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Identifying Challenges and Advantages of Internet Voting and Assessing the Impact on Voters Turnout in Municipal Elections

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**Identifying Challenges and Advantages of Internet Voting and Assessing the Impact
on Voters Turnout in Municipal Elections**

Subject Keywords: Online Voting, Municipal Elections, Elections, Policy Making

Geographical keywords: Markham, Kawartha Lakes, Halifax, Estonia, Canada

MPA Research Report

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ABSTRACT

The paper identifies obstacles, opportunities, and more significant potential for elections through e-voting. The study uses literature review and statistical data assessments of e-voting in Ontario municipal elections to identify the impacts of e-voting on voter turnout. The research's anticipated findings show e-voting presents substantial challenges for governments, including privacy and data protection and constantly updating policies to keep up with evolving technologies. The challenges must be addressed while maintaining voters' privacy and trust in the voting processes. The research provides literature and recommendations for further research on e-voting in the municipalities that will support developing a strategy ensuring a feasible electronic voting process.

ACKNOWLEDGMENTS

The paper is the final assignment which completes the requirements for the Master of Public Administration at Western University and ends my journey as a graduate student. The past year has been an important journey in my academic life, and I will remember this incredible experience for the years to come. Being a full-time student, working, and supporting a family simultaneously was challenging, but it has better prepared me to face obstacles as a student, employee, and person. I want to thank the many people and institutions whose assistance made my graduate study and this project possible. I thank all the lecturers, course instructors, and my research supervisor Kane X Faucher at Western University, whose suggestions and comments improved the paper's calibre. I would also like to express my gratitude for Dr. Joseph Lyons's capstone course, Issues in Local Government, which gave me the chance to receive enlightening and helpful comments on the final research project.

I would also like to thank my parents; their constant support encouraged me to continue my education toward an MPA when I almost gave up on my goal of graduate studies. Without my family's sacrifices and the ongoing support of Sumemra Katawazy, this would not have been possible. I am grateful to my wife, Summera, merely saying a "thank you" for everything she has done would not be sufficient; you genuinely deserve much more than a thankyou. I'm hoping I can make up for the sacrifices you've made someday. Finally, I hope my research will help define the future of electronic voting, improve the process's standard in municipal governments, and create a framework that can be used across all municipalities.

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LIST OF ABBREVIATIONS

IDEA	Institute for Democracy and Electoral Assistance
AMO	Association of Municipalities of Ontario
MEA	Municipal Elections Act
PIPEDA	Personal Information Protection and Electronic Documents Act

INTRODUCTION TO STUDY

Electronic voting is generally defined as a ballot cast using the internet. According to the international institute for Democracy and Electoral Assistance (IDEA), electronic voting is a system where casting, counting, and recording votes in political elections and referendums involves information and communication technologies. The former methods to predict the outcomes of elections were conducting in-person surveys that came with high costs, were time-consuming and required lots of other resources, including manual labour to vote to count. There are three different types of internet voting: supervised online voting, which takes place at a polling place; unsupervised kiosk internet voting, which typically occurs when voting kiosks are installed in public locations like libraries so that members of the public can cast their votes; and remote internet voting, which can be done from any location. Democratic Institutions, (2017).

According to the AMO (2018), the number of voters in the 2018 municipal election declined from 43.12 percent to 38.3 percent compared to the 2014 municipal election. Suppose the government does not address the declining voter turnout. In that case, it can jeopardize the elections and their process, and the political parties and the voters may question whether we have fair policies. To increase voters' response, the government made amendments to bylaws that no longer required the voters to visit the polling place in person according to (Municipal Elections Act, 1996).

The Act permitted citizens to vote by mail or phone, contributing to higher voter turnout. It will also encourage voters who otherwise could not cast their votes due to constraints such as time and accessibility. Before e-voting, the voters had to visit the polling stations to cast their votes, and election administrators had to count each vote

manually or scan the voters' ballots to get the outcomes of the elections. However, with the advancing technological improvements, traditional elections are changing. Election administrations at certain municipalities have adopted e-voting to operate more efficiently and transparently when dealing with voting results. It also engages voters to cast their votes with a few mouse clicks. The process, as a result, is much faster, more accurate, less costly, and more effective. However, internet voting also brings with it a new set of challenges.

Purpose of the Paper:

The research aims to identify limitations, including public policy, voter privacy, and other factors that discourage the use of e-voting in elections and understand the impact of e-voting on voter turnout. Some research has been done to explore the privacy risks to voters associated with e-voting. I will review Ontario's privacy laws guidelines and gather literature data to understand the perspective of voters, administrators, and political parties to address the challenges, identify gaps, and determine whether e-voting leads to higher voter turnout. We already know through previous research conducted in this area that there are policy lacks and an absence of universal frameworks. This paper will research the missing knowledge about why some municipalities choose e-voting despite the lack of a clear framework and policies targeting voters' privacy. My hypothesis in this research is that electronic voting enhances the voting process and encourages voters who otherwise may not vote. They are encouraged to vote because electronic voting provides an alternate mode of voting, which is more convenient and efficient.

The research examines whether the limitations are due to outdated rules regarding evolving technologies, fiscal constraints, or voter resistance to change. This paper will also assess the procedures taken to protect voters' privacy and the municipalities that have considered electronic voting, how successful they have been, and how the political parties are processing, collecting, and protecting the voters' information. Besides privacy, there are other challenges to electronic voting; the challenges include voter authentication, which cannot be done as the voter information and whom they voted for must remain separate because of the nature of the election for confidentiality reasons. Traditionally there is oversight of the election process by the political parties and the election administrations when the voters cast their ballot at the polling station. However, with electronic voting, we lose access to the traditional oversight by the candidates and the election administrations, who ensure that the process is fully transparent.

Structure of the Paper:

The paper has two parts. The first part of the paper provides information on the background, significance, and literature review on challenges and opportunities. The first half of the paper also provides an overview of online voting in Canada, focusing on the municipal experiences of Markham, Kawartha Lakes and Halifax and then looks at the international pioneer of Internet voting and how they have managed to implement the practice successfully. The second part discusses the findings and data analysis, mainly identifying the impact of internet voting on voter turnout. The final section of the paper provides conclusions, recommendations and limitations of the paper.

BACKGROUND

The fundamental right of citizens in any democracy is the right to vote, which is the cornerstone of democracy. The Constitutional Act of 1867 explicitly states that elections are a local concern until the parliament determines differently. The municipal election procedure is still a matter overlooked by the local government. Elections have been victims of fraud and other unfair practices since the beginning of the elections in the early days; over time, the process has evolved and improved to enhance the practice. According to the elections act, the ballots and voting information cannot be disclosed publicly, which is a significant improvement over the early elections where ballots were initially not secret that stirred many problems. However, Voter secrecy remains a challenge with online voting.

According to Election Canada, E-voting has only been practiced in municipal elections in Canada, while federal elections are still practiced with paper ballots. Internet voting was first implemented in Markham as a trial in 2003, in Kawartha Lakes in 2005, and in the municipality of Halifax in 2008. Online voting is relatively new in Canada. The municipality of Markham introduced online voting to provide more options for the voters to cast their vote and increase the services for the electoral. The municipality also hoped online voting would encourage voters who otherwise might not vote, increasing the overall voter turnout and making it more accessible to the disabled community. Finally, the city believed online voting would result in better tabulation and accurate vote counting, saving time and resources. The key objective of most of the city was to increase voters' engagement and provide better services to the electoral process.

Municipal Elections and Online Voting:

The Municipal Elections Act (MEA) authorizes municipalities in Ontario to use alternative voting methods beyond paper ballots and with similar provisions in Nova Scotia. Currently, many municipalities have offered online voting in municipal elections. According to Churchard (2022), since 2003, online voting in municipal elections has been on the rise. In Ontario, out of the 444 municipalities, 177 municipalities offered online voting, and 131 did not offer any alternative voting method. Online voting has been equally successful in Nova Scotia, where 39 out of 47 offered online voting and 26 offered no alternative voting method.

However, 43 municipalities in Ontario reportedly experienced website failures and delays during the 2018 local elections, according to the author. As a result, 35 municipalities extended 24 hours to their deadline. Elections and internet voting have both been subjected to independent audits. Twenty-two municipalities claimed that they did not take any further security precautions beyond those offered by the vendor, according to the association of Municipal Managers, Clerks and Treasurers of Ontario. There have been advancements in improving the process and learning from past experiences. According to the report, *Cyber Threats to Canada's Democratic Process*, prepared by the Communications Security Establishment CSE (2021), the sub-national level of the cyber threat to Canada's political process is relatively low.

LITERATURE REVIEW

Relevance of the Research

It is essential to understand why some municipalities in Ontario have decided to accept internet voting and others have not and how it has impacted the municipal elections. How can voter privacy be secured yet not overlook the application of e-voting, which has many benefits such as cost reduction, efficiency, and accuracy? It is essential to review the available literature and conduct primary research to identify the critical constraints to online voting, review the current practices by the political parties and election administrators involving internet voting, and then provide recommendations where voter privacy can be safeguarded. At the same time, we can use e-voting to have more transparent, effective, and efficient voting.

The research is relevant to the voters, the election administrators, and the political parties to address the challenges by not compromising voters' privacy. Electronic voting offers several advantages if the challenges are addressed, and voter confidence is built. For instance, it may boost voter turnout because many people do not have the time to go to the polls. Voters will be encouraged to participate and vote online in less time with a button click as this method is more convenient. Electronic voting is crucial because it provides voters with special needs, single parents, students, and those who might otherwise be unable to vote with alternatives and increased accessibility to voting from the comfort of their home, office or school. I anticipate that electronic voting is more efficient, less costly, and effective in delivering accurate results since tabulating results are delivered with the help of computers. Moreover, I believe it is essential for a green environment as the process is paperless and does not require unnecessary ballots.

The municipal governments must consider modernizing the electoral process to online voting. But it is equally important to assess whether the resident has access to the internet, including low-income and rural residents, whether it is accessible to the seniors and if the electoral are adequately trained to ensure they do not face any issues during the process. I also suggest an alternative method should always be available in all municipalities, such as telephone or paper ballots, to cast votes just in case something goes wrong with internet voting.

Advantages of E-voting

Electronic voting significantly enhances the electoral process and election administration. This chapter will discuss some of the advantages of online voting. Vote counting and casting take less time with electronic voting. It is cost-effective since it needs little labour and is convenient for voters because they can cast their ballots from any location at any time. The ability to vote from the convenience of your home or workplace makes it more accessible for anyone with access to a computer and internet connection. Internet voting enables those who are travelling and would not be able to vote in person for persons with disabilities. These chapters further discuss the advantages in more detail.

Fast

Electronic voting is also faster votes can be cast and counted with just a click of a button, making the processing time efficient. Since the process does not require manual paper ballots, counting results are tabulated much faster when compared with traditional paper ballots. E-voting has a great potential to improve electoral efficiency at a faster

speed and minimize errors, producing more accurate election results. This also helps reduce the burden for those casting their votes in person, reducing wait times in the lineups as more and more voters turn to e-voting.

According to Goodman (2016), interest in online voting has grown as more of our day-to-day activities move online. The author claims that Canadians prefer online voting, supported by a survey in which 1000 participants were asked to select their preferred voting method. Participants in the survey preferred online voting by 42 percent, a new electoral system by 25 percent, mandatory voting by 20 percent, and no voting by 13 percent. According to Elections Canada, survey data reveals that the top reasons for not voting include being too busy, going on vacation or travelling, and having obligations for work or education. (Freeland et al., 2010).

Economical

Electronic voting tends to be more economical because there is minimum human labour involved, such as the election administration officers supervising the process and manually counting votes. The cost is much lower than a traditional paper ballot. It also is environmentally friendly to have non-paper ballots minimizing paper waste. Online voting is the most economical method in Estonia, and preference for it has increased every year, reaching 47% in the election of 2021, according to a Smartmatic Case Study of online voting in Estonia. Elections Canada states that the cost is crucial when examining the voting process; in municipal elections, the average cost per elector ranges from \$4 to \$6. However, the initial costs of launching online voting are relatively costly because of the price of the equipment and upkeep. However, the standard cost for online elections is lower, at around \$2 per voter.

Convenient and Accessible

Conventional voting methods require the voters to take time out of their schedule to visit the polling station and may cast a vote from the convenience of their home or office. However, electronic votes can be cast at any time from any location, making it more accessible to voters. Electronic voting is also suitable for situations like the pandemic Covid-19 that we recently experienced. During the lockdown, it was not safe to join larger groups of public places with a significant people presence; electronic voting minimizes any in-person contact with the public. E-voting allows people to cast their votes remotely without endangering their or anyone else's health. E-voting is more user-friendly; the voter may adjust the font size and language to as convenient minimizing errors, and it also flags ballot errors; not a single vote goes uncounted due to human error. According to the Municipal elections Act, the democratic institutions and municipalities adopting online voting have almost doubled with every municipal election. According to a survey conducted by democratic institutions, municipalities accepting online voting are increasing because online voting is more accessible, resulting in increased voter turnout.

According to Goodman (2016), research has shown that online voting has also engaged voters who usually do not vote, meaning that online voting has increased voter turnout. According to the author, research has shown that In Canada, Estonia and Switzerland has shown that online voting has added non-frequent voters to the pool of voters when done online. According to one at the University of California Barbara, voting in Ontario's Municipal elections increased by three percent when done online.

Challenges to E-voting

Electronic voting also brings challenges as this is a relatively new method used to cast votes; some countries have had better experiences than others. It is not a perfect procedure in Canada; municipalities did experience issues when we tried for the first time in 2014. However, there is room for improvement; some challenges discussed in this chapter are voters' authentication. If the voting is done remotely, how do we verify voters' identification and ensure the electoral card belongs to the same person casting a vote online? Legal framework and trust and transparency are some of the challenges.

Voters Authentication

Voter authentication is a significant obstacle in electronic voting. The paper ballot voting process is transparent and leaves a paper trail which can be used for a recount if needed. Voting also requires that the vote remain secret and not be traced back to the voter. However, with electronic voting, it cannot be easy to authenticate a vote without being able to identify the voter. There is also the possibility that an authorized user may access a voter's card and use it to cast a vote; this is the misuse of the card without any knowledge or method to be verified by the elector.

According to Schwartz (2013), Estonia has an excellent voter authentication standard which eliminates vast-scale fraud in elections. They verify their voters through electronic identification card, which is widely used in the country for all-purpose. When voting, they insert their cards into their computer, encrypt the data and verify the user through a secret passcode. Just like the voter must prove with government-issued identification when voting in person, they are equally required to verify their identity through online voting—making it impossible for the large-scale fraud of unauthorized

voters to vote on someone else behalf. However, In Canadian municipal elections, mail-in voter cards are still highly vulnerable to theft, and the unauthorized person may use the information to cast a vote.

Legal Framework

According to Essex & Goodman (2020), Online voting is common in Canada's municipal elections; thus, the government needs to establish a unique structure. According to the author, his research indicates no clear standards around online voting. The research indicates that online voting positively impacts turnout, accountability, and transparency. The research recommends that the Canadian government take urgent actions to regulate the technologies associated with online voting. According to Canada Elections Act 164(2)b, sharing proof of your vote is illegal because doing so can persuade others to support a particular candidate. The election law under the CEA S.155 also refrains anyone from influencing electors to vote for a particular candidate. When voting in person, election administration staff protect the confidentiality of all ballots, as required by law, for all electors. They restrict using any recording devices throughout the process. The law, however, does not mention or forbid access to voting data for the officials who have access to the information Schwartz (2013).

Based on the literature review, the author proposes some guiding principles to maintain trust, accountability, and confidence in online voting. The guiding principles include secrecy between the voter and the voter's identity. The voters should cast one vote only and have the option to use any means to cast their vote. The vote could be in a paper ballot, online or any other form available. The voters should be able to access all available voting forms and be provided with the means to cast a vote. In the case of

online voting, they should have access to reliable internet. Both the candidates and the voters have the right to be treated fairly, and the election administrations should be able to deliver the results promptly. The voting procedures must be accurate, and the voters and the candidates must be confident of the process and the results. Finally, the elections process must be transparent to both the candidates and the voters.

In his reasoning, the author also addresses essential legal, operational, and technical issues relevant to online voting. Political parties are taking advantage of the situation because there are few rules for online voting. According to the author, political parties send clerks door to door to ask voters to vote for their party using iPad. However, it is a highly private subject that should be kept private regarding voting. Operational consideration aims to give communities and municipalities operational guidance on what to do in the event of a technical problem. As seen in the 2018 elections, the clerks lacked clear operational guidance and had they had such guidance, the process could have gone smoother.

Trust and Transparency

Those voting from unsupervised locations risks being under pressure to support a specific candidate. Election officials cannot guarantee that remote voters can cast their ballots without being under duress. There is also a possibility that voters' list and addresses are not UpToDate, and as a result, voters' card is mailed to the wrong address, which can be misused if it falls into the wrong hands. Online voting can also be a victim of a data hack, and voter information may be altered, as we have witnessed in the past where the servers of reputable organizations have been hacked and accessed to sensitive information. If voter information is hacked, this may jeopardize voters' trust and ensuring

trust in voting will become a challenge for the election officials. The government must enforce a nationwide standard approach to online voting and not let municipalities rely on independent contracts to procure online voting services.

According to (Judge & Pal 2020), the existing framework that ensures voters' privacy consists of the privacy act, PIPEDA, legislation on the voter's privacy, self-regulation, which are implied by the political parties to secure voters' privacy, and the election modernization act. The policies and self-enacted frameworks by the political parties are essential for my study to understand the parameters that ensure voters' privacy. What must worry us all is that several data breaches have publicly disclosed the used information. The breaches include social media giants such as Facebook and banks, who all take extra measures to ensure the privacy and safety of the users but still have been the victim of a data breach.

However, the government has failed to introduce fast technological changes, including big data that has replaced traditional data storage practices in different sectors. Political parties use big data for voter contact information, turnout, marketing, fundraising Etc. However, they have taken self-regulatory measures since there is no apparent public sector enforcement to target the political parties. According to the author, the federal privacy legislation which regulates the public sector is not a part of the Personal Information Protection and Electronic Documents Act (PIPEDA). Therefore, the election regulatory authority known as the national register of voters has not imposed any measures when storing, collecting, or using mass voters' data. The data collected by political parties are vulnerable to hacking and can be used by undesired people, delegitimizing the election process. Once the election data is breached, people will lose

faith in this process, damaging trust in elections. Therefore, we need a proper framework that the government overlooks to maintain trust between voters, the election administrators, and the political parties. The research mentions that since 2018 after Canada Elections Act, there have been policy reforms, and now the political parties have minimal privacy reporting obligations.

To protect the data of the voters' Election Modernisation Act (EMA) which ensures the protection of digital data and voters' information. EMA does not have rigid rules that the political parties can follow. I hypothesize that there needs to be strict oversight of the voter information and firm boundaries need to be set for all those parties that have access to the voter's information on what and how to use the data that ensures the voters' privacy.

Technical Complications

It is of great significance that municipalities are ready for any disaster during the elections. Adopting alternative voting methods brings along new challenges. However, according to Goodman, N. (2020), municipalities do not have any disaster management plan for any failure in an online voting infrastructure. According to the author, they surveyed clerks of different municipalities about the issue. Still, no one was able to provide a plan in case of a possibility of hacking, system failure, power outages, internet issues or other disasters of a similar nature. Most of the municipalities relied on the security of the vendor they contacted but had no backend security on their end. There is a possibility of any of the above issues, and if no plan is in place, it could compromise the elections.

RESEARCH DESIGN AND METHODOLOGY

Research Design

This chapter explains the research design and the methodology used to collect and analyze the data. It is essential to understand previous research, to build and carry out future research addressing the question. "What are the challenges and advantages of e-voting and assessing the impact on voters' turnout in municipal elections?" To answer this question in detail, the research aims to gather available data on e-voting in Canadian municipalities; the research findings can be used in future research to enhance the study by improving the issues for systematic investigation and the formation of new research questions.

I should mention that Internet voting is still relatively new in Canada, and there hasn't been much research done to address the many facets of the study. Numerous factors could affect voter turnout, and the opportunities and challenges are vast. This study is limited to the technological and legal framework elements that impact voter turnout, identify challenges, and perhaps open new opportunities. The first half of the research mainly explored the challenges of electronic voting at municipal elections and identified opportunities for e-voting through a literature review. The second part identifies whether electronic voting leads to higher voter turnout. To answer this question effectively, the chapter will provide a detailed overview of the research design and the methodology used to compile and analyze the data.

Research Methodology

This paper's content is secondary research and analyzing voter statistics. The sources explored for the research paper include published research journals, reports, policies, frameworks, electoral guidelines, and municipal elections data. Municipalities

randomly selected are the be the subject of this study. I have examined the trends in voter turnout throughout time and how they've varied across the several elections that have transitioned from paper ballots to internet voting. The data compares pre- and post-internet voting in the municipal elections to identify trends and changes over time and the impact on voters' turnout.

The research will contribute to the literature on electronic voting by addressing the challenges and opportunities of internet voting. The research further investigates the municipal voting patterns and understanding the online voting preferences. The paper also identifies why voters favour a particular way of voting. The findings from the research identified the main challenges and opportunities for internet voting to understand how the municipalities can overcome these challenges. The paper examined the data from different municipal elections to compare the trends of internet voting in the municipalities of Markham, Halifax, and Kawartha Lakes, mainly focusing on the municipalities that have transitioned to e-voting. The paper also examined the impact of internet voting on voters' turnout over time. The paper also examined the experience of I-voting in Estonia and compared that to the internet voting system in Canada. However, I acknowledged differences in voting systems, verification, demographics, legal structures and other areas between the two countries.

Case Justification

Compared to Canada, Estonia has a well-established online voting system. In Canada, we only conduct online voting at the municipal level, whereas in Estonia, voting is conducted online for federal and provincial elections. I chose Estonia to study how they have dealt with similar issues Canada faces in internet voting. We can undoubtedly

draw on their expertise to address some of our problems with online voting. This chapter will outline and compare voting in Canada and Estonia and highlight the significant difficulties and opportunities.

Overview of Online voting in Canada

The push for online voting in Canada started in late 1990, with the internet boom expediting the interest in technology in 2000. Voters were permitted to cast ballots online at advance polls in Markham, the first municipality to use online voting, in November 2003. (Goodman, 2016). Online voting was introduced in Canada to avail new convenient and additional voting methods to voters as a trial in some municipalities. The online voting process used by the municipalities varied; therefore, there have been different experiences, models, and justifications. According to MEA, Section 11, the municipal clerks oversee local election procedures; any recommendations made by local clerks are exclusively subject to MEA's rules. The municipal clerks run the local elections with a significant degree of autonomy.

Municipal Elections Act (MEA)

The Ontario Local Elections Act is the primary legislation controlling municipal elections in Ontario (MEA). Online voting is not explicitly mentioned in the MEA but allows municipal councils to enact bylaws. Such as voting by mail or by telephone does not need electors to be at a polling venue to vote" (MEA sec. 42). It also gives local clerks the authority to create guidelines for alternative voting systems.

The problem with authority creating additional voting methods is that MEA provides clear guidelines for the paper ballots and the general voting forms. However,

MEA does not provide specific guidelines regarding alternate online voting methods, leaving municipalities on their own to operate online voting. This becomes very challenging when dealing with voters' information and the technology used to store and perform the operation and communicate with the voters about the vote. At the same time, the Act prohibits any communication regarding voting or who the electors have voted for or intend to. The election administrators supervise the in-person paper ballots process. In contrast, remote voting can not be supervised, and the information about the voting can be recorded, duplicated and shared, which may influence other voters' decisions. The MEA 1996 legal framework's principles specify that elections must be safe and secret, impartial, and accessible; the integrity of the process must always be preserved; the results must be specific, and all voters must be treated fairly and equally.

Estonia

Estonia became the first country to offer internet voting when it introduced the I-Voting programme in 2005. According to Goodman (2016), the rationale for introducing online voting was that the Estonian parliament believed online voting would increase voter turnout and be more convenient and accessible to the electors. According to the author, online voting has been successful in Estonia due to the factors such as high internet penetration and the Digital Signature Act passed in 2002 allowed confirming the citizen's identity and online transactions, including voting. According to Ehin et al. (2022), the programme is a part of a highly developed legal and technological framework that has evolved since 2005. According to the author, the initiative has been quite successful based on voters' preference for online voting; in the municipal elections of 2021, almost fifty percent of voters used I-Voting, compared to only two percent in the

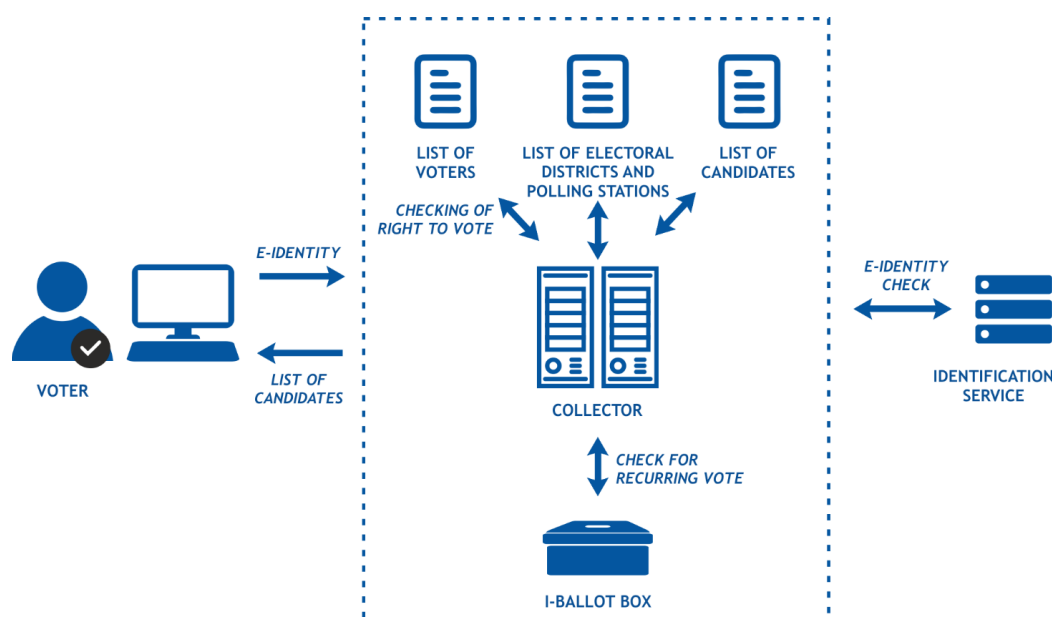
local elections of 2005. The program has succeeded in increasing voter participation and improving the efficiency of elections by enabling the electors to vote from any distance, providing the opportunity to avoid rugged terrains and weather conditions.

Senior citizens and residents of remote Estonian communities have found online voting more convenient and accessible. Additionally, since the average voter does not have to travel to the polling station, it is more convenient for them and saves them money on transportation. The author claims that several other European nations were inspired by Estonia's success with online voting and have tried out similar initiatives in Switzerland, France, Norway, the United Kingdom, Lithuania, and Finland. The programmes have also been used in several Canadian, American, and Australian provincial elections. The process to cast your vote in Estonia takes about two minutes using your electronic id or telephone number. The elector also may change their vote as often as they wish in the advance voting period, and the previous vote is no longer considered valid. The reason for allowing the voter to change their vote that if anyone feels pressured to cast their vote, they can always go back and change it. (Ehin et al., 2022)

I-Voting in Estonia: Legal and Technical Considerations

According to Alvarez et al. (2009), Estonia has addressed the legal and technological issues that concern online voting. Several countries, including Canada, are still working to improve their online voting system where the voters' legal concerns and technological security are guaranteed. Since 2005 the issues and concerns that have challenged online voting in Estonia have been resolved, making Estonia one of the best online voting in the world. According to Heiberg & Williamson (2014), the ballots are kept in a signed and secure form, and the system is fully encrypted. According to the

author, I-Voting had technological weaknesses in the 2011 elections. I-voting had weak security, and no feedback was shared on how the vote was interpreted at the server. There was malware developed that could alter the data before received by the server, but the voter would not know since there was no feedback shared with the voter. However, after the fix, the voter can check and see who they voted for and even change the vote if needed. I- Voting has also overcome the problem of voter identification; the system can verify the candidate without knowing or storing the voter's identity.



Tallinn. (2016) Figure 1. Identification of the Voter

According to Tallinn (2016), Voter identification entails four fundamental steps, and the first is for the elector to choose a candidate from the list. A public key encrypts voters' choices once they have made their decision. The second step is the elector sends his encrypted vote to the servers and the certificate. The collections services validate the voter with the list of voters and send a confirmation back if valid. Voter registration in the third phase is done using a different registration service. The voter is sent a message

informing them that the server has received and logged their vote. As a final step, the Collection Service provides them with a QR code generated using the encryption's random number and the vote identification used during voter registration.

FINDINGS AND DISCUSSIONS

The research paper looked at the experiences of Markham, Kawartha Lakes, and Halifax; these are some of the first municipalities that have completed online voting and have held multiple elections with the online voting method. We have chosen these municipalities to compare the data pre- and post-e-voting in municipal elections. The data on pre- and post-e-voting help us understand the impact of voting on voters' turnout.

Markham

According to City Clerk's Post-Election Review (2019), delivered to Markham's General Committee, the key driving factors for the shift to online voting in Markham were convivence, accessibility, sustainability, and digital leadership. The initiative was supported by several academic and professional studies and surveys to assess the implication of online voting before implementation and post-elections. According to study findings, Markham's online voting satisfaction rate is the highest compared to other municipalities. The number of voters increased from 37.1% in 2014 to 38.26% in the 2018 municipal elections, which employed online and paper votes at the polls. (Goodman, 2019).

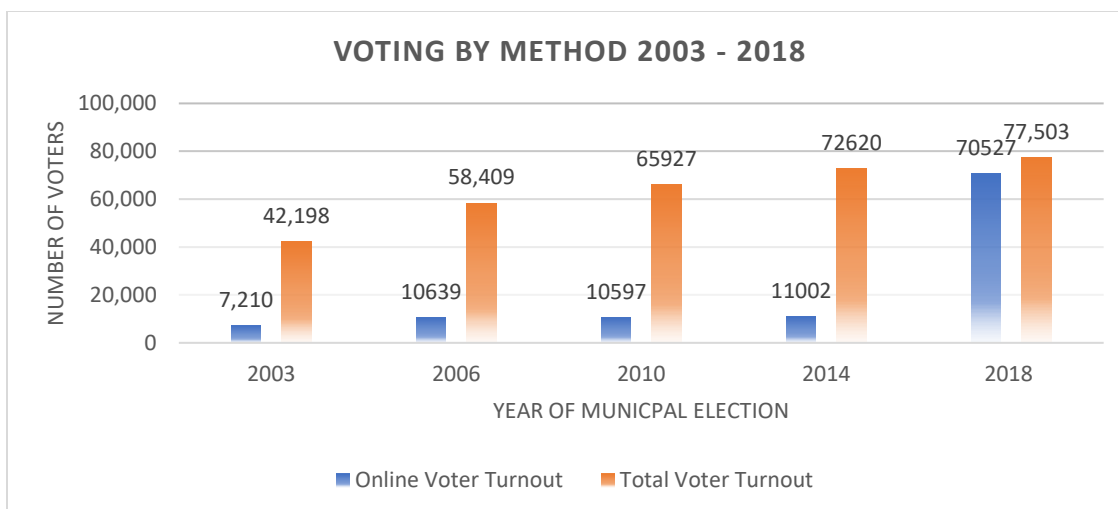


Figure 2 –Voters Turnout / Source: Data from Official Site of Markham City

Data on voters' turnout is compiled from Markham city, illustrated in Figure 2, which shows voters' turnout from 2003 to the most recent municipal election held in 2018. The figures show the total and online voter turnout over the past five municipal elections. According to the data, there has been a noticeable rise in internet voting between elections. 17.09% of all voters cast ballots online in 2003; 18.21% did so in 2006; 16.07% did so in 2010; 15.15% did so in 2014, and 91% of all voters cast ballots online in 2018. However, that does not confirm if the online vote had any effect on increasing the overall number of voters. In the following figures, we look at the trend of the overall number of voters to understand if online voters had any effect on voter turnout.

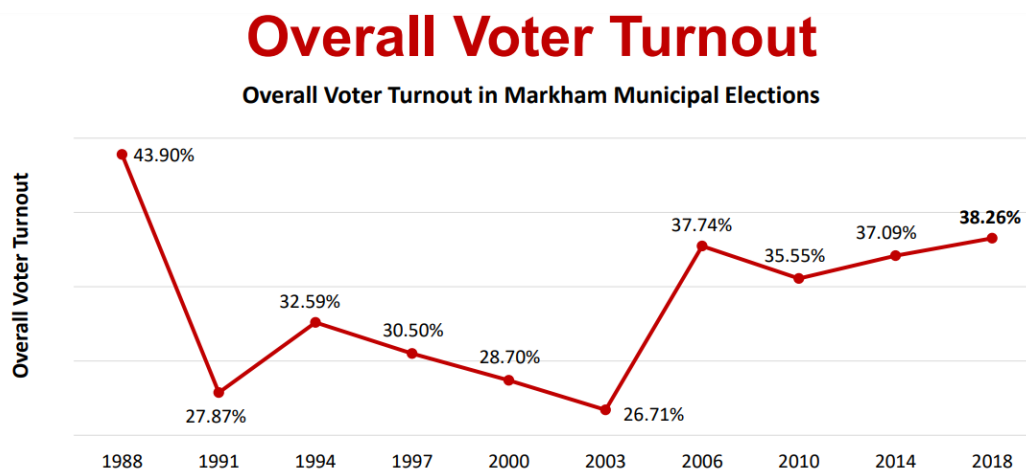


Figure 3- Source: Overall Voting Trends Data / Source: Markham Municipal Post Election Review

The total voter turnout information for the Markham municipal elections held since 1988 is shown in Figure 3. The results show that the number of voters has been steadily declining. From 43.90% in 1988 to 27.87% in 1991, 32.59% in 1994 to 30.50% in 1997, 28.70% in 2000 to 26.71% in 2003, there was a decline in voting participation. Voter turnout has changed significantly from 2003, going from 37.74% in 2006 to 35.55% in 2010, 37.09% in 2014, and 38.26% in 2018. The overall voter turnout in the municipality of Markham since the introduction of online voting confirms that there has been an increase in overall voters.

Halifax

Following the 2017 provincial election, Nova Scotia released the following graph, illustrating how voter turnout had decreased since the 1960s from a high of 82% to a low of 53.4% in general elections. Voters turn out has been a matter of concern in both provincial and general elections in Halifax. According to Freeland et al. (2010), HRM introduced online voting in 2008 municipal and school board elections as a pilot project

to increase voter turnout. Accessibility and scrutiny, voter engagement, integrity. Lastly, voter convenience and election security were the three driving factors for the municipality of HRM to introduce online voting.

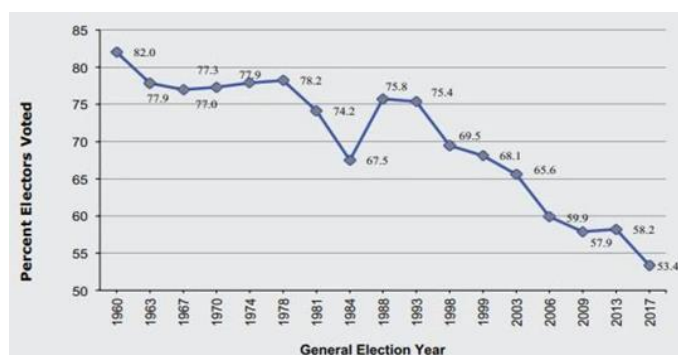


Figure 4 – Source: Elections Nova Scotia – General Elections

However, the author states that because the voting process in Markham and Kawartha Lakes and Halifax was different, the results of the online voting in those two cities differed from that of Halifax. In Halifax, the voters had high flexibility in choosing the voting method up to the last minute; they could also choose not to vote online just like you can on paper ballots.

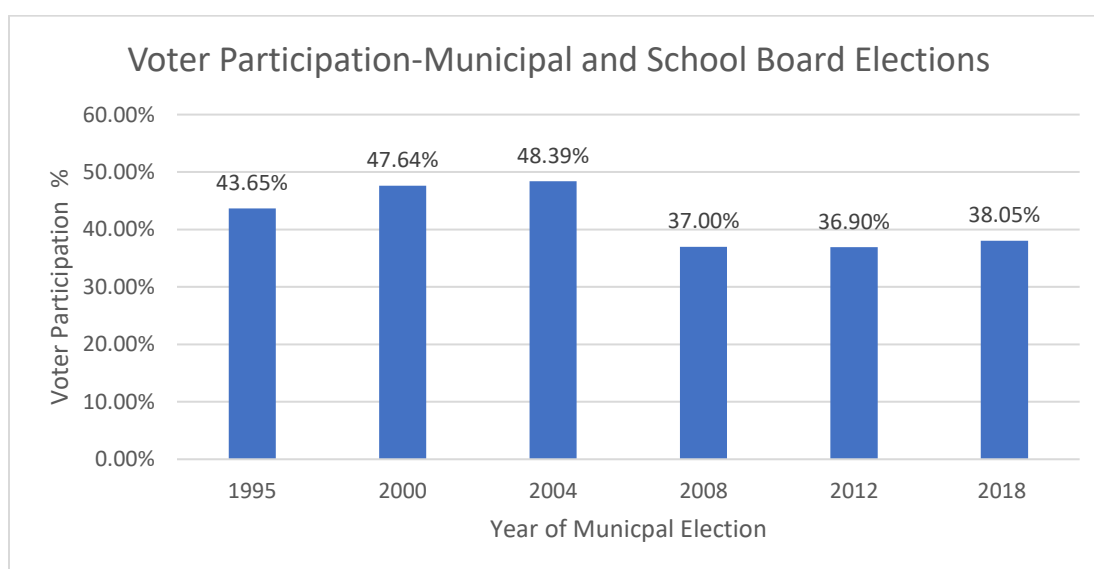


Figure 5 – Source: Report on Municipal & School Board Elections 2012 / HRM

According to data compiled from the Municipal School Board Elections Report (2019) and the HRM website, as illustrated in Figure 5. In 1995, voter participation was at 43.65% with only two days of advanced in-person polls and 47.64% in 2000. In 2004, the participation was 48.39%, it dropped to 2008 at 37% even though online voting was introduced, and in 2018 voter participation was 38.05%. According to Goodman, N. (2016), Even though remote Internet and telephone voting were only available for three days, turnout on advance voting days increased by more than 50% (the total number of electors increased from 14,000 in 2004 to 29,000 electors in 2008). However, it did not increase the overall voter turnout. Instead, the number of voters dropped (from 2004 to 2008, the number of electors decreased from 48 percent to 38 percent or 125,035 voters to 100,708 voters). According to the author, the close mayoral race and Canadian federal election may be the reason for the decrease in the lower number of voters.

Kawartha Lakes

According to AMCTO (2020), Kawartha Lakes implemented internet voting to boost voter participation, effectiveness, accessibility, and convenience. Data from the 2014 municipal election, which used mail-in votes, to the 2018 municipal election, which used online and telephone, shows that voter turnout was lower than in the previous elections, as illustrated in figure 6. However, compared to the provincial average in 2014, Kawartha lakes was under 1.5% more than the provincial average, while it was over by .46% in 2018.

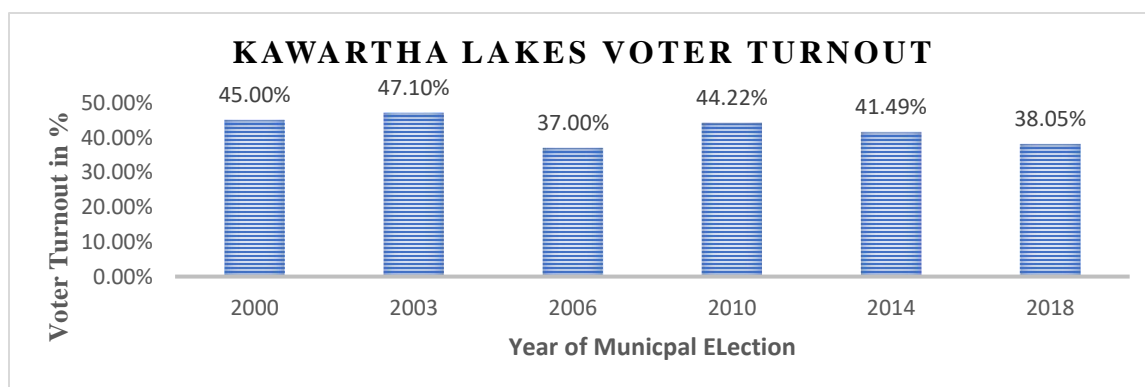


Figure 6 – Source: Elections results. City of Kawartha Lakes

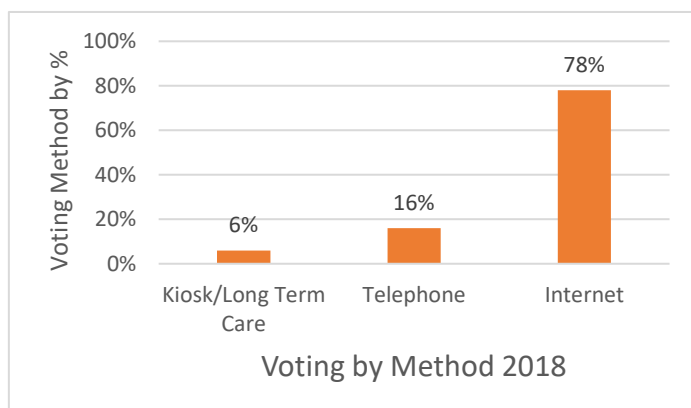


Figure 7 – Source: Elections results (2018). City of Kawartha Lakes

Figure 7 illustrates that 78% of voters in Kawartha Lakes cast ballots online, 16% did so by phone, and 6% did so at a kiosk or long-term care facility. Nevertheless, the overall turnout of voters decreased from 41.49% in 2014 to

38.5% in 2018. The data shows that internet voting has been successful in terms of voting preferences by the electors. The author hypothesizes that a drop in interest may have caused a reduction in voter turnout. No incumbent was competing against the mayoral candidate in 2018.

CONCLUSION

According to AMO (2018), an increasing number of municipalities continue adopting internet voting. In the 2018 municipal elections, 178 municipalities used internet/phone voting, an increase of 84 more compared to the previous elections. However, that has impacted lower use of alternative methods such as mail-in ballots, noticed a drop of 46% in the same year. The following Figure 9 illustrates the votes methods used in Ontario in the 2018 municipal elections.

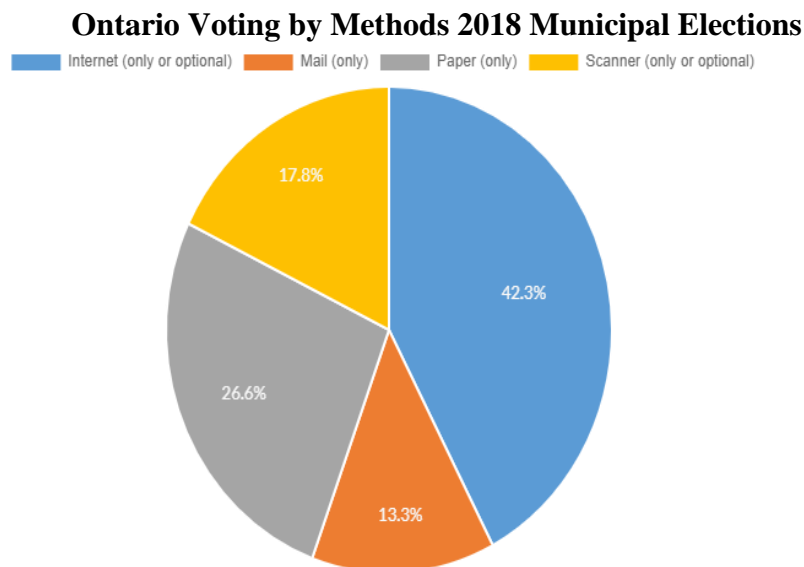
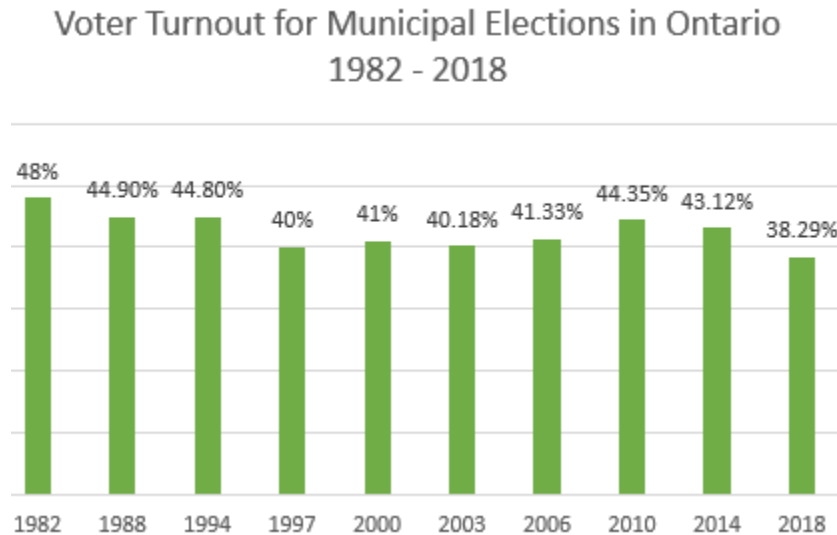


Figure 8 - Source: Municipal election statistics. AMO (2018)

Statistical data shows that even though there has been a shift from paper ballots to the internet or phone voting, the impact on voter turnout has not varied as much. Figure 9 illustrates overall voter turnout from 1982, when most municipalities used paper ballots, up to the 2018 elections, in which 178 municipalities shifted to internet and phone voting. The figure shows that the highest over the years was in 1982 at 48%, and the lowest was in 2018 at 38.29%. This chart does not represent only internet voting municipalities but includes all Ontario municipalities using all voting methods. Still, the chart shows that

voter turnout has been consistent with a slight increase after 2003 when some municipalities introduced internet voting.



Figuer 9 -Source: Municipal election statistics. AMO (2018)

The study looked at the benefits and drawbacks of internet voting as well as voter turnout in municipal elections, and I concluded, based on the research, that the benefits outweigh the drawbacks and that internet voting has slightly increased voter turnout in some cases, as discussed in the papers. Most municipalities are adding internet voting or have already replaced paper ballots with internet voting. Based on the statistics gathered for this study, it can be applied to municipalities of different sizes, as both the case studies of Markham, a municipality of greater size, and Kawartha Lakes, which is comparatively small, have had positive experiences. It is convenient, less costly, and fast to tabulate accurate real-time results with minimal error, and the process is paperless, making it environment-friendly. However, challenges remain, and municipalities must increase security for voter information safety and maintain trust in the electoral process.

RECOMMENDATIONS

This study can add to future studies looking into voter turnout and the benefits and drawbacks of internet voting in Canadian municipalities. The paper is an initial study as this topic is not explored in depth. Still, this paper will provide up-to-date statistical data compiled from municipal websites for future research in the field. To determine the impact on voter turnout, this paper examines data collected before and after some municipalities adopted internet voting. Future research may look into the municipalities that are still all paper-based and compare the data with municipalities that have turned to internet voting to compare the effect on voter turn in both cases.

Internet voting has proved to be a great experience on the voter's end, the election administrators in terms of cutting costs in the long term, tabulating efficient and accurate results. However, future research may also examine how this may impact the candidates and the political parties and whether internet voting is in their best interest. Internet voting saves cost, but internet voting may reduce manual labour. Future research may examine whether internet voting impacts the labour market and economy or even identify the changes in short- and long-term job losses due to internet voting.

Another recommendation is to switch from paper ballots to internet voting because most municipalities have pledged to go toward greener cities as one of their future strategic goals. This may help them achieve their goal. Understanding the impact can also help communities identify cost savings and money that could be used for alternative initiatives.

LIMITATIONS

The study was limited because some municipalities only gave data for recent elections and did not provide election turnout results dating back three or four election cycles, which made the research process challenging. The analysis was conducted using data that was readily available and accessible. Secondly, time was a constraint in this research, so I relied on secondary data and did not collect primary data, which needed ethics approval. I did not have enough time to go through the process to meet the deadlines for this paper.

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