ALTERNATIVE VOTING TECHNOLOGIES REPORT

Chief Electoral Officer's Submission to the Legislative Assembly

Elections Ontario

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Elections
Ontario

Office of the
Chief Electoral Officer
of Ontario

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De l'Ontario

June, 2013

The Honourable Dave Levac
Speaker of the Legislative Assembly
Room 180, Legislative Building, Queen's Park
Toronto, Ontario
M7A 1A2

Dear Mr. Speaker,

It is with pleasure that I submit my report on the review of alternative voting technologies undertaken by my office.

The report was prepared to comply with section 44.3 of the *Election Act*. I am thankful that the Legislative Assembly provided Elections Ontario with the opportunity to formally review this important and timely subject. I would also like to thank those who participated in our review process.

The report contains two documents that describe the work we have completed in the past three years. The first document is a report that summarizes our findings and research process. The second document is a copy of our business case. Together, they present a thorough review on alternative voting technologies and pave a clear path for where we would like to go with alternative voting in the future.

Sincerely,

Greg Essensa
Chief Electoral Officer

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Supplementary document available online under the Publications section of our website or in hard copy upon request:

Message from the Chief Electoral Officer

Today, public opinion is divided between those who strongly desire the introduction of internet and telephone voting (network voting), and those who do not trust it and do not want it.

In many other sectors a natural evolution has occurred as business and industries have employed new technologies to respond to customer demand and have adapted the manner in which they provide their services. While changes have recently been introduced to Ontario's voting process, there is a growing desire amongst members of the public, advocacy groups, the media and political entities for Ontario's electoral process to evolve and transform.

I welcome the benefits modernization can provide so long as we can ensure that electors have the utmost confidence in the integrity of the process used to select their provincial representatives.

This report presents the necessary framework that guides how we are moving forward on a responsible and principled approach to innovation. It presents the key findings of our research and outlines what we will be considering as we work to modernize the electoral process in Ontario.

In addition to providing a thorough review on the topic, this report will also help to bridge the divide and allow those who want network voting and those who do not to learn from each other's perspectives. As the Chief Electoral Officer of Ontario, I have a role to play in educating the public about both the benefits and risks of network voting and outlining how it may be possible to employ technology, in a principled manner, to achieve improvements to our electoral process.

We have already started down the path of introducing choice to Ontario's electoral process. We now have in place convenient and accessible voting mechanisms, including voting by mail (special ballots), home visits by special ballot officers, and using ballot marking devices and tabulators in returning offices before election day.

Although our current voting processes have served us well in the past, they are becoming increasingly difficult to sustain and administer. There is a growing expectation that electoral agencies will employ technological solutions to increase efficiency, reduce costs, and increase the integrity, accessibility and participation in the electoral process.

With our current processes, Elections Ontario is required to connect more than 8.5 million electors with approximately 8,000 voting locations that are staffed by more than 70,000 election workers.

It is also becoming increasingly difficult to recruit and train the tens of thousands of people who are needed to serve as election and polling day officials. In comparison to the past, fewer people are either able or willing to be election workers. The average age of our workforce is also well above the provincial average. These realities mean that recruitment is a growing problem.

It is also becoming a challenge to obtain voting locations. Traditionally, schools have served as voting locations. Due to security concerns, however, school boards are increasingly resistant to having polling places in their schools. While our customary locations are becoming more difficult to rent, we also have stronger requirements to ensure that all voting locations are physically accessible and to remediate any potential physical barriers.

In addition, voter participation in the electoral process is declining. In the 2011 General Election, for the first time, voter participation dropped below 50%, setting a record low for voter turnout in Ontario. We need to identify and remove barriers in our processes and procedures that may discourage people from voting.

To address these challenges, I am transforming Elections Ontario to be more:

- Customer-focused
- Efficient in operations
- Robust in capabilities, and
- Proactive in recommending legislative change.

It is my responsibility to ensure that any change that I make or recommend making to Ontario's voting process uphold the democratic principles upon which the *Election Act* was founded and the criteria that are introduced in this report.

Elections need to be administered with proven, well-tested, and secure processes. Innovations must be tested in a methodical and principled manner, so that the benefits and risks of the innovation can be objectively assessed, without endangering the trust that electors have in the integrity of the process and the validity of the results.

Ontarians must consider a future role for network voting in the administration of the provincial electoral process because someday there will be an effective solution that meets the province's needs and adheres to our criteria. At this point, we do not have a viable method of network voting that meets our criteria and protects the integrity of the electoral process.

We will continue our work innovating Ontario's electoral process and will monitor, evaluate and build solutions, which will include the use of technology, to successfully conduct elections in an efficient, fair and impartial manner.

Greg Essensa, Chief Electoral Officer

Purpose

Around the world, election administrators are grappling with the question of how to best incorporate technological advances into the voting process. As other industries have been transformed, questions are being raised regarding how best to incorporate technology into elections.

Each jurisdiction has approached the topic of network voting in their own way. Some jurisdictions have moved forward and adopted voting by internet and/or telephone, while others have moved away from it. The use of network voting is an international issue that does not yet have a commonly accepted solution.

We are on the cusp of a major change to how we vote – network voting is perceived by some as the way of the future. There is the perception that internet and telephone voting will be more convenient, just as secure and less cumbersome to administer than traditional voting methods. In this report, we examine and test these assumptions.

Legislative Context

In May 2010, Ontario's *Election Act* was amended to require the Chief Electoral Officer (CEO) to review alternative voting technologies

The Assembly mandated the Chief Electoral Officer to do two separate things on two separate timelines. The CEO:

1. **Shall conduct a review and report on the use of alternative voting technologies on or before June 30, 2013 (section 44.3).**

   This report fulfill this legislative requirement by providing a broad-ranging survey on what current technologies for voting exist and their characteristics and discussing the framework for which they can potentially be employed in Ontario in the future.

2. **May deploy an alternative voting method in a future general election, so long as several conditions are met (section 44.2).**

   The conditions are as follows:

   a) The method must have been tested in a by-election and a report in connection with that by-election must have been tabled with the Speaker within 4 months of polling day (see section 4.1 of the *Election Act*).

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b) The Chief Electoral Officer must:

i) be satisfied that the security and integrity of the method is equivalent to the statutory requirements that govern the use of tabulators and ballot marking devices;

ii) have consulted with registered political parties, electors, experts on voting methods, about the method tested in the by-election and the results from its test; and,

iii) recommend how the method should be used for a specific general election.

c) The Legislative Assembly, through one of its committees, must have held public hearings into the CEO's recommendation and approve it without modification.

What are Alternative Voting Technologies?

The term "alternative voting technology" can be taken to refer to many different technologies that could be applied to the voting process. For some, the term applies to technologies used to make the voting process more accessible to people with disabilities such as ballot marking devices. For others, it refers to voting via the internet. For others still, it refers to direct-recording electronic (DRE) voting machines (touch screen voting machines).

In the absence of a universal definition, we created and applied the following definition of alternative voting technology to our review:

"Alternative voting technology" is a means of both casting and counting votes electronically, involving the transmission of ballots and votes via telephones, private computer networks, or the internet.

Our definition includes electronic processes for voting (casting votes), storing votes, and counting them. Vote information travels electronically at each step, through a "network", rather than physically. We refer to this as "network voting".

For clarity, we use the term "network voting" in this report in place of the more ambiguous "alternative voting technologies". While network voting encompasses numerous voting channels, we focused our attention on internet/online and/or telephone voting and use the terms synonymously.

Factors We Need to Consider When Moving Forward

When we move forward with any innovation plan, we need to ensure that the proposed improvements to the voting process align with our mission.

Elections Ontario's mission is to uphold the integrity and accessibility of the electoral process and to manage elections in an efficient, fair, and impartial manner. As such, any innovation that we adopt needs to balance the integrity (or security) of the process with the accessibility of the process, while keeping in mind the need for the solution to be efficient, fair and impartial.

When determining how we should proceed with our network voting review, we ensured that our approach aligned with our organization's core values. Our core values represent our guiding principles and serve as a check and balance system that we use to gauge the validity of new projects and help us clarify and determine direction. We value:

- ***Integrity*:**
  We believe in administering transparent and non-partisan processes that maintain integrity and the democratic rights of all electors.

- ***Accessibility:***
  We believe that the administration of the electoral process must be accessible, open, impartial and characterized by the consistent application of legislation.

- ***Responsiveness and innovation*:**
  We believe that, in administering the electoral process, we must respond to changing needs and encourage innovation.

- ***Accountability:***
  We believe in creating an organizational culture where we understand and live by clear principles of professional and ethical conduct.

- ***Respect:***
  We believe in recognizing and celebrating diversity, building collaborative working relationships based on mutual respect, fairness and equality and demonstrating courteous conduct and communication in all that we do.

- ***Efficiency:***
  We believe that we need to ensure the prudent, effective and efficient use of the public funds with which we are entrusted.

We used our core values as the basis to develop the implementation criteria (or principles) that we would use to evaluate the success of any change to the voting

process. It was necessary to determine a set of well-defined metrics so that we could evaluate the success of any new initiative.

After carefully researching the best examples worldwide of network voting principles, we established, consulted on and accepted the eight principles described below as the criteria we will use to measure the success of any innovation. They reflect what we believe to be the most critical factors in the successful implementation of a network voting solution, and provide the best possible balance of access and integrity. The implementation criteria (or principles) form a reasoned judgment on how to proceed.

Our implementation criteria are:

- **Accessibility:**
  The voting process is equally accessible to all eligible voters, including voters with disabilities. The voting process will be performed by the voter without requiring any assistance for making their selections.

- **Individual verifiability:**
  The voting process will provide means for the voter to verify that their vote has been properly deposited inside the virtual ballot box.

- **One vote per voter:**
  Only one vote per voter is counted for obtaining the election results. This will be fulfilled even in the case where the voter is allowed to cast their vote on multiple occasions (in some systems, people can cast their vote multiple times, with only the last one being counted).

- **Voter authentication and authorization:**
  The electoral process will ensure that before allowing a voter to cast a vote, that the identity of the voter is the same as claimed, and that the elector is eligible to vote.

- **Only count votes from valid voters:**
  The electoral process shall ensure that the votes used in the counting process are the ones cast by valid eligible voters.

- **Voter privacy:**
  The voting process will prevent at any stage of the election the ability to connect a voter and the ballots cast by the voter.

- **Results validation:**
  The voting process will provide means for verifying if the results clearly represent the intention of the voters that participated in the voting process.

- **Service availability:**
  The election process and any of its critical components (e.g., voters list information, cast votes, voting channel, etc.) will be available as required to voters, election managers, observers or any other actor involved in the process.

If the eight implementation criteria identified above are met, then the proposed solution would be one that protects the accessibility, security and integrity of the electoral process. These implementation criteria must be satisfied before we proceed with any future modernization efforts. The development of these criteria comprised the essential first step that was required for us to measure any innovative solution that we may bring forward in the future.

Benefits and Risks of Network Voting

"Implementing Internet voting would require extensive revisions to long-established procedures for voting, counting, monitoring and auditing. It is critical that the general public trusts the security of new voting and counting processes and their ability to deliver a result that is a true and accurate reflection of their will as expressed through the voting process. If Internet voting is not trusted, voters may not accept the legitimacy of the elected members to govern. It is, therefore, very important that trade-offs among electoral principles are considered carefully."[i]

We need to modernize Ontario's electoral process because what has previously served us well is no longer sustainable, but our modernization efforts need to be undertaken in a principled, balanced manner.

As mentioned in the Chief Electoral Officer's message, it is becoming increasingly difficult to recruit and train the 70,000 people required to administer an election since fewer people are either able or willing to be election workers. It is also more difficult to obtain voting locations. Traditionally, schools have served as voting locations. Due to security concerns, however, school boards are increasingly resistant to having polling places in their schools. While our customary locations are becoming harder to rent, we also have stronger requirements to ensure that all voting locations are physically accessible and to remediate any potential physical barriers. These competing demands pose significant challenges, especially in a non-fixed date election environment.

There is a perception that network voting could help to alleviate some of the challenges described above. Our research has found that the potential benefits of network voting include:

- Increased choice for electors in how and when they cast their ballot

  - Voting is more accessible to electors with disabilities[ii].

  - Voting is more accessible to electors who live outside the jurisdiction, such as military voters, students and snowbirds.

- Fast and accurate tabulation is often made possible by network voting – useful for jurisdictions where votes are cast for multiple offices or referenda questions and can replace aging vote counting equipment.[iii]

- Network voting facilitates voting where elections or referenda are held frequently[iv].

- Reductions in the number of election workers and voting locations.

- Cost reductions may be achieved, particularly by jurisdictions that eliminate paper ballots.[v]

- Environmental benefits may result from reduced travel by electors and election officials and less paper is required for poll materials, ballots and staff training materials.

However, there are a number of risks and limitations with network voting that would need to be mitigated before a network voting solution is used in a binding by-election or general election in Ontario. When developing our implementation criteria, we ensured that they addressed the following risks and limitations:

- Security concerns - security breaches that could jeopardize the integrity of the voting process[vi].

- Secure digital authentication mechanisms are not available[vii].

- The possibility of denial of service –whether deliberate or inadvertent[viii].

- Lack of transparency, including for a vote audit or for recount purposes, due to the lack of a paper trail.

- The digital divide – some electors or subgroups of electors do not have equal access to the internet.

- Network voting is costly – particularly when supplementing existing voting channels.[ix]

According to the survey that we conducted following the 2011 General Election, only half of Ontario electors believe that security and integrity can be maintained with internet or telephone voting systems. This is a much lower level of confidence than electors have in the existing electoral process, according to our analysis.[x]

The 2011 Canadian Election Study conducted by Elections Canada reached similar conclusions. Just under half of electors (49.1 percent) agree that "Canadians should have the option to vote over the internet in federal elections". This compares to 39.4 percent who disagree. That said, almost 60 percent of electors indicated that they would be likely to vote over the internet if they could do so. But, 50.3 percent of electors also believed that voting over the internet is "risky".

With any future change to the voting process, we need to be able to balance the responsibility of delivering accessible elections to all Ontarians with a more flexible administrative model that ensures the integrity of the process. A key component of any modernization proposal brought forward in the future would be a strong communications and outreach strategy that would provide detailed information to our stakeholders so that everyone had a clear understanding of the changes being proposed and their impact.

Our research indicated that the communications and outreach materials represent approximately 10 percent of the budget for implementing network voting.[xi] Clear communication to electors is essential as they need to understand that network voting may have different eligibility criteria and voting calendars than other voting methods. An integrated approach to communications that blends traditional and online marketing tactics would be required, along with a dedicated call centre to provide support. The communications materials would need to create awareness and build acceptance for network voting.

Key Findings from Our Research

Beginning in the fall of 2010, we sought out and reviewed extensively the best-practices in network voting being implemented worldwide. A full description of our research process can be found in Appendix 2.

In the section below, we will provide a brief summary of our research, including the development of our business case and our decision not to move forward with our announced pilot project, as well as our key findings as they apply to:

- the municipal experience in Ontario,
- the provincial and federal experiences in Canada,
- relevant international experiences.

Brief Summary of Our Research Process

We conducted internal research and consulted with leading academics and jurisdictions that have employed or studied network voting methods. Part of this

phase of work included holding a summit, in December 2010, where we brought together people from different jurisdictions, many from across Ontario, who have run elections using internet or telephone voting.

We contracted with a consultant with exceptional technical expertise to conduct research and analysis regarding the suitability of network voting technologies for Ontario. Through comprehensive research and analysis, and keeping in mind our core values, the consultant helped us develop the implementation criteria (principles), described earlier in the report, that we would apply against all proposed network voting solutions.

The consultant's research and analysis form the basis of our Network Voting Business Case located in Appendix 5.

Based on the findings of the business case, we secured the service of a second company to assess and develop an end-to-end network voting solution that would match our implementation criteria and fit with our election processes. If a solution was successfully developed, it would be piloted in a by-election. We followed best practices for new technological initiatives, and built several critical pre-determined points in the project at which we would make a decision whether to proceed with a pilot. "Off-ramp" points were dependent on risk assessment, cost, testing, or other assessments, including assessments of the specific electoral district and its geography where a by-election would be held.

In the spring of 2012, taking into consideration the implementation criteria and the possible off-ramp points, the Chief Electoral Officer determined that a pilot project was not feasible in 2012.

In assessing the proposed network voting solution, we determined that proceeding with a pilot project alongside our existing electoral process would be a significant undertaking – both in terms of the front end delivery of the election, as well as the back end technical processes. By evaluating the implementation against our criteria, we determined that it would introduce more complexity and security issues, operational challenges and risk than originally anticipated. It would take time to determine whether these identified risks could be adequately resolved. As such, we did not proceed to the next stage of pilot development.

At that point, we also decided to conduct a more extensive consultation with our key stakeholders to ensure that we had a common understanding of our implementation criteria and the goals of a pilot. For example, we needed the network voting process and solution that we tested to be scalable – could the process used in a single electoral district with approximately 85,000 electors be expanded to 107 electoral districts serving nine million eligible electors? We also needed to ensure that all of our stakeholders had a common understanding of what constituted success in a pilot project. Piloting internet and telephone voting in a by-election could cost close to $2 million and yield only 1,000 votes. We needed to have further discussions with our stakeholders to help them

understand that we would be measuring the success of the pilot against how well it upheld our implementation criteria and not by cost per vote.

In order to allow our stakeholders to provide greater input into our review, in the fall of 2012, we released our business case, implementation criteria and research conclusions and pursued additional consultations to include further perspectives, research and analysis in our report.

To facilitate this process, we developed an online questionnaire and feedback mechanism for the public to provide their views regarding network voting. The public could read our research summary, or request the full Network Voting Business Case for review. In response, we received nearly 150 submissions from the public.

We consulted our Accessibility Advisory Committee, for a second time, seeking additional advice and met with a number of other key provincial stakeholders, again with a focus on our network voting implementation criteria and research conclusions.

As part of this consultation process, we met with representatives from the following groups:

- Accessibility Directorate of Ontario;
- Accessibility for Ontarians with Disabilities Act Alliance (AODA Alliance);
- Advisory Committee of Political Parties;
- Correctional Service of Canada;
- Office of the Information and Privacy Commissioner of Ontario;
- Office of the Corporate Information Officer; and
- Ontario Human Rights Commission.

Our research and consultations demonstrated that, above all, we need to move forward in a principled manner taking methodical, measured steps.

Learning from Other Jurisdictions' Experiences

Throughout our review, we studied how network voting technologies were being used in Ontario, across Canada and around the world. We considered both the adoption and rejection of use, and successful and unsuccessful experiences.

Each implementation reflects the needs, legislation, available technology, and priorities of the jurisdiction. As a result, there is a wide variety of approaches made available to electors. While each is unique, it is through looking at other implementations that we are able to see the opportunities and challenges that network voting could introduce to Ontario's provincial elections.

In the following pages, we will outline the jurisdictions and experiences that we reviewed in some detail, and then use our implementation criteria to examine how elements of other jurisdictions' experiences could possibly apply to Ontario's provincial voting process. Although in this section we highlight specific findings for each jurisdiction, our learning was cumulative and the lessons derived from one jurisdiction also apply to the others. (Please see Appendix 1 of this report for additional information about jurisdictions that we have studied.)

Use of Network Voting Municipally in Ontario

We conducted a review of many jurisdictions in Ontario to gather information about network voting. The review included municipal experiences that ranged from contemplation of network voting to actual implementation for an election.

Ontario municipalities are an obvious choice for this review because, while Ontario's provincial and municipal elections are conducted under different legislative frameworks, the electors in provincial and municipal elections are generally the same. In addition, the geographic and cultural circumstances in which elections are held are the same.

In 2010, 44 of 444 Ontario municipalities offered network voting for their municipal elections.

Under the *Municipal Elections Act, 1996*, the City Clerk has the legislative authority to establish policies and procedures for the conduct of elections, by-elections and referenda. Section 42 (1) of the *Municipal Elections Act, 1996* explicitly states that the "council of a local municipality may pass by-laws,

> (a) authorizing the use of voting and vote-counting equipment such as voting machines, voting recorders or optical scanning vote tabulators;

> (b) authorizing electors to use an alternative voting method, such as voting by mail or by telephone, that does not require electors to attend at a voting place in order to vote."

Each of Ontario's municipal clerks has the authority to establish the policies and procedures that will apply to how the municipal election is conducted in their jurisdiction. As a result, there are a number of variations to how network voting has been deployed across Ontario since each municipality has adopted solutions that reflect their local needs and priorities and there are no common standards for the technology used.

Some municipalities, such as Stratford, entirely eliminated in-person paper ballots, and offered only internet and telephone voting in the 2010 municipal election. All of the information required to cast a ballot (a unique PIN) was mailed directly to the elector in one mail out.

Other municipalities, such as Markham, the largest Ontario municipality to use internet voting, offered the choice to vote by internet only during the advance vote period. Electors wishing to vote online were required to pre-register, at which point their names would be taken off the voters list as that would now be the only way in which they could cast their ballot. Upon registering, electors were prompted to create a unique security question and, shortly after, were mailed a unique PIN. Use of the PIN and the correct response to the unique security question were required before a ballot could be accessed.

Different authentication mechanisms were used in other municipalities, such as Peterborough. In Peterborough, internet voting was offered during the advance vote period. All electors on the voters list were mailed a notice of registration card or letter with a unique elector identifier (EID). To access the online election services electors were required to log in to the system prior to registering, using their EID as well as solving a CAPTCHA challenge. A CAPTCHA challenge is a random test generated by a computer to ensure that the test is being answered by a human being and not an automated system. After registering, voters had the option of having a PIN code mailed or e-mailed to them.

The implementation decisions and experiences of the municipalities described above provide a good representation of the implementation decisions and experiences of all the Ontario municipalities that offered network voting in 2010. Appendix 1 contains a table that provides further information on how each of the 44 municipalities employed network voting in the 2010 municipal election.

The municipal experience provides information that can be used to assess the impact of network voting on voter turnout since a few municipalities have used network voting for multiple elections. For example, Markham used network voting for their 2003, 2006, and 2010 municipal elections. In 2003, Markham's overall voter turnout went down by one-and-a-half per cent. In the 2006 election, voter turnout increased substantially. In the following municipal election in 2010, the number and per cent of online voters declined and overall voter turnout slightly decreased.[xii]

The academic literature supports Markham's experience in suggesting that there are inconclusive results about the impact of network voting on voter turnout. Voter turnout is influenced by a number of factors, many which are difficult to quantify. These include, for example, the competitiveness of the election, candidate campaign mobilization efforts, issues at stake, voter fatigue, and the weather, among other elements that may vary from one election to the next in the same jurisdiction.

Election managers who responded to a post-election survey by the Association of Municipal Managers, Clerks and Treasurers (AMCTO) indicated that they had a fairly high level of satisfaction with network voting after using in to conduct their election. Among those who evaluated network voting, 86% were satisfied with internet voting and 83% were satisfied with telephone voting.

While there were high levels of satisfaction among those who administered network voting, a total of 33 municipalities experienced system delays on election day when servers became overloaded due to hardware problems and higher-than-expected levels of access by election candidates. Electors were delayed in casting their votes during this time. In some cases, voting hours were extended by an hour in order to compensate for the lost time; at least one municipality extended voting for a full day.

According to a statement provided by the vendor to the 33 municipalities "During the heavy load, the system experienced a hardware server error that resulted in the entire load on the system being switched to the redundant load-sharing server A combination of the heavy voting activity and the administrative activity resulted in the system reducing the capacity to process voter activity over a 57-minute period." The vendor apologized for the inconvenience and provided assurances that "the integrity of the vote activity was not compromised and (the vendor) is confident in the official election results."[xiii]

What We Learned from the Municipal Experience

The hardware server error experienced by the vendor raises concerns regarding reliance on vendors to provide critical election related services such as election results accumulation and tabulation. An overreliance on vendors and technology can heighten risks to the electoral process if appropriate mitigation strategies are not in place. We recognize the risks of ceding full control to a vendor and realized Elections Ontario's responsibility to manage potential technology vendors appropriately to prevent those risks from becoming a reality. Part of the risk mitigation would be to ensure proper stress testing and planning. To assist with the management of vendors, common standards may be appropriate to ensure that any technology that is introduced to Ontario's voting process meets consistent and clearly articulated expectations that are aligned to our implementation criteria.[xiv]

The capacity challenges experienced by municipalities in the 2010 municipal elections also raise questions regarding the ability of a system that works in one electoral district in a by-election to function across 107 electoral districts during a general election. The technological infrastructure required to run network voting in a general election would be significantly different from what would be required for a by-election. It is worth noting that several other large jurisdictions such as Toronto and Vaughan have already formally indicated that they will not be pursuing network voting for the 2014 municipal election.

In addition to the scalability question, there are a number of lessons that we can learn from the experiences of Ontario's municipalities when comparing their implementation of network voting to our criteria.

Given our current legislative framework, in order to ensure that a potential network voting solution met our criteria for:

- One vote per voter
- Voter authentication and authorization
- Only count votes from valid voters
- Individual verifiability
- Voter privacy

we would need to implement a solution that had a two-step authentication and verification process to protect integrity and privacy. As presently envisioned, an elector's first step would be to register online. The registration would trigger another piece of mail from Elections Ontario. Only after receiving this second document would the elector have all authentication information necessary to cast their vote.

Network voting for a provincial election or by-election would currently only be available to some electors. For security purposes related to our existing technology infrastructure and election calendar, only those who were already registered with Elections Ontario, whose names appear on the initial voters list, would be eligible and voting would be restricted to the advance voting period.

As a result of our current circumstances, these limitations would be necessary for upholding the integrity of the process and to meet our implementation criteria as described above.

If we return to public expectations that a network voting solution would be more convenient, just as secure and less cumbersome than our current processes, the experiences of many Ontario municipalities indicate that the benefits of network voting may not be as great as predicted. In order to adhere to our implementation criteria and ensure the integrity of the election, at present, network voting would need to be implemented in a way that required electors to take action in advance and vote via a multi-step process. It is possible that technological, legislative or other changes to current circumstances could reduce these limitations in the future. Until then, a review of Ontario's municipal experience leads us to believe that while network voting would improve convenience, this would not be to the degree that might be expected.

Provincial and Federal Experiences with Network Voting

A number of Canadian jurisdictions are interested in examining the feasibility of introducing network voting to their electoral processes. That said, to date, network voting has not been tested in any provincial or federal by-election or general election and only two provinces (Nova Scotia and Ontario) allow internet voting in municipal elections.

In Nova Scotia, Halifax Regional Municipality, the capital city, employed internet voting for municipal elections in 2008 and 2012, adding a telephone option for 2012. With a population of 390,000, it is the largest jurisdiction in Canada to use network voting. In 2008, four municipalities in Nova Scotia offered internet voting in their municipal elections. By 2012, that number had grown, and 15 municipalities offered internet voting.[xv]

In Alberta, the City of Edmonton tested network voting in a mock election and a citizen jury recommended its use for the 2013 municipal election. Edmonton's City Council, however, voted against using internet voting in their municipal election, citing concerns about security and manipulation of the system.[xvi] After the City of Edmonton withdrew its support in February 2013, Alberta withdrew its funding for other internet voting pilots and decided not to proceed with a regulatory change that would have permitted pilots in municipal elections.

In British Columbia, the City of Vancouver requested and was recently denied provincial approval to use internet voting for its municipal election. B.C.'s provincial government then directed Elections BC to establish an independent panel to study internet voting. The panel is currently completing its work, examining opportunities and challenges related to the potential implementation of internet voting for provincial or local government elections in British Columbia.

At the federal level, Elections Canada intended to undertake an internet voting pilot for a by-election called after 2013 (if prior approval was given by Parliamentarians) and has postponed its plans. In explaining its decision, Elections Canada cited budget concerns and stated that it will continue to monitor network voting in other jurisdictions, but it would not pursue its own program until "we have assurances that whatever we want to test will ensure the integrity of the process and the secrecy of the vote." [xvii] In an April 2013 report on compliance with the voting process, Elections Canada indicated that "current Internet voting systems carry with them serious, valid concerns about system security, user authentication, adequate procedural transparency, and preserving the secrecy of the vote. However, evolving technology and societal expectations seem very likely to modify this equation in coming years."[xviii]

What We Learned from Provincial and Federal Experiences

In reviewing the experiences of other provinces and Elections Canada, we can see that Ontario is not the only jurisdiction interested in examining the feasibility of introducing network voting to the voting process. That said, no large Canadian jurisdiction has yet piloted a system. Most jurisdictions have concerns with the security of voting over the internet as technology and legislative frameworks have not yet evolved to fully address integrity concerns.

The implementation criteria that we have developed represent the first step that a provincial jurisdiction has taken to formally state how it would evaluate potential innovations, such as network voting, to the voting process.

International Experiences with Network Voting

We considered the experiences of several other countries, including jurisdictions such as the United States which is an obvious comparator because of our shared geography, Australia since we have a similar electoral system, and others because they are often employed as examples for or against the introduction of network voting.

The United States of America

In the United States, where all levels of elections are run at state or local levels, various internet voting pilots and uses have been developed or undertaken in several jurisdictions, including in Honolulu, Hawaii, the state of Vermont, and for military electors. Although none of these jurisdictions have adopted network voting for general use for the direct election of a state or federal representative, we believe these jurisdictions are still important to consider when assessing the evolution of network voting.[xix]

There have been several high profile occurrences where network voting pilots have been cancelled. In 2010, Washington D.C.'s internet voting pilot project was compromised by a group of four University of Michigan professors and students who, within 48 hours of the system going live, gained near complete control of the election server. The students and professors were able to successfully change every vote and reveal almost every secret ballot. Election officials did not detect the breach for nearly two business days.[xx]

The U.S. Department of Defense has also cancelled internet voting pilots. In 2000, the U.S. Military implemented a pilot project to evaluate an internet voting implementation. A total of 84 votes were cast, and the cost was approximately $62 million dollars. It was considered to have failed to address numerous key security issues. The program was intended to continue in 2004, but a report analyzing the security of the system indicated that there remained a significant number of vulnerabilities. As a result, the project was cancelled with unresolved security issues cited as the primary cause.

Under the *Help America Vote Act*, the U.S. Department of Defense had been researching and analyzing plans for potential internet voting possibilities. In 2012, plans for internet voting by overseas military personnel were cancelled after a

security team audited their $22 million system and found it to be vulnerable to cyber-attacks.

Lobbyists from two separate not-for-profit, non-partisan groups (the California Voter Foundation and Verified Voting) have submitted letters imploring President Barack Obama to refuse requests to implement internet voting. Collectively, these two letters are co-signed by over 50 technical experts and election leaders. These letters outline the vulnerabilities and challenges to integrity posed by the introduction of network voting. Arguing the impossibility of verification without a true paper trail, these groups present a breadth of reasons for the President to be cautious with regard to network voting.[xxi]

Not surprisingly, there are many in the United States who hold opposing views and strongly advocate on behalf of network voting. The U.S. National Defense Committee, for example, issued a news release citing analysis by 17 computer scientists that for very specific groups of electors, in this case, the military, "focused research…could lead to reasonable solutions that are sufficiently secure for use by the military" and can "manage electoral risk by limiting these systems only to military voters."[xxii] Despite such pressures, network voting has not been adopted for general use in elections for state and federal representatives in the United States.

What We Learned from the United States of America Experiences

The American experiences with network voting provide a number of lessons that we should consider when deciding how best to modernize Ontario's electoral process.

First, we will need to extensively test any proposed solution to ensure that it meets our implementation criteria. When conducting these tests, we should consider the value of offering independent, public review and open testing to ensure that Ontarians can be satisfied that we have resolved any potential concerns regarding security, privacy, authentication, and verification.

Second, we need taxpayers to understand the costs involved in testing new technology. The U.S. Department of Defense spent $62 million for 84 votes. In times of fiscal constraint, it can be challenging to find the funds to cover expenditures for innovation. If modernization is to be a priority, then it will require a clear mandate for additional funds to allow for building new infrastructure, conducting tests and communicating with stakeholders.

Third, the American experience demonstrates that offering network voting to a select group of voters may be a feasible first step to test and ensure the security of the voting process.

Australia and the United Kingdom

Given the similarities in our Commonwealth electoral processes, it is useful to examine how countries such as Australia and the United Kingdom have approached network voting.

In Australia, some of its states have made telephone voting available to specific subgroups of electors, with a focus on electors with disabilities. New South Wales successfully implemented remote internet voting for electors with disabilities, those who live a specific distance from their voting location, and electors who will not be in their district on voting day.

Network voting (internet and telephone) is available in New South Wales in the advance vote period. Electors who are blind or have low-vision, who have a disability, who live more than 20 kilometres from their nearest polling place or who will be interstate or overseas on election day can apply and register to vote by internet or telephone until the day before the election. Network voting is not available on election day.

New South Wales' experience with network voting was a success with the vast majority (91 per cent) of respondents to a post-election survey indicating they were either satisfied or very satisfied with the registration process and 96 per cent of users were either satisfied or very satisfied with the way the system worked when casting their vote.[xxiii]

New South Wales also experienced a larger than anticipated take-up rate for their network voting initiative, since they expanded the eligibility criteria to include people who were outside of the jurisdiction on election day. The table below describes the estimated and observed number of people who used network voting in their 2011 State General Election.

Table 1: Estimated and Observed Take-Up Rate for Network Voting during the New South Wales 2011 State General Election, Number of People[xxiv]

Group	Average estimated take-up	Observed take-up	
		Registrations	Votes using Network Voting
People who are blind or vision impaired	7,000	778	668
People with other disabilities	3,300	1,457	1,296
People in remote, rural areas	650	1,830	1,643
People outside of New South Wales	N/A	47,038	43,257
Total	10.950	51,103	46,864

In a survey conducted after the election, a significant percentage of respondents indicated that they believed that network voting eligibility should be extended so that more people could have the choice to use the system. The survey also recommended making the website easier to navigate; making the registration process easier; providing clearer information; fixing technical glitches; and eliminating the paper mail interface.[xxv] The post-election report on the initiative also recommended enhancing the communications strategy to promote the system to raise awareness, encourage participation and generate familiarity with the technology to overcome reluctance to try new ways of casting a vote.[xxvi]

In total, the New South Wales network voting system cost just over 3.5 million Australian dollars (approximately 3.6 million Canadian dollars). While there are some savings that can be achieved from further use of the system, the estimated costs per vote for the same number of users remain fairly similar. The New South Wales Electoral Commission has noted that if network voting were to be used again in another State General Election, with the same number of users, similar costs to those incurred in the 2011 election would be anticipated. This suggests that there are not cost efficiencies to be achieved by using the system for more than one election.[xxvii]

We also reviewed the experiences of the United Kingdom, where pilot projects were undertaken during the previous decade.

In May 2003, the United Kingdom launched the country's largest ever trial of network voting for their local government elections. Over 1.5 million people in 18 local council areas were able to take part in voting trials by text message, internet, electronic kiosk and digital TV.

Overall, although electors enjoyed the convenience of network voting, it had a very minimal affect on turnout. While some jurisdictions experienced voter turnout increases up to 5 per cent, other jurisdictions registered a decline in voter turnout of up to 8 per cent.[xxviii]

In 2007, the United Kingdom tested five different forms of network voting in their local government elections, including remote internet voting, telephone voting and the provision of electronic polling stations enabling a 'vote anywhere' environment on election day.

To vote using network voting, electors were required to complete a pre-registration that, in a subsequent report, the United Kingdom Electoral Commission asserts contributed to a significantly lower proportion of electors using the network voting channels than in previous pilots.[xxix]

The May 2007 pilots proved successful and facilitated voting, although there were some issues concerning accessibility, public understanding of the pre-registration process and, in at least one pilot area, technical problems in relation to telephone voting.

In a review of the pilots, the United Kingdom Electoral Commission found there was insufficient time available to implement and plan the pilots, and the quality assurance and testing was undertaken too late and lacked sufficient depth. The United Kingdom Electoral Commission stated that "the level of implementation and security risk involved [with the pilots] was significant and unacceptable".[xxx]

The United Kingdom Electoral Commission also found that there remain issues with the security and transparency of the solutions and the capacity of the local authorities to maintain control over the elections.

The Commission recommends that no further testing of network voting is undertaken until the following four elements are in place:

- There must be a comprehensive electoral modernization strategy outlining how transparency, public trust and cost effectiveness can be achieved.

- A central process must be implemented to ensure that sufficiently secure and transparent network voting solutions that have been tested and approved can be selected by local authorities.

- Sufficient time must be allocated for planning network voting pilots.

- Individual voter registration must be implemented.[xxxi]

What We Learned from Australia and the United Kingdom

From the United Kingdom, we learned that in order to evaluate success effectively, it is important to allow for enough time to develop a strategic context for approaching network voting. The United Kingdom's experiences demonstrate that six months was not sufficient time for design, implementation and development to take place.[xxxii] It is also necessary to complete controlled testing rather than testing multiple channels and processes. There needs to be a scientific design for pilots and the capacity for analysis. The strategic plan for developing a network voting solution should be made publicly available for consultation to build trust among electors.

We can learn also from the success experienced in New South Wales. When comparing the approach taken by New South Wales to our implementation criteria, we can see how the New South Wales solution struck a balance between the accessibility and the integrity of the voting process. New South Wales was able to introduce a new channel of voting and maintained the integrity of the voting process by:

- following a two-step authentication process,
- only offering the service to a select group of electors, and
- operationally ensuring the method of implementation aligned with already existing voting channels (e.g. they followed the same process to request an internet ballot as their mail-in paper ballot).

We can also learn from New South Wales' experience in determining the costs associated with introducing and sustaining network voting as a permanent voting option. In their post-pilot analysis, New South Wales was clear that the costs associated with developing and using the network voting solution would be consistent with each use of the system.

Estonia

Estonia provides the most well-known example of the adoption of internet voting worldwide, particularly since it is the first jurisdiction to offer internet voting for its national parliamentary elections. In its 2007 parliamentary election, 30,275 out of 940,000 registered voters cast their ballots via the internet.

The network voting system in Estonia was under development from 2002 until 2004, when the final pilot was held. In 2005, the system was used for the first time for local government council elections. In 2007, it was possible to vote online in parliamentary elections. In 2009, the network voting system was used in the European Parliament elections and the local government council elections.

In Estonia, network voting is meant to supplement, not to replace, the traditional methods of voting, and the idea is to give voters the possibility to vote from the location of their choice, without the necessity of going to the polling station. Network voting takes place during advance polls and government-issued ID-cards are used for voter identification. The voter inserts the ID-card into a card reader and enters the voting website. The card contains two digital certificates: one for identification and another for digital signatures. Therefore, the votes are digitally signed with these certificates in order to provide vote integrity. At the vote count, the voter's digital signature is removed before decrypting the vote, in order to provide voter privacy. During advance voting, the traditional means of voting (paper ballots) has priority. Therefore, electronic votes can be "overwritten" by paper votes.

What We Learned from Estonia's Experience

In comparing Estonia's approach to our implementation criteria, the use of a government-issued ID card greatly strengthens the certainty that the solution adheres to all of our criteria: accessibility, one vote per voter, voter authentication

and authorization, only count votes from valid voters, individual verifiability, voter privacy, results validation and service availability.

Our current legislative framework does not provide for a government-issued ID card, and we do not yet have digital certificates to authenticate voters. If either of those options were available in the future, they would have the potential to not only greatly enhance the security of a network voting solution, but also simplify our current voting processes. For example, the database that housed the government-issued ID card information could replace the need for a Permanent Register of Electors for Ontario.

Conclusion

This report acts as the framework that we will employ as we move forward on our principled approach to innovation.

Within it, we present the key findings of our review, including a summary of our research process and the development of our implementation criteria, our business case and an explanation of our decision not to continue with our network voting pilot.

We also outline the key findings of our research into other jurisdictions' implementation experiences and describe how those findings could be applied to our future modernization efforts, including:

- o Identifying the need to overcome capacity challenges by building and supporting the infrastructure required to manage a system for the entire province

- o Appreciating the significant costs associated with pilots and integrating network voting into a general election (more than $2 million per use of the system)

- o Acknowledging the need for a two-step authentication process, given the lack of a government-issued ID card or digital authentication certificate

- o Recognizing the need for independent, open testing of the potential solution to address security concerns

- o Realizing the desirability of linking the potential solution to already existing processes

- o Understanding the value in offering the potential solution to a subset of voters

- o Being aware of the importance of education and outreach to support and promote the potential solution

We also provide an overview of the benefits and risks associated with network voting and examine the assumptions that network voting would be more convenient, just as secure and less cumbersome than our existing processes.

As we discussed earlier in this report, often people assume that introducing a new channel of voting such as network voting will translate to an increase in voter turnout. Our research supports the findings of the City of Edmonton's Issues Guide on Internet Voting which states that, at present, there is

> *"no conclusive evidence that shows introducing Internet voting will have a positive impact on turnout. Internet voting will not fix the problem of voter turnout decline completely –**it is not a solution to the social and political causes of non-voting**. It does, however, have the potential to lower the opportunity cost of voting sufficiently that some electors may be encouraged to participate."[xxxiii]*

We have developed a set of implementation criteria that we will use to measure success that forms the foundation of our measured, disciplined approach to innovation. Our criteria will allow us to effectively manage the modernization of Ontario's election process as we introduce innovation.

We are excited by the role that technology can play in making improvements to Ontario's voting process. Our 2013 – 2017 Strategic Plan demonstrates our commitment to building choice for electors and modernizing the way in which we elect our provincial representatives.

It will take time and resources to modernize, and potentially introduce a new method of voting, but we have taken the first step by clarifying our approach and defining our implementation criteria. While there is not yet a network voting solution that meets our criteria, we will continue to evaluate systems and approaches so that when it is warranted, we are prepared to recommend methods to modernize the voting process.

This report marks the culmination of our research and activity, but should not be viewed as the end of our work on network voting – rather it is the beginning. We will continue to report on our efforts to innovate and modernize Ontario's electoral process in our annual reports.

APPENDIX 1 – Network Voting Experiences in Canada and Around the World

Where and When Researched or Used	System	Authentication	Available on Election Day?	Notes
CANADA				
Ontario				
Ontario municipalities: Population greater than 15,000, 2010	• Internet / telephone voting • Served by several vendors	A split between 1-step and 2-step verification	Predominantly no	13 municipalities with populations over 15,000 used internet and/or telephone voting in 2010*
* Municipalities with populations over 15,000: Belleville (49,454), Brockville (21,780), Burlington (175,779), Clarence-Rockland (23,185), Cobourg (18,519), Huntsville (19,056), Markham (301,709), North Grenville (15,085), Peterborough (78,698), Port Hope (16,214), Prince Edward (25,258), South Frontenac (18,113), Stratford (30,886)				
Ontario municipalities: Population of less than 15,000, 2010	• Internet / telephone voting • Predominantly served by Intelivote	Predominantly 1-step verification	Predominantly yes	31 municipalities with populations under 15,000 used internet and/or telephone voting in 2010**

Where and When Researched or Used	System	Authentication	Available on Election Day?	Notes
**Municipalities with populations under 15,000: Addington Highlands, Augusta, Armour, Arnprior, Brockton, Carling, Champlain, East Hawkesbury, Edwardsburgh/Cardinal, Elizabethtown-Ketley, Greenstone, Hawkesbury, Huron-Kinloss, Laurentian Valley, Leeds-Thousand Islands, McNab/Braeside, Mississippi Mills, Montague, North Dundas, North Dumfries, North Stormont, Pembroke, Perth, Renfrew, South Glengarry, South Stormont, Tay Valley, The Archipelago, The Nation, West Elgin, Whitewater				
Selected Ontario municipalities				
Markham Municipality, 2003, 2006, 2010	Internet	2-step mail-out. Voters must enter PIN and personal passcode to initiate second mailing.	No	Advance voting increased significantly when network voting was introduced; although overall turnout went down, then up significantly, then down again in 2010; and uptake of network voting channels remains at about 6%
Huntsville, 2010	Internet and telephone	1-step. PIN sent via mail must be entered.	Yes, only voting stream offered.	Huntsville has decided to return to paper ballots for the 2014 election.
Peterborough Municipality, 2006, 2010	Internet	2-step mail-out. Voters must enter year of birth along with PIN to initiate second mailing.	No	16.3% of electors voted online in 2010, up from 14% in 2006. Young people who vote are as likely to use this channel as those in their 50s and 60s.
Stratford, 2010	Internet and telephone	1-step. PIN sent via mail must be entered.	Yes, only voting stream.	High-demand on the server resulted in a slowed delivery service, and voting was

Where and When Researched or Used	System	Authentication	Available on Election Day?	Notes
				extended by an hour to accommodate the delays.
Vaughan, 2013	Internet	Not specified.	N/A	Concerns regarding security and integrity, coupled with little evidence to prove increased voter turnout, were cited as reasons to reject the proposal to include internet voting in the 2014 election.
Alberta				
Edmonton, 2012	Internet mock trial	Registration process and uploading of appropriate ID.	N/A	City council rejected the recommendation to proceed with an internet voting implementation.
British Columbia				
City of Vancouver	Internet		N/A	Provincial government refused permission to use internet voting in municipal elections
Nova Scotia				
Halifax Regional Municipality, 2008, by-election 2009, 2012	Internet, telephone	The elector must enter the PIN sent via mail, as well as their date of birth, to access the ballot.	No	

Where and When Researched or Used	System	Authentication	Available on Election Day?	Notes
OTHER COUNTRIES				
AUSTRALIA				
Australia, 2010	Onsite telephone voting.	Provides appropriate ID to election officials. They are then taken to a telephone voting booth by an election official.	Yes.	Available to those who are blind or have low vision. In 2013, this is being expanded to remote telephone voting, and the current status on their website indicates "Voters can telephone the AEC call centre and cast a secret vote from any location, without attending an AEC office. More information about telephone voting including how to register will be available closer to the election."
State of Victoria, 2006, 2010	Onsite telephone, onsite touch-screen kiosk, and mobile voting teams for hospitals and nursing homes.	After being identified by the electoral officers and eligibility verified, the voter was given a smart card with a code inside in order to access a voting kiosk, or a PIN code to access telephone voting.	No.	The preferential voting system does not readily lend itself to the use of the same technology that is used in North America, due to the differences in ballot presentation.
State of New South Wales, 2011	iVote: system is accessed via an interactive voice response-based	Voters provide a 6-digit PIN with their application, and are returned an iVote number that would enable them to access	No.	For electors who identify as having a disability or those more than 20 km from a polling place on election day.

Where and When Researched or Used	System	Authentication	Available on Election Day?	Notes
	phone number or an internet-enabled PC or phone.	the iVote system. Once logged, the votes will be printed out in a central location as completed ballot papers and would then be included in the manual count process.		
BRAZIL				
Brazil, 2012	Biometric voting machines.	Nearly 500,000 electronic voting machines were deployed in Brazil's municipal elections in 2012	Yes.	Brazil's Federal Election Court aims to have every voter in the country use biometric machines by 2018. Approximately 7.5 million of 140 million Brazilian voters used fingerprint-based biometric machines to vote for mayors, vice mayors and local legislators.
ESTONIA				
Estonia, 2002 –present	Remote internet	Electors authenticate via use of their National ID card and home-owned scanning system.	No.	Online voting turnout has steadily increased, with approximately 25% voting online in the 2011 election. 2011 was also the first election to allow for voting

Where and When Researched or Used	System	Authentication	Available on Election Day?	Notes
				through chip-secure mobile phones.
SWITZERLAND				
Geneva, since 2003	Remote internet.	One step mail-out. Electors are sent a voter card, which has a voter card number. Electors enter this number, and after answering "yes" to a reminder about criminal penalties for proxy voting, are granted access to the ballot.	No.	Because of Geneva's direct-democracy system, electors are often called to the polls 4-6 times per year. This frequency drives a demand for elector convenience.
Zurich, 2004, 2009	Internet, SMS, Interactive TV.	Voters receive a registration letter containing a user-ID, a PIN-code, a fingerprint for verifying the validity of the website certificate, and a security symbol for further authentication.	Yes.	Zurich suspended these implementations in 2010, citing technical issues and costs.
UNITED KINGDOM				
Swindon Borough Council, 2007	Remote internet, remote telephone.	Two step mail-out process. Voters would input first PIN, and two unique identifiers (DOB and a self-created PIN). This would initiate second	Yes.	Swindon was the largest of the UK alternative voting trials. In 2007, the UK Electoral Commission discontinued internet and alternative voting trials.

Where and When Researched or Used	System	Authentication	Available on Election Day?	Notes
		mailing with a ballot number. This ballot number, self-generated PIN, and DOB would allow the elector to access their ballot.		
UNITED STATES				
State of Florida, Okaloosa County, 2008	Remote kiosks for overseas civilian and military voters.	Provides appropriate ID to election officials. They are then given a smartcard with their PIN, and may cast their ballots.	No.	This project was referred to as the Okaloosa Distance Balloting Pilot (ODBP).
State of Hawaii, City of Honolulu, 2009	Internet and telephone.	Combination of mail-out and last four digits of Social Security number.	Yes, only voting stream.	This implementation saw a drastic drop in voter participation.
State of Vermont, since 2006	Onsite telephone	Provides appropriate ID to election officials. They are then given an access ID, and taken to a telephone voting booth.	Yes.	This implementation is designed to enable people with disabilities to vote privately and independently at the polling place.
State of West Virginia, 2010	Internet.	The elector was required to submit a Federal Post Card Application (FPCA) or the West Virginia	No.	68 overseas voters and military personnel requested an online ballot. 54 of those ballots were voted and

Where and When Researched or Used	System	Authentication	Available on Election Day?	Notes
		Electronic Voting Absentee Ballot Application. They would then receive an email from either the county clerk or a voting system vendor which contains a username and URL for a website to access the ballot, and could access the ballot using these supplied credentials.		returned.

Appendix 2 – Network Voting Research Process Description

Introduction

In May 2010, the *Election Act* was amended to require the Chief Electoral Officer to review alternative voting technologies and report to the Legislative Assembly by June 30, 2013.

In response, and in line with the Chief Electoral Officer's commitment to modernizing the voting process, we undertook extensive analysis and research on network voting solutions such as internet and telephone voting.

We must always strike a balance between providing electors with accessible, convenient and modern voting options and ensuring the integrity and security of the process. This approach is reflected in our research.

To understand the balance that we sought, it is important to be familiar with how voters in Ontario cast their ballots today. That, in turn, provides context for our research process, including the detailed research we undertook in the Network Voting Business Case.

When reviewing the Business Case, the reader should be aware that the document was completed in the initial phase of our research. While the key principles will shape all future decisions and the research conclusions are still current, specific references to plans for a pilot and associated timelines are no longer applicable, as is explained below.

Voting in Ontario's Provincial Elections

The *Election Act* outlines the methods that electors can use to cast their ballot. Electors currently may vote in one of the following ways, after providing appropriate identification documents:

- In person on election day, by marking a paper ballot by hand or with the assistance of a friend or election official;
- In person at an advance poll, as above;
- In person at the returning office using Assistive Voting Technology, which allows an elector to use a ballot marking device with audio and tactile interfaces to mark the paper ballot;
- In person at the returning office, by writing in the candidate's name on a special ballot or doing so with the assistance of a friend or election official;
- At home, in person, by writing in the candidate's name on a special ballot or doing so with the assistance of two special ballot officers; or

- By mail using a special ballot.

Voting by mail is a recent change. Until the 2011 election, all voting was "supervised" (i.e. all ballots had to be cast in the presence of election officials).

The *Election Act* does not currently permit the use of network voting technology in a general election. However, the Chief Electoral Officer may use section 4.1 of the Act to pilot alternative voting or vote counting methods at a by-election and make recommendations about their use in a general election.

Research Timeline

2010 - Literature review

When the new legislative requirement to formally review network voting came into effect, we were already familiar with network voting issues. We had examined trials by other jurisdictions and analyzed public appetite for network voting in Ontario as far back as the time of our post-2003 General Election report.

To comply with the new requirement, we conducted an extensive review of the significant studies and research papers that have already been produced on network voting. They pertain to theoretical evaluation and the practical experiences of network voting being implemented worldwide. See Appendix 3 for a selection of the works we consulted as part of our ongoing research.

The literature we reviewed, including that written by other election administrators, explores a number of issues and debates, some of which are particularly relevant to Elections Ontario and our goals and challenges.

Since we are already required to offer Assistive Voting Technology (onsite non-networked accessible voting equipment), the research focused on network voting technology.

Consultation – Municipal I-Voting Summit

In December 2010, Elections Ontario hosted a municipal summit on network voting – the Municipal I-Voting Learning Summit. The summit came on the heels of Ontario's 2010 municipal elections in which approximately 44 of the province's 444 municipalities offered internet and/or telephone voting. The summit was an opportunity to learn from those directly responsible for local real-world implementations of both types of voting channels.

The goal of the summit was to hear from election practitioners about their policies, procedures and experiences in running elections using internet and telephone voting. Delegates and observers from municipal, provincial, and federal backgrounds attended the summit.

Representatives from Peterborough, Markham and Stratford were invited to share their experiences with network voting. Presenters outlined:

- Their motivations for implementing internet and telephone voting;
- The varied technical and practical aspects of how their systems worked, including the complexities they encountered in offering new internet or telephone voting channels; and
- Data and cost information.

Technical research and principles / success criteria

In late 2010, we issued a Request for Proposals (RFP) and subsequently contracted with a consultant with technical expertise in the field of network voting to conduct research and analysis regarding the suitability of network voting technologies for Ontario. The consultant's task was to work with us in developing a business case outlining recommendations for at least two well-defined network voting solutions.

The purpose of the business case was to investigate network voting and present the benefits, assess the risks, and estimate the costs of a network voting pilot that would take place in an active by-election setting.

To guide research, analysis and decisions, Elections Ontario developed a set of electoral principles to be applied against all proposed network voting solutions in order to be able to consistently assess all potential options. The key principles – our implementation criteria – are outlined in the report and described in detail in the Business Case.

2011 - Pilot project

Early in 2011, the Chief Electoral Officer indicated his intention to explore the possibility of conducting a pilot of network voting technology in a by-election in 2012.

With a technology-based project of this magnitude and impact, it is best practice to establish points where decisions will be made whether to move to the next phase of the project.

We identified four decision points – potential "off ramps" – for determining the viability of testing a network voting solution in a pilot in Ontario:

- Phase One: Development of a business case;

- Phase Two: Network voting pilot development, including Request for Proposal response/vendor evaluation;
- Phase Three: Completion of User Acceptance Testing (UAT), Systems Performance Testing, Threat Risk Assessment (TRA) and Privacy Impact Assessment (PIA); and
- Phase Four: Assessment of the specific by-election electoral district including its geography.

Assessment at each of these points was to include the following:

- In-depth risk assessment;
- Review of the security of the technical solution;
- Assessment of cost;
- Ability to adequately test; and/or
- Other assessments or reasons.

During each phase, additional information would be available to make an informed decision about whether to proceed to the next phase or not. Our decision points were crucial because unlike some types of pilots, there is no room for error in a network voting project. Only after completion of all four phases would we be in a position to potentially implement a pilot in a by-election in 2012.

Consultation – Accessibility Advisory Committee

Before making decisions about what a network voting pilot might offer to electors, the Chief Electoral Officer consulted with the Elections Ontario Accessibility Advisory Committee regarding the network voting initiative. The Committee had been established in 2010 to advise the Chief Electoral Officer on specific initiatives Elections Ontario could undertake to remove barriers in the electoral process and to increase opportunities available to persons with disabilities.

The Committee recommended that if network voting was offered, it should not be limited to persons with disabilities, but should be made more broadly available. The emphasis in network voting, members advised, should be on "universal design" – the concept proposed by Ronald Mace of designing all products and the built environment to be aesthetic and usable to the greatest extent possible by everyone, regardless of their age, ability, or status in life. This recommendation, as brought forward by the Elections Ontario Accessibility Advisory Committee, was adopted for the proposed pilot project.

Business Case research conclusions

The research we undertook had to assist in determining which, if any, network voting channels might suit the needs of all Ontarians by enhancing accessibility, while providing a sufficient level of integrity in the process.

The research was then used to evaluate the feasibility of conducting a pilot. Potential viable options that could be tested in a pilot were identified.

We concluded that remote computer and telephone voting channels with password authentication were potentially the best fit for Ontario's provincial elections.

Some of the identified integrity issues would be addressed through the following processes designed to support network voting under Elections Ontario's current operational circumstances:

- Only electors on the Preliminary List of Electors would be eligible to register to vote using one of these channels, if they wish to use alternative voting channels.
- Each elector would follow a two-step voter authentication and registration process. Once authenticated, the system would allow the elector to create a self-generated password to use for voting.
- To avoid the risk that electors who use alternative voting technology could be disenfranchised by a system failure, network voting would be available during the advance voting period but would not be available on election day.
- Once the advance voting period commenced, voters who had registered for remote voting could log in to either the voting web site or the telephone interactive voice response system using their secure second Personal Identification Number and self-generated password.
- The voter would cast a ballot by making a selection from an online screen. Voters who use the telephone would make their selections using an automated menu system.
- After voting over the internet, the elector would receive a numerical receipt that would allow them to verify (via a list of the receipt numbers published on the Elections Ontario website) the inclusion of their ballot in the final election results.

Information about the range of available voting channels we evaluated in order to narrow our options to remote internet and telephone voting is available in the Business Case. The Business Case also describes the extensive risk analysis we undertook and outlines how security issues associated with these channels would be addressed through encryption steps.

Pilot development

The Business Case laid out our theoretical assessment of network voting, but it did not identify the precise technology solution or the election processes that would support delivery.

We issued a second RFP to determine if there was a vendor who could help us develop and then deliver an end-to-end network voting solution that would match our principles and fit with our election processes to be piloted in a by-election.

Our objective was to find an appropriate "off-the-shelf" solution. Building our own solution for research purposes, even with the assistance of a vendor, would have been cost and time prohibitive.

We recognized the drawbacks of using a procurement process to develop and deliver a network voting solution. In the absence of agreed-upon universal standards for such solutions, it meant we would rely on vendors to protect integrity to the same degree we ourselves would. Yet, we would still need to allocate staff time and resources to observe and evaluate the pilot development and delivery.

2012 - Pilot project decision

After conducting comprehensive analysis of a suitable networked voting solution for Ontario, the complexities of effectively integrating technology into our election delivery became clear.

In the spring of 2012, taking into consideration the key electoral principles and the possible off-ramp points, the Chief Electoral Officer determined that a pilot was not feasible in 2012. This decision meant we would not complete Phase Two or move to Phase Three of the network voting pilot project research. Accordingly, the pilot timelines referenced in the Business Case are no longer applicable.

While we decided not to proceed at that time, the procurement and pilot development process was a key component of our research.

Public consultation

After we had communicated our decision not to proceed with a by-election pilot during 2012, we released the Business Case, including our principles and research conclusions and pursued additional consultations to include further perspectives, research and analysis in our statutory report.

We had already conducted a public opinion survey following the 2011 General Election, including questions about network voting. While a slight majority of respondents indicated an interest in internet voting at that time, we found that only half of Ontario electors believed that security and integrity can be maintained with network voting systems.

In the fall of 2012, we conducted a public consultation process focused on our network voting principles (implementation criteria) and research conclusions. To facilitate this process, we developed an online questionnaire and feedback mechanism for the public to provide their views regarding network voting. The public could read our research summary, or request the full Business Case for review. In response, we received nearly 150 submissions from the public.

A significant majority of participants agreed with our identified network voting technology principles.

Feedback on other aspects of network voting varied. While the methodology used in the consultation process does not allow us to draw statistically relevant conclusions about the views of the general population, there were some interesting findings. About six in ten of the participants supported network voting channels (internet and telephone voting) before reading our research documents. The remaining participants were either neutral or opposed to the use of these network voting channels. However, after reviewing the research, the number of participants who supported internet and telephone voting increased slightly. At the same time, views polarized slightly – more respondents expressed either strong support or strong opposition to internet and telephone voting.

Although a majority supported internet and telephone voting, many expressed some reservations about the proposed channels. About six in ten participants were concerned about the security of network voting. Half were concerned about the integrity of network voting processes.

Consultation – Accessibility Advisory Committee

We also consulted our Accessibility Advisory Committee. With respect to our network voting principles, Committee members emphasized that security must be the overarching principle for any voting system. They indicated that "perception is reality," meaning that Elections Ontario must emphasize the attention that had been paid to security while developing the principles.

With respect to the Business Case's research conclusions, Committee members recommended that, to support a possible future network voting pilot project, we should continue to explore authentication options. Members were concerned about accessibility challenges for those with visual disabilities that could be posed by the proposed two-step mail-out authentication mechanism.

Committee members, while acknowledging the challenges we faced, also communicated their disappointment with our decision not to proceed with a pilot project at this time and expressed a general eagerness for us to move forward on the initiative.

Consultation – other stakeholders

We held meetings with a number of other key stakeholders, including leading academics, again with a focus on our network voting principles and research conclusions.

As part of this consultation we met with representatives from the following groups:
- Accessibility Directorate of Ontario;
- Accessibility for Ontarians with Disabilities Act Alliance (AODA Alliance);
- Advisory Committee of Political Parties;
- Correctional Service of Canada;
- Office of the Information and Privacy Commissioner of Ontario;
- Office of the Chief Corporate Information Officer; and
- Ontario Human Rights Commission.

In general, these groups agreed that we had identified the appropriate eight network voting principles and that the research conclusions accurately reflected the principles as well as possible, given current available technologies and authentication mechanisms. There was virtually no discussion among stakeholders about utilizing onsite network voting technologies or other voting methods, (e.g., text messaging).

Although all stakeholders acknowledged that the integrity of the vote is a non-negotiable priority, other views were quite varied. Among the views expressed:

- Ontario may not be ready at this time for network voting.
- If a secure authentication mechanism can be found, this may support both integrity and accessibility.
- The possibility of remote digital authentication by a third party should not be eliminated as the Business Case concluded, because other major organizations are working to develop an effective third party mechanism that could become universally available.
- Remote voting robs the electoral process of its public nature and of its sense of community.
- The ability to scrutinize a network voting technology as it tabulated votes would be difficult. What would the role of the scrutineer be – monitoring by candidates and their representatives – if network voting was implemented?

- If telephone voting uptake is typically limited, it may not be necessary to include the telephone option, given the additional security risks associated with that option.
- A pilot should be undertaken soon, as a step towards a more accessible voting process for all Ontarians.
- Change happens incrementally. While the approach outlined in the Business Case is not optimally convenient, the approach should proceed nonetheless.
- Over time, steps should be taken towards a more universal design.
- From an accessibility perspective, the articulation of an end goal – the description of what we are working towards in terms of using technology – is as vital as taking steps towards the goal.

There was no consensus among key stakeholders about whether or how to proceed with respect to implementing network voting. Some recommended that we should proceed rapidly. Others suggested proceeding with great caution. Some advised against implementing network voting entirely.

APPENDIX 3 – SELECTED WORKS CONSULTED

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Appendix 4 – End notes

[i] Elections BC. *Discussion Paper: Internet Voting,* p22.
[ii] For example, Australian telephone voting
[iii] In municipalities, as in other jurisdictions where each elector casts multiple votes (e.g., for mayor or reeve, councilor, school board representative, referenda or initiative questions), an electronic voting channel can facilitate tabulation. In the U.S., there are also multiple votes cast at any one time.

[iv] For example, Swiss cantons
[v] For example, Stratford, Honolulu
[vi] For example, Vaughan, Huntsville, Edmonton. Edmonton recently completed a trial implementation of internet voting, where electors were invited to vote online for their favourite colour of jellybean. On the basis of this trial, a citizen panel recommended to city council that they proceed with plans for internet voting in the upcoming election for the city of Edmonton. However, the city council rejected this recommendation, citing concerns regarding security.
[vii] For example, Vaughan; concerns raised by McAfee
[viii] Vaughan and others citing the denial-of-service experience faced by the NDP during its 2012 leadership election.
[ix] For example, Vaughan; U.S. military
[x] Ipsos Reid was contracted to conduct public opinion surveys on our behalf following the 2011 General Election. Nine out of ten respondents (90 per cent) thought we did a good-to-excellent job of organizing the voting process. A large majority of respondents (81 per cent) also believed that Elections Ontario, the independent provincial agency responsible for managing provincial elections, is an unbiased organization. As such, we know that they think we are doing a good, unbiased job of administering elections.

To date, our public opinion surveys have not asked electors directly about their trust in the outcome of Ontario's electoral process. However, if we compare our public opinion survey findings to those of Elections Canada, our federal counterpart, we see parallels that we believe would apply generally to our provincial situation. Elections Canada surveyed Canadians after the 2011 federal election. They found that a great majority (90 per cent) felt that Elections Canada ran the 2011 federal election fairly. This is similar, though with a slightly higher percentage federally than provincially; to Elections Ontario's 81 per cent response indicating Elections Ontario is an unbiased organization. With respect to trust, the large majority of federal respondents (87 per cent) expressed high levels of trust in the accuracy of election results in their riding.) Assuming there is a link between believing the election administrator is unbiased and trusting the accuracy of election results, we believe that Ontarians trust the accuracy of election results in provincial elections.

[xi] Elections Ontario – Municipal I-Voting Summit.
[xii] Markham's Internet Voting Experience in 2003, 2006 and 2010*

Year of election	Number of electors voting online	Per cent of total electors voting online	Per cent of total electors who voted in advance polls (including online)	Per cent of eligible electors who voted (voter turnout)	Per cent change in voter turnout compared to previous election
2003	7,210	4.6	6.5	28.0	(- 1.5)
2006	10,639	6.3	9.3	37.9	(+ 9.9)
2010	10,597	5.7	8.9	35.5	(- 2.4)

Compiled by Elections Ontario with data from Town of Markham and Froman, "Democracy Online: Can IMC Stimulate Disenfranchised Voters?"

[xiii] Zajak. "Technical snags won't be repeated: Intelivote."

[xiv] Goodman, *Issues Guide: Internet Voting,* p.12.

[xv] Goodman, *Issues Guide: Internet Voting,* p.23.

[xvi] CBC news. *Edmonton turns thumb down on internet voting*. .

[xvii] *Election Administration Reports*. April 15, 2013. Vol.43, no. 8, p.5.

[xviii] Elections Canada, 2013. *Compliance Review: Final Report and Recommendations – A Review of Compliance with Election Day Registration and Voting Process Rules* .

[xix] Some military voters transmit their ballot by e-mail, but this method is not included in the concept of internet voting.

[xx] Wolchok, "Attacking the Washington, D.C. Internet Voting System"

[xxi] Alexander et al. *Election Reform and Verification Letter to President Obama*; Simons et al. *Letter to President Obama.*

[xxii] National Defense Committee. *17 Computer Scientists: Invest More in Military Internet Voting.*

[xxiii] Allen Consulting Group. *Evaluation of Technology Assisted Voting Provided at the NSW State General Election March 2011: Report to the New South Wales Electoral Commission*, p.39.

[xxiv] Allen Consulting Group. p.26.

[xxv] Allen Consulting Group. p.43.

[xxvi] Allen Consulting Group. p.vi.

[xxvii] Allen Consulting Group.p.47.

[xxviii] United Kingdom Electoral Commission. 2005. *Securing the Vote*.

[xxix] United Kingdom Electoral Commission. 2007. "Key issues and conclusions: May 2007 electoral pilot schemes."

[xxx] United Kingdom Electoral Commission. 2007.

[xxxi] United Kingdom Electoral Commission. 2007.

[xxxii] Carleton University. "Internet Voting: What Can Canada Learn? Internet Voting Workshop Summary of Proceedings". p.5.

[xxxiii] Goodman *Issues Guide: Internet Voting.* p. 20.

Supplementary document available online under the Publications section of our website or in hard copy upon request:

Appendix 5 – Network Voting Business Case