004 and 2008. Furthermore, the strength of this positive association increased slightly from 2004 to 2008. As such, the higher an elector's education level is, the higher the chance that this elector will disagree with the idea that Internet voting is too risky.

Graph 6: Education and Perception of Risk Associated With Internet Voting (2004 and 2008)

(% of respondents disagreeing with the statement that Internet voting is too risky)[**]



2004 (EC)	2008 (EC)
$X^2 = 18.13$ ($p < 0.001$) $\gamma = 0.20$	$X^2 = 26.86$ ($p < 0.001$) $\gamma = 0.26$

[**] Response categories were recoded using a dichotomous nominal scale (Agree/Disagree). In addition, the "Neither agree nor disagree", "Don't know" and "Refused" categories were excluded from the analysis.

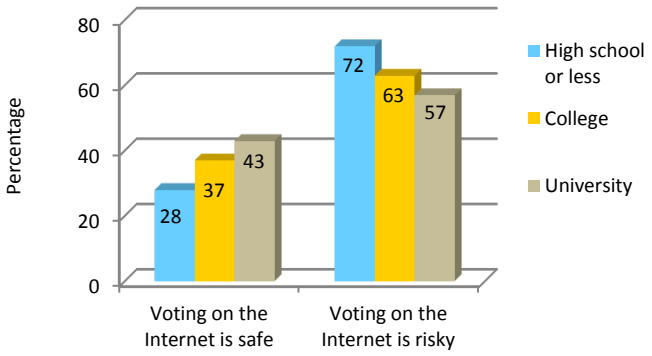
[12] Even though the subject matter was very similar, we are of the view that the questions in 2004 and 2008 are not directly comparable with the question used for the 2011 federal general election.

For 2011, we notice that electors with a university degree are the most inclined to think that Internet voting was safe (43%). In contrast, we note that electors with a high school diploma or less education are the most inclined to believe that voting on the Internet is risky (72%), as observed in Graph 7.

These observations are confirmed by the presence of a statistically significant relationship between the education variable and perception of risk. However, we note that this positive association is weak. That said, in the last general election survey, the higher the individual's education level, the lower the chance that this individual will be likely to agree that voting on the Internet is risky.

Graph 7: Education and Perception of Risk Associated With Internet Voting (2011)[13]

(% of respondents agreeing with one of the following statements: Voting on the Internet is safe / Voting on the Internet is risky)



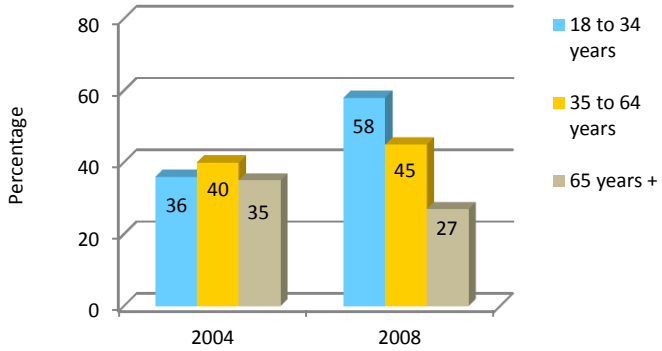
2011 (CES)
$X^2 = 13.14$ ($p = 0.001$) $\gamma = 0.21$

Graph 8 shows that the gap in perception of risk among age groups is quite small in 2004, but not in 2008. In fact, the percentage obtained in 2008 reveals significant differences between the 18-to-34 (58%), 35-to-64 (45%) and 65+ (27%) age groups.

Confirming these data, we notice that the relationship between age group and perception of risk is not statistically significant ($p = 0.327$) for 2004. This result contrasts with the result for 2008, where a significant association of moderate strength and negative direction is observed. In other words, only for 2008 do we note that, the higher an individual's age group, the smaller the chances this individual is likely to disagree with the idea that Internet voting is too risky.

Graph 8: Perception of Risk by Age Group (2004 and 2008)

(% of respondents disagreeing with the statement that Internet voting is too risky)



2004 (EC)	2008 (CES)
$X^2 = 2.23$ ($p = 0.327$) $\gamma = 0.02$	$X^2 = 37.02$ ($p < 0.001$) $\gamma = -0.33$

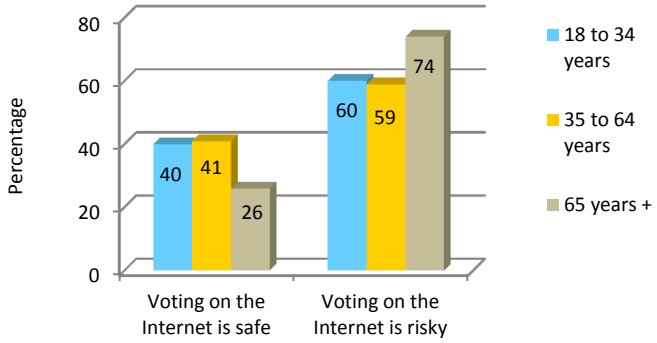
[13] The response categories were recoded using a dichotomous nominal scale (Voting on the Internet is safe / Voting on the Internet is risky). In addition, the "Not sure" and "Refused" categories were excluded from the analysis.

As indicated previously, the question on perception of risk was reworded in 2011. Graph 9 shows that there is a similarity in the level of agreement of respondents in the 18-to-34 age group (40%) and the 35-to-64 age group (41%) with the statement that voting on the Internet is safe. In contrast, we note that in the 65+ age group, nearly three out of every four persons consider Internet voting risky.

The association between age group and perception of risk is statistically significant for 2011. However, the strength of the association is relatively weak and negative.

Graph 9: Perception of Risk by Age Group (2011)

(% of respondents agreeing with one of the following statements: Voting on the Internet is safe / Voting on the Internet is risky)



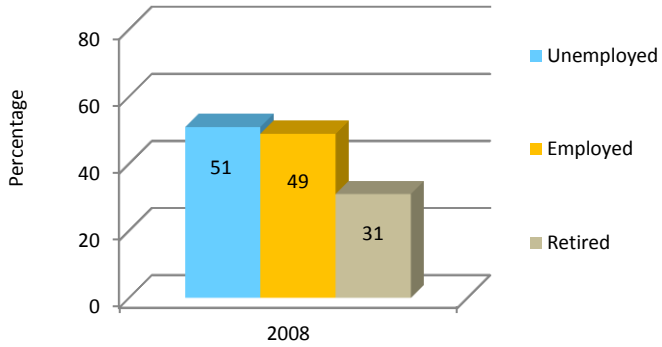
2011 (CES)
$X^2 = 14.63$ ($p = 0.001$) $\gamma = -0.22$

The results related to the 2008 general election show perception of risk by elector employment status. Graph 10 shows that nearly half of those in the labour market do not consider Internet voting too risky, compared with a little less than one third of retired respondents.

The association between employment status and perception of risk is statistically significant. Furthermore, the strength of that association is moderate.

Graph 10: Perception of Risk by Employment Status (2008)

(% of respondents disagreeing with the statement that Internet voting is risky)



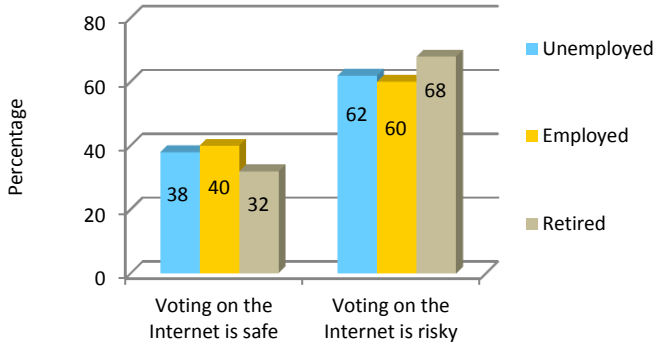
2008 (CES)
$X^2 = 25.23$ ($p < 0.001$) Cramer's V = 0.15

For 2011, Graph 11 sets out the results for the reworded question on perception of risk by elector employment status. At first glance, we note that retired people (32%) are slightly less likely to consider Internet voting safe when compared to individuals who are employed (40%) or unemployed (38%).

However, the association between employment status and perception of risk is not statistically significant ($p = 0.10$). That is, the results indicate that perception of risk associated with Internet voting was not influenced by the employment status of Canadian electors at the time of the 2011 general election.

Graph 11: Perception of Risk by Employment Status (2011)

(% of respondents agreeing with one of the following statements: Voting on the Internet is safe / Voting on the Internet is risky)



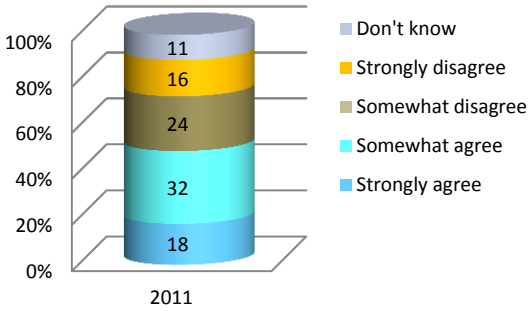
2011 (CES)
$X^2 = 4.60$ ($p = 0.10$) Cramer's V = 0.07

Electors' Opinions Concerning Principle of Internet Voting

For the 2011 election, Elections Canada added a question on the principle of Internet voting to the Canadian Election Study, to obtain electors' opinions in this regard. As may be seen in Graph 12, 50% of Canadian electors agree with the principle of Internet voting, while 40% disagree and 11% do not know.[14]

Graph 12: Electors' Opinions Concerning the Principle of Internet Voting (2011)

(% of respondents agreeing with the principle that Canadians should be able to vote over the Internet)

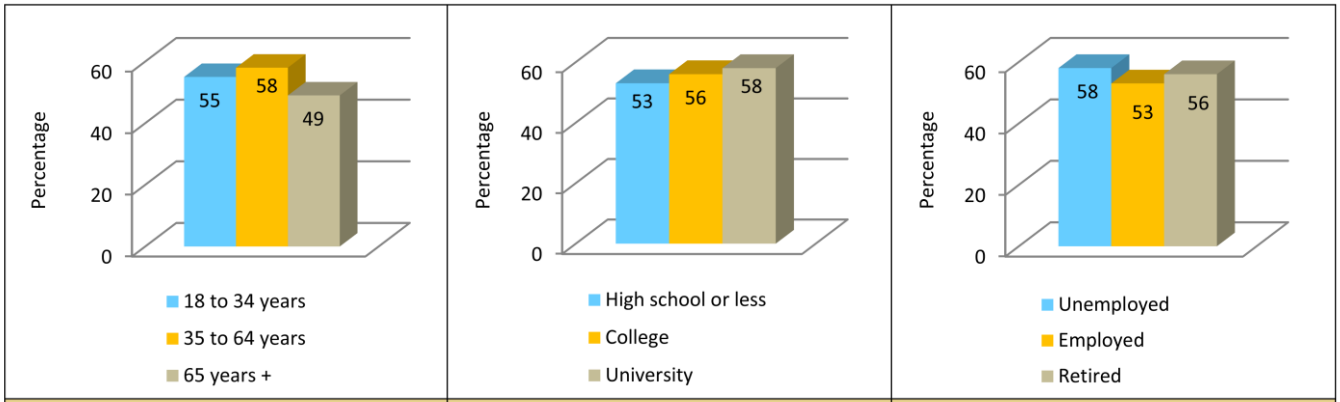


With respect to the socio-demographic variables, Graph 13 shows little fluctuation in respondent opinion concerning the principle of Internet voting, regardless of the variables used for the analysis.[15] In fact, we note that the highest percentage is 58% (35–to 64-year-olds, university graduates and unemployed individuals), three percentage points above the national average (55%),[16] and the lowest percentage is 49% (the 65+ age group).

Overall, none of the socio-demographic variables used to analyze elector opinion concerning the principle of Internet voting proved statistically significant ($p < 0.05$). In other words, for the 2011 survey, Canadians' opinions concerning the principle of Internet voting reveal no significant differences based on age group, education level or employment status.

Graph 13: Principle of Internet Voting by Socio-Demographic Variable (2011)

(% of respondents agreeing with the principle that Canadians should be able to vote over the Internet)



Age Group 2011 (CES)	Education 2011 (CES)	Employment Status 2011 (CES)
$X^2 = 5.56$ ($p = 0.062$) $\gamma = -0.11$	$X^2 = 1.73$ ($p = 0.422$) $\gamma = 0.07$	$X^2 = 0.97$ ($p = 0.615$) Cramer's V = 0.03

[14] Rounding out of decimals brings the total percentage to 101.

[15] Response categories were recoded using a dichotomous nominal scale (Disagree/Agree).

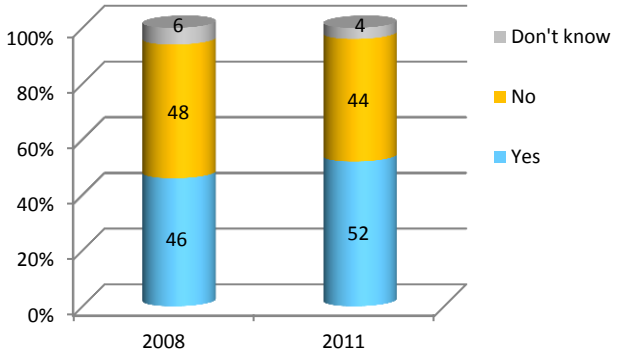
[16] The "Not sure" category was excluded, which explains the difference in the general population percentage between graphs 12 and 13 (50% vs. 55%).

Candidates' Opinions Concerning Principle of Internet Voting

Following the 2008 and 2011 general elections, Elections Canada surveyed candidates on various issues, including Internet voting.[17] In both surveys, we asked candidates whether or not they agreed with the principle of Internet voting. On that point, Graph 14 shows a slight increase between 2008 and 2011 in respondents agreeing with the principle of Internet voting, from 46% to 52%.

Graph 14: Candidates' Opinions Concerning Principle of Internet Voting (2008 and 2011)

(% of respondents agreeing with the principle that Canadians should be able to vote over the Internet)

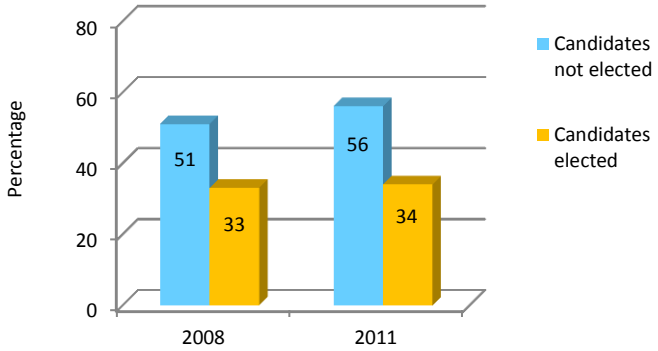


As seen in Graph 15, the percentages conceal a considerable discrepancy between the opinions of those candidates who were elected and the opinions of those who were not, both in 2008 and in 2011. More specifically, candidates who were elected expressed much less agreement with the principle of Internet voting (between 33% and 34%) than those who were not elected (between 51% and 56%). Additionally, we note that the discrepancy in the opinions of elected and unelected candidates increased by four percentage points between 2008 and 2011, widening the opinion gap from 18 to 22 percentage points.

Confirming these observations, the association between whether or not one is elected and one's opinion concerning the principle of Internet voting is statistically significant. Furthermore, we note that the association is negative and that it increased in strength between 2008 and 2011. In other words, all things being equal otherwise, a candidate who was elected is significantly less likely to agree with the principle of Internet voting than a candidate who was not elected.

Graph 15: Opinions of Elected and Unelected Candidates on the Principle of Internet Voting[18] (2008 and 2011)

(% of respondents agreeing with the principle of Internet voting)



2008 (EC)	2011 (CES)
$X^2 = 7.71$ ($p < 0.001$) $\gamma = -0.35$	$X^2 = 18.63$ ($p < 0.001$) $\gamma = -0.43$

[17] 877 out of 1,601 candidates in 2008 and 1,008 out of 1,587 candidates in 2011 took part in the survey.

[18] The "Not sure" category was excluded from the analysis.

Conclusion

By and large, results show that a moderate proportion of electors would be likely to vote over the Internet, and that this proportion is increasing from one general election to the next. Furthermore, there is a significant association of moderate strength between that likelihood and age group and, to a lesser extent, education level and employment status.

That said, there remains a high level of perceived risk associated with Internet voting. Since 2004, only one in every three people has expressed an appreciable degree of confidence in the safety of such a voting method. Overall, we note that, in the entire period under review, university graduates had less of a tendency to consider Internet voting risky. With regard to the principle of Internet voting, we note that about one in two electors agrees with the principle, regardless of the socio-demographic variable taken into account. However, according to our observations on candidates, there is a major opinion gap between candidates who were elected and those who were not; with the latter expressing considerably more agreement with the principle of Internet voting than elected candidates.

Lastly, the statistically significant associations between the interest toward Internet voting and the observed socio-demographic variables enable us to foresee some opportunities for further research, either by the introduction of control variables or by using a more advanced statistical method (i.e.: logistic regression) to verify the relations and interrelations of variables associated with the interest of Canadians towards Internet voting.

Appendix: Questions on Internet Voting and Response Frequency

VOTING LIKELIHOOD			
YEAR	QUESTION	FREQUENCY	%
2004 EC (n = 2822)	How likely would you be to vote on-line if it were available?	1 – Very likely	37
		2 –	11
		3 – Neither likely nor unlikely	6
		4 –	6
		5 – Not at all likely	38
		Don't know	1
2006 EC (n = 3013)	For future elections, if you could vote online on the Elections Canada website, would you be very likely, somewhat likely, not very likely or not at all likely to do so?	Very likely	37
		Somewhat likely	18
		Not very likely	12
		Not at all likely	29
		Do not have access to Internet	2
		Don't know / Depends	3
2008 EC (n=2486)	If you could vote online, would you be very likely, somewhat likely, not very likely or not at all likely to do so?	Very likely	37
		Somewhat likely	16
		Not very likely	14
		Not at all likely	26
		Do not use / have access to Internet	4
		Don't know / Depends	2
2011 EC (n = 1108)	If you could vote online, would you be very likely, somewhat likely, not very likely or not at all likely to do so?	Very likely	40
		Somewhat likely	16
		Not very likely	15
		Not at all likely	24
		Not sure / Don't know	4
PERCEPTION OF RISK			
YEAR	QUESTION	FREQUENCY	%
2004 EC (n = 1455)	There is too much potential for fraud and mistakes to ever have Internet voting for federal elections.	1 – Strongly disagree	16
		2 –	13
		3 – Neither agree nor disagree	20
		4 –	16
		5 – Strongly agree	32
		Don't know	4
2008 CES (n = 1273)	Do you strongly agree, somewhat agree, somewhat disagree or strongly disagree with the following statement: "Voting online is just too risky."	Strongly agree	40
		Somewhat agree	19
		Somewhat disagree	20
		Strongly disagree	14
		Don't know	7
2011 CES (n = 1106)	Which statement comes closest to your own view…	Voting on the Internet is safe	30
		Voting on the Internet is risky	50
		Don't know	20

PRINCIPLE OF INTERNET VOTING (ELECTORS)			
YEAR	QUESTION	FREQUENCY	%
2011 CES (n = 1107)	Do you strongly agree, somewhat agree, somewhat disagree, or strongly disagree with the following statement: "Canadians should have the option to vote over the Internet in federal elections"	Strongly agree	18
		Somewhat agree	32
		Somewhat disagree	24
		Strongly disagree	16
		Don't know	11
PRINCIPLE OF INTERNET VOTING (CANDIDATES)			
YEAR	QUESTION	FREQUENCY	%
2008 Candidates (n = 877)	Do you think that electors should be able to vote online?	Yes	46
		No	48
		Don't know	6
2011 Candidates (n = 1008)	Do you think that electors should be able to vote by using the Internet?	Yes	52
		No	44
		Don't know	4