Appendix A

Comprehensive Risk Assessment and Jurisdictional Analysis of Alternative Voting Methods, Including Online Voting Standards

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Voting Standards

Unlike other countries or jurisdictions, the use of digital technology in Ontario municipal elections remains largely unregulated. There is no comprehensive legal framework governing its implementation, oversight, or verification processes. All responsibility for managing, securing, and verifying digital voting systems falls solely on election administrators and the private vendors providing the technology. This creates significant challenges, as the existing legislation is not up to date with the complexities of modern digital election systems, leaving gaps in areas such as cybersecurity, transparency, and auditability. Without clear regulatory guidance, municipalities must rely on their own discretion and vendor assurances, which can lead to inconsistencies and potential risks to the integrity of the electoral process.

The Digital Governance Standards Institute is in the final stages of establishing and approving voluntary online electoral voting standards for use in Canadian municipal elections. Developed by the Institute's Technical Committee—comprised of thought leaders and experts in cybersecurity, political science, and public policy, and election administration and vendors—these standards specify technical design requirements for online voting services and outline best practices for election administrators. The goal is to address concerns around the consistency of online voting implementation, the integrity of the vote, ballot privacy, and system auditability. While the development of these standards is a positive step in the right direction, and can address issues around uniformity and accountability, it's important to remember that they remain voluntary, and there is still no legal framework for the verification of online voting systems. Final approval of the standards is expected by early 2025.

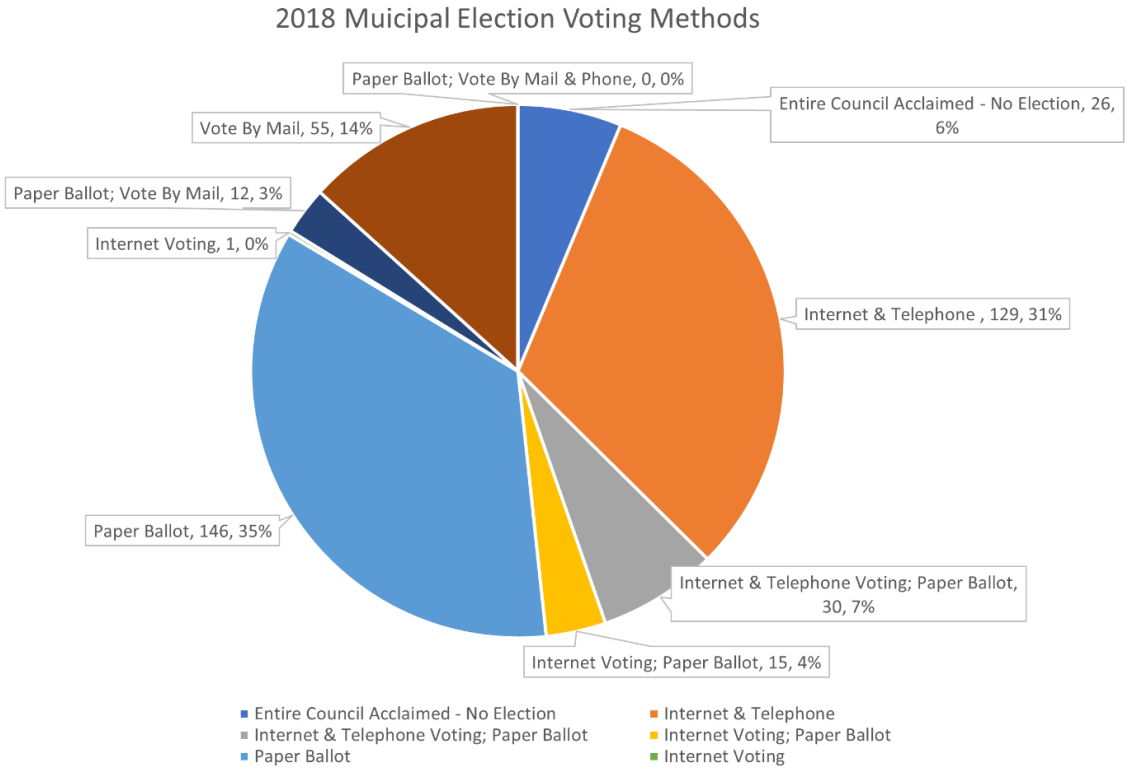
The introduction of online voting standards, new authority over the voters' list, and enhanced mechanisms for verifying results are helping Ontario municipalities become better equipped to explore the potential benefits of online voting while safeguarding electoral integrity. Such measures help to mitigate risk exposure and prevent or limit incidents from occurring. However, research indicates that a significant gap in available data on online voting persists. This lack of data may lead to an overdependence on the standards themselves, highlighting the need for more comprehensive research and evidence to fully understand the impact and effectiveness of online voting systems.

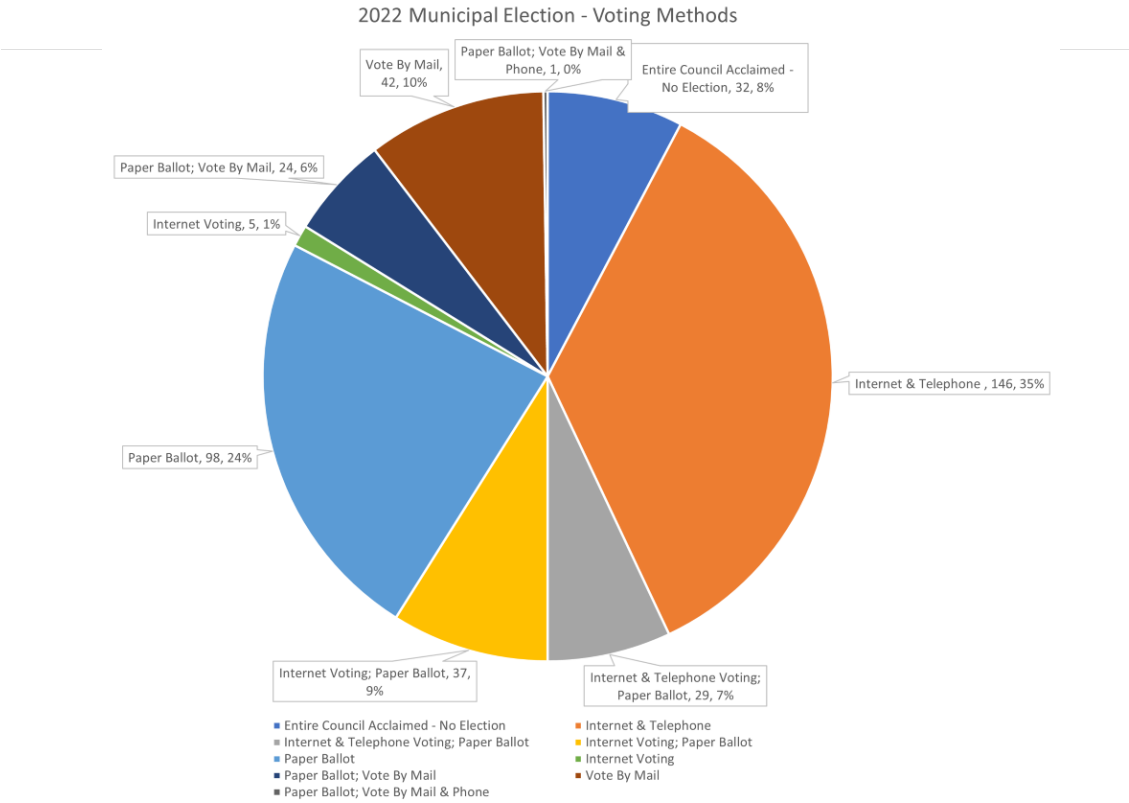
Ontario Jurisdictional Benchmarking

The way voters cast their ballots is increasingly shifting toward technology-based methods. At the municipal level, several cities have been early adopters of online voting, most notably the City of Markham. Since introducing online voting in 2003, overall voter turnout in Markham has remained stable and comparable to other Ontario municipalities. However, the growing percentage of voters casting ballots online demonstrates that clear preference for the convenience and accessibility of internet voting as it remains a reliable option during advance polls and on election day.

Since first adoption within Ontario, digital voting methods have seen widespread adoption across Ontario and Canada. According to the Association of Municipal

Managers, Clerks, and Treasurers of Ontario (AMCTO), more municipalities used online voting in 2022 compared to 2018. In the 2022 Ontario municipal elections, 217 municipalities employed internet, phone, or a combination of both methods—an increase of 42 from 2018.





The following chart provides a detailed comparison of voting methods used by municipalities with over 50,000 eligible electors in the 2022 municipal election, highlighting trends and differences.

Municipality	**Eligible Electors**	Paper	Mail	Phone	Internet	Home Vote
Toronto	1,930,813	Yes	Yes	No	No	No
Ottawa	722,227	Yes	Yes	No	No	No
Mississauga	491,260	Yes	No	No	No	No
Hamilton	405,288	Yes	Yes	No	No	No
Brampton	354,884	Yes	No	No	No	Yes
Vaughan	225,983	Yes	No	No	Yes	Yes
Markham	220,234	Yes	No	No	Yes	Yes
Kitchener	171,025	Yes	No	No	No	No
Oakville	144,970	Yes	No	No	No	Yes
Burlington	142,218	Yes	No	No	Yes	No
Greater Sudbury	119,418	Yes	No	No	Yes	No
Guelph	104,612	Yes	Yes	No	No	Yes
Whitby	102,618	Yes	Yes	No	No	No
Barrie	102,379	No	No	Yes	Yes	No
Kingston	96,204	Yes	No	No	Yes	No
Ajax	85,443	No	No	Yes	Yes	No
Thunder Bay	83,010	Yes	No	No	Yes	No
Milton	80,367	Yes	Yes	No	No	No
Pickering	76,021	Yes	No	No	Yes	No
Brantford	75,305	Yes	No	No	Yes	No
Niagara Falls	68,201	Yes	Yes	No	No	No
Sarnia	54,148	Yes	No	No	Yes	No

Despite the growth in digital voting, trends suggest that the adoption of online voting among larger municipalities is still somewhat limited. Many of Ontario's largest municipalities opted not to offer online voting in 2022, citing security and accessibility concerns. For example, the City of Toronto refrained from adopting online voting due to concerns about ensuring security and accessible voting options for all residents. Similarly, the City of Greater Sudbury, which offered only online voting in 2018, brought back paper ballots in 2022 after experiencing vendor-related bandwidth issues that disrupted voting in the 2018 election. The City of Guelph offered online voting in 2014 and 2018, but City Council did not approve it for 2022 due to vendor-related bandwidth issues in 2018. For the 2026 election, staff recommended mail-in and vote-from-home methods; however, Council approved internet voting as an alternative method, contingent on all security requirements and testing meeting the City Clerk’s satisfaction.

The experiences of these jurisdictions have provided valuable insights into the benefits and challenges of online voting, including issues related to security, accessibility, and voter confidence. Security concerns, including the risks associated with unsupervised voting, such as coercion and maintaining the secrecy of the vote, are primary reasons for larger municipalities' hesitance. These concerns extend beyond technical security to ensuring voters can vote independently and privately.

Despite these challenges, municipalities like Markham, Vaughan, and Thunder Bay have reported positive feedback from voters about the convenience and ease of online voting. AMCTO's 2022 Post Election Survey indicated increased voter confidence and satisfaction with online voting systems in municipalities that adopted the method, suggesting that convenience plays a significant role in fostering trust in the process.

Provincial and Federal Voting Practices Review

While several provincial election bodies in Canada provide mail-in voting options to eligible voters who request them, currently none offer online voting in provincial elections. While some municipalities, such as in Ontario and Nova Scotia, use online voting at the local level, provincial elections remain more cautious, primarily due to concerns about security, integrity, and accessibility.

As of October 2024, Alberta's Bill 20 – Municipal Affairs Statutes Amendment Act, 2024 has been introduced but is not yet fully enacted. The proposed changes to the Local Authorities Elections Act aim to add greater transparency to and trust in local election processes, with one of the changes being the prohibition of automated voting equipment, such as vote tabulators, in municipal elections. While parts of the bill have been reviewed and discussed, it is still under analysis, but this bill signals a shift towards traditional voting methods due to concerns over the integrity and reliability of electronic voting systems. This legislative move highlights the ongoing debate and cautious approach towards digital elections across different levels of government in Canada.

Élections Québec recently ended its internet voting pilot project, which was planned for the 2025 municipal elections. The decision was made after none of the vendors could meet the institution's strict security and reliability requirements. Élections Québec remains open to exploring online voting in future elections, potentially in 2029.

Federally, Elections Canada has explored online voting but has not moved forward due to concerns about security, voter privacy, cyberattacks, and maintaining public trust. While they have studied trials in other regions and a 2016 report highlighted the potential benefits for increasing voter turnout and accessibility, particularly for Canadians living abroad or in remote areas, Elections Canada remains cautious. Currently, there are no formal plans for implementation, and Ottawa is not considering any guidelines, as federal votes continue to be cast on paper.

Internationally

Internationally, the implementation and use of online voting have seen varied levels of adoption and success. Estonia is a pioneer in this field, having implemented online voting in 2005 and allowing citizens to cast their ballots online in national elections. This system has been credited with increasing voter turnout and providing a convenient and secure voting option. Estonia's success with online voting is largely due to its advanced digital infrastructure and the widespread use of electronic identification (eID) cards, which allow citizens to securely verify their identity and cast ballots online, ensuring voter authentication and anonymity. The system, supported by robust cybersecurity measures, has contributed to increased voter turnout and accessibility. Estonia's eID system addresses key concerns around security and has been critical to the smooth functioning of online voting.

Switzerland has also experimented with online voting in various cantons (regions), focusing on enhancing accessibility for citizens living abroad. While the list of countries who have adopted online voting or trialed its use is growing, only a small number of countries, 15 in total, have used or use online voting, with most offering it at the regional or subnational level.

Other countries, like the United Kingdom and Germany, have conducted limited trials but have not fully implemented online voting due to concerns about security and voter integrity. These countries paused their initiatives after identifying technical vulnerabilities. For example, New South Wales in Australia experienced bandwidth issues during two elections, similar to the issue experienced by many Ontario municipalities in the 2018 election, and has since paused its online voting efforts, highlighting the complexity of maintaining secure systems.

While online voting systems have shown potential for improving accessibility and convenience, they also face significant challenges, which include balancing the benefits with concerns about cybersecurity and maintaining public trust in the electoral process.

Benefits and risks associated with online voting

Online voting offers significant benefits in terms of accessibility and convenience for voters, particularly for those facing barriers to traditional in-person voting, such as students or travelers. While research has not conclusively shown that online voting directly increases voter turnout, it can expand access, enhance voter privacy, reduce spoiled ballots, and improve overall efficiency. The shift toward online voting also aligns with broader technological trends aimed at improving efficiency and potentially reducing environmental impact by minimizing paper use.

While no voting method is without risk, online voting presents a unique set of risks and challenges. Election officials may encounter reduced control and increased exposure to vulnerabilities such as voter authentication issues, cybersecurity threats, reliance on third-party vendors, and the need for voter technical support. These risks are particularly concerning and challenging in unsupervised voting environments, where direct oversight is limited. Additionally, digital literacy barriers and the potential spread of

misinformation further complicate the landscape. Recently, a well know election systems vendor chose to focus exclusively on in-person and mail-in ballot solutions, emphasizing security and reliability in its services.

Modern cybersecurity measures, including encryption, multi-factor authentication, and audit trails, have enhanced the security of online voting systems. Nonetheless, careful planning and collaboration with vendors are essential to managing risks. Ensuring vendor compliance with established standards, conducting comprehensive voter outreach and education, and coordinating and consulting with ITS, Finance, and Legal departments to monitor compliance are critical steps in mitigating potential vulnerabilities. Additionally, sound communication strategies to combat misinformation are vital for maintaining the integrity of the online voting process.

Drawing on the insights and experiences of other jurisdictions can further strengthen efforts to mitigate risks and establish a more secure and reliable online voting framework.

Financial Impact

Financially, online voting may lead to cost savings over time by reducing the need for physical voting locations and ballot printing, but these savings are only realized when it is offered as a standalone method, not as an option alongside traditional in-person voting. Vendors estimate that the cost of online ballots in Canada would be around $1 to $1.50 per elector at the federal level, excluding additional expenses like voter notification cards. Offering online voting as an additional voting method to in-person voting significantly increases costs, as municipalities must still maintain in-person voting infrastructure. This limits financial benefits, as the resources for managing security vulnerabilities, technical challenges, and system support go beyond the vendor-provided solution.

The City of Ajax serves as a notable example. In 2018, Ajax adopted online voting as its sole voting method, which allowed it to streamline costs by eliminating the need for paper ballots and physical polling stations. By contrast, municipalities offering both online and traditional voting bear the full cost of both methods.

Cost estimates for the implementation of a vendor-hosted online voting service for a municipality with approximately 150,000 electors are projected to start at $225,000, based on federal level vendor estimates. This figure does not include ancillary expenses, such as training for election staff, outreach and communication strategies to inform electors, and the provision of internal staffing support. These additional costs are essential for the smooth deployment and effective use of the online voting system. Final costs would need to be confirmed through a competitive procurement process, which would allow the municipality to assess and compare bids from qualified vendors.

Online Voting Risk Assessment

Implementing an unsupervised alternative voting method such as online voting introduces several risks that must be carefully managed to maintain the integrity and security of the electoral system. This assessment identifies potential risks and proposes mitigation strategies to address them.

1. Risk Identification:

   Categories: Technical, Operational, Legal and Regulatory and Standards Compliance
   Standards Compliance: Risks associated with non-compliance with established industry standards (if applicable) that could impact system integrity and public trust.

2. Risk Assessment: **Likelihood** and **impact** of risks.

   Low Impact: Minor issues with minimal effects on system integrity; unlikely to undermine public trust.
   Medium Impact: Could affect reliability, security, or accessibility; may erode public confidence and require significant resources to resolve.
   High Impact: Severe threats to electoral integrity, security, and legitimacy, requiring extensive resources to mitigate and protect public trust.

3. Risk mitigation:

   Control Measures:
   - Use strong encryption and security protocols.
   - Conduct testing and simulations.
   - Offer comprehensive voter education and support.
   - Implement multi-factor authentication.
   - Adhere to established standards, if applicable.
   - Ensure that the system complies with accessibility standards.

   Contingency Plans:
   - Prepare for system failures or disruptions.
   - Develop cybersecurity response protocols.
   - Designate a support team for technical assistance.

4. Risk Monitoring and Review:
    - Regular system monitoring, security audits, and updates.
    - Periodic review of the risk assessment to address changes in technology, regulations, or other factors.

Identification	Risk Description	Likelihood	Impact	Risk Mitigation	Strategies
Technical risk	Security vulnerabilities in the online voting platform. Including data breaches leading to unauthorized access or manipulation of voter information.	☒Low ☐Medium ☐High	☐Low ☐Medium ☒High	☒Control ☐Contingency	• Adherence to standards • Robust vendor selection through competitive procurement process • Pre-testing of any system or process to implementation • Education and training to any staff involved in managing and coordinating this process • Evaluating most appropriate period(s) to offer this additional channel
Technical risk	Potential for system downtime or technical glitches during voting periods. Including URL not working for voters, application down, network congestion.	☐Low ☒Medium ☐High	☐Low ☒Medium ☐High	☒Control ☒Contingency	• Adherence to standards • Robust vendor selection through competitive procurement process • Establish service response levels with vendor • Additional voting methods offered (in person and home vote program) • Evaluating most appropriate period(s) to offer this additional channel

Identification	Risk Description	Likelihood	Impact	Risk Mitigation	Strategies
Technical risk	Voter authentication (unsupervised voting)	☐Low ☒Medium ☐High	☐Low ☒Medium ☐High	☒Control ☐Contingency	• Adherence to standards • Adherence to established election policies and processes • Robust vendor selection through competitive procurement process • Multi-factor authentication • Robust voter outreach, education, and communication strategy • Use of voter information centres
Operational risk	Insufficient training and support for voters to navigate the online voting platform.	☒Low ☐Medium ☐High	☒Low ☐Medium ☐High	☒Control ☒Contingency	• Establish service response levels with vendor • Robust voter outreach, education, and communication strategy • Use of voter information centres • Additional voting methods offered (in person and home vote program)
Operational risk	Difficulty in ensuring the secrecy and confidentiality of votes cast online.	☒Low ☐Medium ☐High	☐Low ☒Medium ☐High	☒Control ☐Contingency	• Adherence to standards • Adherence to established election policies and processes • Robust vendor selection through competitive procurement process
Operational risk	Challenges in verifying the eligibility and authenticity of voters in an online environment.	☐Low ☒Medium ☐High	☐Low ☐Medium ☒High	☒Control ☐Contingency	• Adherence to standards • Adherence to established election policies and processes • Robust vendor selection through competitive procurement process

Identification	Risk Description	Likelihood	Impact	Risk Mitigation	Strategies
Operational risk	Limited accessibility for voters with disabilities or those with limited internet access.	☒Low ☐Medium ☐High	☒Low ☐Medium ☐High	☒Control ☐Contingency	• Robust voter outreach, education, and communication strategy • Additional voting methods offered (in person and home vote program) • Use of voter information centres
Legal and regulatory risk	Legal challenges related to the validity and integrity of online voting results.	☐Low ☒Medium ☐High	☐Low ☐Medium ☒High	☒Control ☐Contingency	• Strong and defensible election policies and processes • Robust vendor selection through competitive procurement process • Implement and apply lessons learned from past court challenges
Legal and regulatory risk	Ensuring transparency and accountability in the online voting process.	☐Low ☒Medium ☐High	☐Low ☐Medium ☒High	☒Control ☐Contingency	• Adherence to standards • Adherence to established election policies and processes • Robust vendor selection through competitive procurement process • Robust voter outreach, education, and communication strategy • Use of voter information centres