Smart City Governance:

A comparison of models and COVID-19 related implications within the GTA

by

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Author's Declaration

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

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Abstract

The first part of this research asks the question "what is good smart city governance" and analyzes the relevant body of literature on smart cities and smart city governance. Based on the theoretical research, 13 potential characteristics of smart city governance were identified. A comparative case study analysis of two models of smart city-type governance was also conducted to identify practical examples of what can go well and wrong with smart city governance. When it goes well, as illustrated by the City of Mississauga example, the participatory process can be enhanced by digital tools and a holistic governance framework. When it goes wrong, as illustrated by the Sidewalk Labs example, smart cities can be monopolized by corporate interests that push their own governance agendas and fail to consider the local context, exposing citizens to digital vulnerabilities. In 2020, the COVID-19 global pandemic created a public health crisis, which forced governments to connect, communicate and deliver services to their constituents through increasingly digital platforms. Research has shown that the digitalization of cities without social governance frameworks increases the risk of planning governance and decision-making being filtered through "tech goggles" that fail to consider the complex social dynamics of cities. As the pandemic has posed a unique and rapidly evolving challenge to governments at all levels, the second part of this research explores some of the impacts of the pandemic on smart city planning and governance of municipalities in the GTA. Drawing upon a thematic analysis of key informant interviews with municipal staff and topic experts, this study adds new local insights into the smart city status of cities across the GTA. The pandemic became a catalyst for digital transformation and the modernization of government, and it also revealed digital vulnerabilities. According to the research, digitalization will remain a key component of the new normal, although the GTA lacks a regional strategy for smart city governance and local municipal approaches to smart city governance vary across regions. This research suggests that a gap may exist in the governance of smart cities across the province.

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List of Abbreviations

AI	Artificial Intelligence
CCLA	The Canadian Civil Liberties Association
DIP	Digital Infrastructure Plan
GTA	Greater Toronto Area
HEPA	High efficiency particulate air
ICT	Information and Communications Technology
ISP	Internet Service Provider
LED	A light-emitting diode
MPAC	Municipal Property Assessment Corporation
NICT	New Information and Communications Technology
OECD	The Organization for Economic Co-operation and Development
PVM	Public Value Management
PSN	Public Sector Network
PwC	PricewaterhouseCoopers
REB	Research Ethics Board
RFP	Request for Proposal
RFPQ	Request for Pre-Qualifications
SoT	Strategy of Things
TMI	Too Much Information
UNDP	The United Nations Development Programme
UVC	Ultraviolet-C
WFH	Work-From-Home
WT	Waterfront Toronto

1. Overview of Thesis Research

This thesis follows the manuscript option for master students in the School of Planning at the University of Waterloo. It includes two independent manuscripts that together explore the topic of smart city governance, which is an emerging field of research. The research revealed that no clear framework exists for the governance of smart cities and that the smart city largely takes a technological solutionist approach to solving urban issues. However, as is commonly argued, technological solutions on their own are not likely going to solve structural problems in cities as technological solutions do not address root causes (Cardullo & Kitchin, 2019). Smart Cities promise a lot of good things for society, such as green buildings and green energy, healthy and safe communities, 21st century education, an inclusive society, entrepreneurship, innovation, and productivity (Giffinger et al., 2007; Meijer & Bolivar, 2016; Madakam & Ramaswamy, 2014). As we make progress towards the smart city utopia, there are side effects, which could be neglected in the absence of governance. For example, digital literacy is now a pan-Canadian challenge. In 2016, the Brookfield Institute found that "42% of the Canadian labour force is at high risk of being affected by automation in the next 20 years" and here are more risks highlighted in the literature, such as security and privacy concerns (Hadziristic, 2017, pg. 20/21).

The smart cities challenge (2017) was a conduit for much of the smart city planning and development work currently underway across the GTA. Impact Canada defined a smart cities approach as achieving meaningful outcomes for residents using data and connected technology (Government of Canada, 2020). The challenge

motivated cities to start thinking about problems and how technology could help to solve those problems. However, the challenge also set cities up to compete for funding and created smart city status anxiety. For example, "elected officials and policy-makers alike fear the implication that if you are not seen to be a "smart city," then you must be a "dumb city" (Zwick & Spicer, 2021, pg. 218).

Most of the smart city and smart governance models that have been suggested in the literature are based on the identification and description of the various dimensions and components of a smart city, whereas only a few of them also consider the complex interactions between them (Castelnovo et al., 2016). When considering what a holistic framework for the assessment of smart city governance should include, the research suggests a balanced approach towards social, environmental, and economic outputs.

Beginning in 2020, the COVID-19 global pandemic created new governance challenges, as it forced governments at all levels to adopt technologies in response to the pandemic to stay connected with citizens and deliver critical community services. Previous research has shown that the digitalization of cities without social governance frameworks increases the risk of planning governance and decision-making that takes a technological solutionist approach to issues and fails to consider the complex social dynamics of cities. Researchers and practitioners warn of the risks associated with investing in digital infrastructure prior to having a smart city governance framework in place, namely the issue of privacy violations, digital vulnerabilities caused by digital and civic literacy gaps, and the risk of path dependency on technology, especially once built into fixed infrastructure. Researchers argue that cities often make the mistake of

adopting technology for its own sake before clearly understanding the existing problems or needs of urban societies (Zwick & Spicer, 2021).

An important blind spot of the eventually failed Sidewalk Labs smart city project in Toronto by Google, highlighted in Ellen Goodman's affidavit, was identified in the approach to scope data and privacy challenges piecemeal rather than holistically and ignoring the 'total surveillance load' or how technologies interact with each other to affect behavior (CCLA, 2020, pg. 319). Goodman emphasized the need to understand how the network of technologies Sidewalk Labs had proposed would monetize human behaviour and create a form of platform governance (CCLA, 2020).

The first manuscript examines the research on smart city governance and identifies potential characteristics of good smart city governance. A comparative case study analysis of smart city governance in the City of Toronto (Sidewalk Labs project) and the City of Mississauga is also conducted to identify in practice, what can go well and wrong with smart city governance. Quality of life is referenced as a main outcome of smart city governance. Though there is evidence from the research that technology can be used in cities to empower citizens by adapting technologies to their needs, critiques on smart cities include complaints that these approaches do not draw on knowledge about how cities function, particularly on the social front, and disregard the value of complexity (Albino et al., 2015). Another issue exemplified by the pandemic is that "there appears to be little or no recognition that smart developments might contribute negatively to social polarisation in cities" (Zwick & Spicer, 2021, pg. 219).

The second manuscript explores the impacts of the pandemic on smart city planning and governance in the GTA through key informant interviews with municipal

staff associated with the smart city files at their respective organizations, as well as identified experts on smart cities and smart city governance. Municipal staff were recruited from Durham Region, York Region, City of Toronto, Halton Region, and Peel region, creating a snapshot of the status of smart cities within the GTA and gaining insights into what impacts the pandemic has had on their smart city measures. Both researchers and practitioners have argued that many of the challenges for cities to become or to be smart exceed the scope and capabilities of their current organizations, institutional arrangements, and governance structures. The assumption of this research is that the pandemic has become a catalyst for smart city governance, through the rapid digitalisation of government processes. The study revealed that the GTA lacks a regional strategy for the governance of smart cities.

In the book *"The Smart Enough City,"* Ben Green warns of the induced demand phenomenon, expectations of technology under the influence of "tech goggles" and narrow solutions that revolve around technology instead of people (Green, 2020). Instead, Green asks, "how do we harness disruption and paradigm shift to get us toward the goals that are already established?" (Green, 2020, pg. 29). Two key attributes that emerged from case study research were 1) cities need to have a clear policy agenda before deploying technology; and 2) a research process that focuses on people rather than technology (Green, 2020). A common perspective that emerged from this research is the need to have a clear definition of a problem before it gets lost in the speed of technology and that without a strategy driving technology adoption, you get technology looking for a solution.

Jordan Davis, who directs Smart City Strategy at the Columbus Partnership, explains how their Smart Cities Challenge winning project stood out by focusing more on the social welfare impacts of transportation hurdles (Green, 2020). Davis states that transportation technology, for example, "is a very exaggerated space," especially regarding Autonomous Vehicles (AVs) (Davis, as cited in Green, 2020, pg.37). Green warns of similar futuristic hype and technological solutionism that creates this "exaggerated space." In 1939, the Futurama exhibit portrayed a city where "automobile collisions and traffic congestion would be eliminated" thanks to a utopian motor age that focused on efficient car travel instead of people (Green, 2020, pg. 20). He states that making the distinction between what is real and what is not is the essential task faced by cities (Green, 2020). According to Jennifer Clark, there is an inherent proposition that smart cities solve an underlying problem and that it is "the vagueness in defining the scope of the urban problem that opens the door to smart cities as the potential solution" (Clark, 2020, pg. 33).

Both articles have been reformatted for the purposes of the thesis. The final section summarizes key findings from both articles, discusses the relationship between the findings, highlights relevant findings for practicing planners, and proposes directions for future research and advocacy.

2. Two Models, Different Outcomes? Comparing Smart City Governance experiments in Toronto and Mississauga

2.1 Abstract

This paper asks the question "what is good smart city governance" and analyzes the relevant body of literature on smart cities and smart city governance. This paper also explores two models of smart city-type governance: one illustrated by the Sidewalk Labs failed Toronto initiative and the other by the City of Mississauga experience. Much of the research on smart city governance focuses on the technological aspects of smart cities, although there is a growing body of research that focuses on a more holistic view of the smart city and what that means for smart city governance. However, the research on smart city governance still does not appear to pay systemic attention to understanding the complex social nature of cities, and to the governance challenges and opportunities of new technology in the public realm. The argument that is presented in this paper is that although the use of Information and Communications Technology (ICT) in smart cities presents opportunities to improve the function and quality of life in cities by equipping governments with new data and information for better decision making, smart governance must consider root causes to the complex structural problems facing cities and the social risks inherent in the digitalization of society. This study identifies potential characteristics of good smart city governance and examples of what can go well and wrong with smart city governance. When it goes well, as illustrated by the City of Mississauga example, the participatory process can be enhanced by digital tools. When it goes wrong, as illustrated by the Sidewalk Labs example, smart cities can be monopolized by corporate interests.

2.2 Introduction

Cities are growing and are under pressure to perform. They need to produce wealth and innovation, but also health and sustainability. They need to be green and safe and culturally vibrant, and they also need to integrate growing populations from different backgrounds (Meijer & Bolivar, 2016). Although there is currently a wide span of information regarding smart cities, much of the current literature on smart cities is rich but fragmented and although several attempts have been made to define the smart city, this term is not used consistently (Meijer & Bolivar, 2016). Smart governance is an emerging area of study, and according to researchers, "there is no clear framework, especially from a research and policy perspective, for assessing the real level and content of what we call ''smartness'' when related to cities" (Castelnovo et al., 2016. Pg. 725).

Though there is some consensus of what a smart city is, including core dimensions and characteristics, there is still quite a bit more attention being focused on the technology and economy aspects, framing smart cities as a very lucrative industry, which has positioned smart cities as being more competitive than collaborative (Giffinger & Gudrun, 2010). The smart city largely takes a technological solutionist approach to solving urban issues. However, as is commonly argued, technological solutions on their own are not likely going to solve structural problems in cities as technological solutions do not address root causes (Cardullo & Kitchin, 2019).

Researchers warn that "we are on the path to creating technological lock-in by driving fast toward a planned future without the appropriate instruments for checking whether we are going into the right direction" (Castelnovo et al., 2016, pg. 735). This

research will help to identify characteristics of good smart city governance in theory first, through the literature, by exploring some of the politics of smart cities, including social risks, how technology is shifting power dynamics between the citizen and roles of government, and how a collaborative governance approach may help to address root causes of complex structural problems facing cities that technology may then be in a more appropriate position to solve. The local case study examples will then help to identify characteristics of good governance in practice.

2.3 Approach & Methodology

To answer the research question, put forward in this article, a systematic review of the relevant literature was conducted. A systematic literature review is "defined through the usage of a comprehensive search that scans the relevant body of literature with clearly stated and comprehensible search choices and selection criteria" (Ruhlandt, 2018, pg. 2). This was done in two stages. First, a search was conducted in 3 main research journal databases using the keywords "smart city" AND "governance", "smart cities", and "smart governance." Twenty-five articles were chosen to read and summarise. During the second stage, the research question was clarified through identified research gaps. The articles were then evaluated to identify if they added value to the research question. A second search query was conducted and extended to books and grey literature to replace any articles from the first query that were no longer relevant to the narrowed research focus.

The objective of this article is to identify and share new insights about good smart city governance, and to better understand the transformational role of

technology in cities, especially as it impacts people. The planning methodology for this research is centred on a comprehensive literature review followed by case study examples of two different smart city-type governance models within a comparative analysis framework. I will be conducting a qualitative comparative analysis, which bridges the strengths of variable-oriented and case-oriented approaches and provides a logic and tools for comparative research (Van der Heijden, 2019). The case-study examples illustrate two different local Canadian approaches to smart city governance. The City of Toronto example highlights concerns around a manipulation of smart city governance to advance the waterfront project. Lessons learned from the project's failure will be compared alongside the City of Mississauga's vision to becoming a municipal leader in ethical, government-led smart city planning and governance. The limitations of these methodologies are that they are susceptible to selection bias and may provide impartial and/or incorrect conclusions.

2.4 Background Context

In 2017, a Government of Canada-wide initiative called Impact Canada launched a pan-Canadian smart cities challenge and defines a smart cities approach as achieving meaningful outcomes for residents through the use of data and connected technology (Government of Canada, 2020).Though there is evidence from the research that technology can be used in cities to empower citizens by adapting technologies to their needs, critiques on smart cities such as Songdo (South Korea), and Masdar City (Dubai), include complaints that these approaches do not draw on knowledge about how cities actually function, particularly on the social front; often assume that existing

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cities include 'empty spaces' that can simply be built upon; and disregard the value of complexity, unplanned scenarios, and mixed uses of urban spaces (Albino et al., 2015).

The term "smart city" emerged from the "smart growth" movement in the 1990's, in the context of new Information and Communications Technology (ICT) in relation to modern infrastructures within cities but has expanded its definition to include the use of technological innovations to improve quality of life (Zwick & Spicer, 2021; Albino et al., 2015). The term began as an urban labelling phenomenon and has remained somewhat of an elusive or "fuzzy" concept (Albino et al., 2015). Although there is no single definition, there is a consensus throughout the literature that a smart city involves the use of ICT to improve the city's function and that quality of life is a basic component and outcome of the smart city (Albino et al., 2015; Castelnovo et al., 2016; Meijer & Bolivar, 2016; Coe et al., 2001; Bolivar & Meijer, 2015). According to researchers, a big aspect of smart governance involves digital citizen participation and means that various stakeholders are engaged in decision making and public services (Meijer & Bolivar, 2016; Albino et al., 2015). The term e-governance is mentioned throughout the literature and is described as ICT-mediated governance with a reference to electronic democracy, which is described as "a means of improving the responsiveness and accountability of political institutions and enhancing citizen participation in the political process" (Albino et al., 2015; Coe et al., 2001, pg.84).

Overall, most of the literature described a definition that included the use of technology as a transformational tool used to enhance quality of life regarding the six dimensions of a smart city, which are: smart people, smart governance, smart living, smart environment, smart mobility, and smart economy (Madakam & Ramaswamy,

2014; Meijer & Bolivar, 2016). According to Giffinger et al. (2007), smart cities are smart people and smart governance, and smart cities aim to achieve smart economy, smart mobility, smart environment, and smart living (Meijer & Bolivar, 2016). Other terminologies that exist are the intelligent city, "which makes a conscious effort to use information technology to transform life and work" however people are not included, the digital city defined as "a connected community that combines broadband communications infrastructure to meet the needs of governments, citizens and businesses," the virtual city as a hybrid concept that consists of a reality and cyberspace, and the ubiquitous city, which uses urban sensors and sensing planning (Albino et al., 2015, pg. 8). When it comes to the specific characteristics of a smart city, there is much more variance of ideas and opinions. The knowledge economy has played a significant role in the emergence of the idea of smart cities and their aspirations to achieve economic development, investment attraction, quality of life, social inclusion, notoriety, and prestige (Angelidou, 2015).

As the term "smart city" is gaining awareness and adaptation on a global scale, there is still some uncertainty and confusion about what specifically is meant by "smart" within an urban context. According to researchers, the lack of a commonly held definition has caused a divergence in policy objectives, as well as difficulties in collecting reliable data that are comparable across countries (Caragliu & Del Bo, 2016). Given the complex nature of the smart city however, a one-size-fits-all model or approach may not be appropriate. Researchers found that "the positive correlation between smart characteristics and smart urban policies suggests that the Smart City model can be viewed as a model of urban development, with different cities at different

points along the path" (Caragliu & Del Bo, 2016, pg. 667). They suggest that Smart City indices should not be seen as rankings that point to a winner, but rather as an indication of each city's position along a development path of continuous improvement. More research is needed on the relationship between social structure, new technology and roles of government in smart cities (Meijer & Bolivar, 2016).

To answer the research question of "what is good smart city governance?" it is important to first understand what is meant by the term 'good governance' in more general terms. This paper will also explore concepts such as e-governance, collaborative governance, and collective intelligence, which appear throughout the literature in reference to a transformation of government. Best practices in models of citizen participation will also be reviewed. The final section of the literature review will explore some of the politics of smart cities, including social risks, the role of civic and digital literacy and what is meant by the term "smart citizens."

2.4.1 Definitions of Governance and Good Governance

In the 1992 report, Governance and Development, the World Bank defines governance as the way in which power is exercised in the management of a country's economic and social resources for development (The World Bank, 1992). They have identified six broad dimensions of good governance for over 200 countries and territories, known as the Worldwide Governance Indicators (WGI), which includes: Voice & Accountability; Political Stability & Absence of Violence; Government Effectiveness; Regulatory Quality; Rule of Law; and Control of Corruption. The United Nations Development Programme (UNDP) defines good governance as governing systems that are capable, responsive, inclusive, and transparent (Saito, 2021). They have identified 8

characteristics of good governance, which are: Participation; Rule of Law; Transparency; Responsiveness; Consensus Oriented; Equity & Inclusiveness; Effectiveness & Efficiency; and Accountability.

The Institute on Governance has grouped these UNDP characteristics into 5 distinct principles, which are: Legitimacy & Voice; Direction; Performance; Accountability; and Fairness. Using these principles as a working framework, they have developed a governance toolkit that includes a governance scorecard, a governance continuum, and autonomy index. They understand that although many definitions of governance exist, good governance involves the answers to 3 key questions: how decisions are made, who has a voice in making these decisions, and who is accountable (Institute on Governance, 2021). According to the Institute on Governance, the rapid evolution of technology, changing economies, socio-economic upheaval, and new institutional demands have created a shift in the relationship between governments and citizens (Institute on Governance, 2021). There is a consensus across the literature that cities must find new ways to manage new challenges and that government policies help to foster smart cities (Meijer & Boliver, 2016; Albino et al., 2015).

When considering what smart governance means in relation to smart cities, it is also important to consider the meaning of governance within the field of urban planning. In the book City as Interface, Martijn de Waal calls attention to an important point highlighted by author Greg Lindsay, where planners once believed that society was makeable and that it was possible to capture social processes in complex calculations and then convert them into a master plan (de Waal, 2014). He warns that, as we are abandoning this approach, "technology companies are making their entrance along with

their algorithms that will supposedly make life more intelligent, more convenient and more efficient" (de Waal, 2014, pg.137). The portrayal of technology as a magic wand or algorithm is problematic, as it could threaten to diminish or replace the role of responsibility and accountability between government and citizens within the public realm. Researchers highlight that "there are concerns that increased reliance on big data analytics, city-sensing, and social media interactions, activated within a framework of technological solutionism, might privilege real-time and all-encompassing data- and algorithm-led planning decisions over political discussion and agonistic processes of governance" (Cardullo & Kitchin, 2019, pg. 818).

2.4.2 Leveraging Collective Intelligence Through Collaborative Governance

In response to the growing complexities facing communities, some researchers believe that community-based models of governance need to be built on collective intelligence because local government often lacks the policy tools and jurisdictional authority to effectively manage the new governance (Coe et al., 2001). Collective intelligence refers to a group's combined capacity and capability to perform a wide variety of tasks and solve diverse problems and it has been found to be predictive of the future performance of groups and teams (The Oxford Review Encyclopedia of Terms, 2021; Chikersal et al., 2017). Collaborative governance, which leverages collective intelligence to solve complex problems, refers to cases where citizens play a more active role in the development of policies or service delivery (Bevir, 2012). The key characteristics of collaborative governance are that the governance process involves the citizens who would be affected by the policy or service outcomes (Bevir, 2012). Because collaborative governance has been "driven by the increased desire for

improved public processes and outcomes," collaborative governance processes include agreement seeking, collective action, and collaborative systems (Greenwood et al., 2021, pg. 13). More collaboration and coordination are now required by governments and between governments to effectively manage and pursue their goals (Coe et al., 2001).

2.4.3 Identifying Best Practices in Citizen Engagement

One of the most prominent models of citizen participation referenced within the research and planning practice is Arnstein's "A Ladder of Citizen Participation." Published in 1969, this framework forever changed how planners, communities and governments think about citizen participation (Gaber, 2019). The model Arnstein created includes an eight-level ladder indicating a scale from 'manipulation' at the bottom end to 'citizen control' at the top and includes three degrees of participation ranging from non-participation and tokenism to citizen empowerment. Arnstein's model created new dialogue regarding citizen involvement in the planning process and has become a benchmark for evaluating the equity of citizen participation and serves as a checklist for action (Gaber, 2019).

In her article, Arnstein said that "the ladder juxtaposes powerless citizens with the powerful in order to highlight the fundamental divisions between them" (Gaber, 2019, pg. 190). In an evaluation of smart city participation in Dublin, researchers identified 16 'smart citizen' roles, demonstrating that most of these were rooted in what Arnstein termed 'tokenism' and 'non-participation' (Cardullo & Kitchen, 2019). Criticisms of Arnstein's framework include how citizen participation is framed as an "us" verses

"them" struggle for power between government officials and community activists, focusing on disenfranchised community groups (Gaber, 2019). The challenge this model presents "is that the empower level, at the far right of the spectrum, puts decision making in the hands of the public which is more in line with deliberative democratic ideals and has been resisted by elected governments at all levels" (Goodman et al., 2020, pg.6).

Building on the work of Arnstein, researchers have proposed a new framework, known as the CitiVoice framework (Simonofski et al., 2019). The CitiVoice framework was created to structure and evaluate citizen participation in smart cities and includes a very simple evaluation metric, as seen in figure 1 below, to enable the evaluation and comparison of multiple smart cities.

Figure 1: CitiVoice holistic evaluation framework for citizen participation in smart cities

The limitations of this framework are the simplicity of the evaluation metrics, which may require extra details, based on the local urban context to maintain validity and the framework could be further enhanced by taking a maturity model approach to evaluating criterion (Simonofski et al., 2019). A maturity model is a set of characteristics, attributes, indicators, or patterns that measure achievement over time in a particular domain or discipline (Caralli et al., 2012). When considering what a holistic framework for the assessment of smart city governance should include, researchers suggest public value creation to address quality of life, vision and strategy formulation, asset management, financial and economic sustainability, social inclusiveness, and multi-stakeholder participation (Castelnovo et al., 2016).

2.4.4 What is Smart Governance?

If governance is described as "the exercise of political, economic and administrative authority to manage a nation's affairs," smart governance is more about the future of public services in cities by using technology to facilitate and support "better" planning and decision making (Madakam & Ramaswamy, 2014, pg. 41). As the term better is subjective, it is important to understand how better planning and decision making translates into quality-of-life outcomes. Some authors define smart governance as simply the governance of a smart city while others view it in terms of technological innovations regarding decision-making, administration, and collaboration, or what is described as "e-governance" throughout the literature. There is a dominant belief that transformation of governance is desirable and needed to make cities smart (Albino, et al., 2015). Smart governance can be scored on a scale ranking from conservation (traditional governance of a smart city) to transformation (smart urban governance)

(Meijer & Bolivar, 2016; Castelnovo et al., 2016). As no two cities are exactly alike, both the local context of a city and the conditions of a city have a role to play when it comes to figuring out the role of government in modern society (Meijer & Bolivar, 2016). An important consideration is that "social rights seek a balance that is not always easy between conservation and transformation, and in many cases, the process is corrupted." (Garau et al, 2016, pg. 6).

As cities are facing growing competition for high ranked economic investment and talent due to such strong economic and technological changes over the last decade, one instrument that has been quick to catch on is the smart city ranking approach. Some evidence shows that discussions around city rankings are concentrated on final ranks and neglect important factors, such as: methods & indicators used; and the purpose and effectiveness for strategic planning aiming at the improvement of the position to be gained (Giffinger & Gudrun, 2010).More research needs to be conducted on the methodology of rankings and their importance for different actors or their impact on certain issues of city planning (Giffinger & Gudrun, 2010).

Most of the smart city and smart governance models that have been suggested in the literature are based on the identification and description of the various dimensions and components of a smart city, whereas only a few of them also consider the complex interactions between them (Castelnovo et al., 2016). One approach that has been suggested is the Public Value Management (PVM) approach to smart cities, which addresses the multifaceted, interrelated, and dynamic structure of smart city governance. Another approach is to look at smart cities as performance organizations

through the path of continuous improvement, innovation, and accountability (Castelnovo et al., 2016; Madakam & Ramaswamy, 2014).

The Idea of "one best city" is still dominant in the smart city discourse (Meijer & Bolivar, 2016). Local governments are tied between being competitive enough to attract global investment and create social capital while also advocating for and protecting their constituents. Some researchers argue that smart cities should move away from the 'smart city's club' and "be defined in relation to different perspectives or aspects" (Castelnovo et al., 2016, pg. 727). The data being collected from smart cities has the capacity to generate a wealth of information into the wants and needs of the citizenry, but also signals a need to pay close attention to the public realm through the creation of a regulatory framework that acknowledges the rights and freedoms of the citizens as they become more open and vulnerable and more importantly, more valuable. Otherwise, the smart city risks becoming nothing more than the most connected and efficient platform for collecting personal data under the guise of what Sidewalk Labs called "urban data."

According to researchers, "we must be aware that effective societal uptake of digital means is not yet supported by enough metrics on whether they can actually improve living conditions in the world's cities" (Castelnovo et al., 2016, pg. 725). One argument is that smart technologies, in the forms of sensors and real-time big data streams, agree with the establishment of a neoliberal subject within the constraints of individual responsibility (Castelnovo et al., 2016). Another perspective is that "neoliberalism has tapped into, and is exploiting, the psychic realm" through the seduction of software "because it promises rewards for use, but at the same time it

conditions through automation and forms of control" (Cardullo & Kitchen, 2019, pg.817).

In 'smartpolitics,' smartness leads to the gamification effect and creates notions of a

'good' or 'bad' citizen/user through smart city rankings, leading to speculations that

smart cities are more market-centric than citizen-centric (Cardullo & Kitchen, 2019).

One can also find that behind the smart cities topics lays a very dynamic market of

"smart" products for monitoring the urban environment and managing urban functions

(Angelidou, 2015)

2.4.5 Smart City Governance and E-Government

The World Bank defines E-Government as "the use by government agencies of

information technologies (such as Wide Area Networks, the Internet, and mobile

computing) that have the ability to transform relations with citizens, businesses, and

other arms of government" (The World Bank, 2015). Some of the outcomes of E-

Government are "better delivery of government services to citizens, improved

interactions with business and industry, citizen empowerment through access to

information, or more efficient government management" (The World Bank, 2015).

While the local application of New Information and Communications

Technologies (NICT) "leads to economic, social and political transformations

encapsulated by the smart community movement," it is important to understand that the

details of how the collective intelligence of the communities would operate or how new

governance structures would work have yet to be fleshed out (Coe et al., 2001, pg. 81).

Researchers warn that the role of ICT and NICT-mediated governance, as defined

through the concept of e-governance will only benefit the citizens if the decision and

implementation process remain transparent, citizen-centric, and citizen-driven (Albino et al., 2015).

What Google's Sidewalk Labs named "urban data" in their plans, has been described as the new oil, a key commodity, and a new form of capital within the smart city's context, which is increasingly understood and framed as a private asset (Artyushina, 2020). Smart city initiatives have been linked to the marketization and privatization of urban governance by tech companies, who seek to introduce policies that help maximize their profits. Technocratic approaches to governance have been identified as overarching problems of smart city urbanism, as

> *"The Cambridge Analytica scandal signalled such dangers associated with private data governance by exposing the infrastructural power of technology companies to transform societies through the regulation of individual and group behavior" (Artyushina, 2020, pg.4).*

The literature on e-government highlights a tension between two concepts of citizens: citizens as customers of city services; and citizens as participants adding value to public processes (Simonofski et al., 2019).

2.4.6 Understanding the Social Risks of Smart Cities

Both researchers and practitioners have argued that many of the challenges for cities to become or to be smart exceed the scope and capabilities of their current organizations, institutional arrangements, resources, and governance structures.

> *"The lack of appropriate governance arrangements for the majority of cities appears to constitute the most serious obstacle for their effective transformation into being smart" (Ruhlandt, 2018, pg. 1).*

Another challenge presented by researchers is that "the main features of the new global and digital age have been a drift toward a more demanding citizenry at a time when the

collective institutions (market, state, civic fixtures) would appear to have become less able to satisfy these demands" (Coe et al., 2001, pg.85). This includes an increase in discontent of the citizenry and the challenges of having to adapt faster to the changing environment and the assumption that we can do better together than in isolation (Coe et al., 2001). If a transformation of government is required, as the literature suggests for a city to be fully realised as a smart city, and for governments to be able to manage the complex intersections of social and technological change, it is important to understand the impacts this could have on people.

Though rural to urban migrations are well documented, the path from the city into the smart city is difficult to nail down and trace, though rapidly evolving. A prominent concern is that civic literacy has been identified as a pan-Canadian challenge, with impacts that could signal division and disparity within the smart city context. The Samara Centre for Democracy have identified four dimensions of Civic Literacy, which are: 1. Institutional knowledge; 2. Political ability; 3. Topical knowledge; and 4. Media literacy (Samara Centre for Democracy, 2019). According to the centre, civic literacy rates are unevenly distributed among Canadians. They found that citizens with higher socioeconomic status, who are wealthier and better educated, tend to have higher levels of civic literacy and higher levels of democratic participation as well. They warn that in recent years, a new and rapidly changing set of democratic challenges has emerged, requiring Canadians to be more civically literate than ever. These challenges have been identified as: 1. Newspapers in decline, signalling the decline of traditional information gatekeepers; 2. Too much information (TMI syndrome); 3. Social distortion and people relying on social media as a filter; 4. Echo chambers, which become highly

partisan information bubbles; and 5. Bad actors and the spread of disinformation (Samara Centre for Democracy, 2019).

It has been said that the 21st century has been dubbed both as the century of knowledge and as the century of learning (Angelidou, 2015). According to Media Smarts, Canada's Centre for Digital and Media Literacy:

> *"Digital literacy is more than technological know-how: it includes a wide variety of ethical, social and reflective practices that are embedded in work, learning, leisure and daily life" (Media Smarts, 2020).*

The Samara Centre warns that "citizens are going to have to do more and more of the work that was once performed by educators and gatekeepers, such as processing huge amounts of ever-changing information, separating fact from fiction, and making judgements about what is most important to them and to the country" (Samara Centre for Democracy, 2019).

A huge challenge is how we will continue to learn amidst the era of "TMI" when information is moving at the speed of light, and we are more distracted than ever (by technology). Jacques Ellul, a French philosopher, sociologist, lay theologian, and professor who wrote many books on the intersection of urbanization and technology such as *"The Meaning of the City"* and *"The Technological Society"* warned decades ago that technological society leads to increasing numbers of people who cannot adapt to the inhuman rhythm of modern life with its emphasis on specialization (Ellul, 1970). He said that technological progress makes whole categories of people useless without making it possible to support them with the wealth produced by the progress (Ellul, 1970).

In the smart city, the citizens level of civic and digital literacy will determine how well they adapt to the smart city and may also determine how advantaged or disadvantage they will become. Complex ecosystems of people, institutions and stakeholders are significantly harder to organize and manage and special attention must be paid to issues of equity and accessibility to avoid the creation of digital disparities and spatial polarization (Angelidou, 2015).

Part of the discourse on smart cities involving the dimension of smart citizens includes the level of education as a main driver in economic growth (Meijer & Bolivar, 2016). Similar to the theme of Richard Florida's creative class, smart cities are centers of higher education that are clever, smart, skillful, creative, networked, connected, and competitive. People are at the core of smart cities and communities. Smart citizens are smart, educated, informed and success is based on engagement and participation (Castelnovo et al., 2016). The concept of smart citizens has been confused in the literature with the creative class discourse, which is separate from the smart city discourse, though there is overlap (Bolivar & Meijer, 2016). For example, urbanization "has transformed human society to the point that now knowledge and creativity are the paramount drivers of economic growth (Zwick & Spicer, 2021, pg. 4).

The concept of smart citizens can be problematic. In the smart city discourse, it appears that the citizen must earn their right to the city, though social inclusion is an outcome indicated in the research. There are no current defined examples for how a citizen arrives to the smart city but encouraging citizens to become more civic and digitally literate should build the foundation for inclusion. It is important to note however

that "a commitment to participate in local political processes is something that technology can facilitate but not cause" (Ramos, 2019).

For example, the Ardler Inventors Project was a smart city project hosted in the neighbourhood of Ardler in Dundee, Scotland. Ardler had been experiencing a period of degeneration and regeneration with plans to foster social inclusion and community development, but still faced social and economic issues. The project aimed to explore how neighbourhoods could be empowered to take leading roles in imagining, creating, and using technology in their local area with the goal to better understand the role of technology at the neighbourhood scale "and truly empower citizens in a digital age" (Taylor et al., 2018, pg.1). According to the researchers, "the biggest challenge of the project was empowering neighbourhoods to take advantage of civic technologies," though the study was successful at creating a series of strategies for engaging neighbourhood residents in different stages of a design process, levels of participant engagement varied (Taylor et al., 2018, pg. 1). The paradox that emerged from the project was that:

> *"Participants must take control of the process to be invested in it but creating a community of invested local residents initially required a carefully designed process" (Taylor et al., 2018, pg.10).*

2.4.7 Characteristics of Good Smart City Governance

Thirteen (13) potential characteristics of good smart city governance were

identified throughout the research and are further explained below:

Table 1: Characteristics of Good Smart City Governance
Established smart city plan and/or strategy
Smart city policy
Collaborative governance framework
Measurable outcomes
Fosters civic literacy among citizens
Fosters digital literacy among citizens
Transparent/open government
Public realm is connected and protected
Decision and implementation process remains citizen-centric and citizen-driven
Inclusive digital citizen engagement
Technology as a tool that enhances the participatory process, not a magic wand
Root cause approach to solving problems
Works within cultural context of city

Established smart city plan and/or strategy & smart city policy: without a smart city

plan and/or policy, the risk is that governance will have to catch up with technology. The

Backlash surrounding Sidewalk Labs included policy gaps regarding data governance.

Ellen Goodman argued in her affidavit that "Sidewalk Labs promises are not a substitute

for public digital governance" and warned of path dependency on technology, especially

once built into fixed infrastructure and especially prior to the establishment of a digital

governance foundation (CCLA, 2020, pg. 316).

Collaborative governance framework: understanding and solving the root cause of

complex issues requires an integrated approach to planning and collaborative

governance provides a framework for this. More collaboration and coordination are now

required by governments and between governments to effectively manage and pursue their goals (Coe et al., 2001).

Measurable outcomes: you can't improve what you can't measure. Quality of Life is a basic component and outcome of the smart city, however "we must be aware that effective societal uptake of digital means is not yet supported by enough metrics on whether they can actually improve living conditions in the world's cities" (Castelnovo et al., 2016, pg. 725).

Fosters civic and digital literacy among citizens: civic and digital literacy gaps should be addressed in the planning stages, taking a more responsive or upstream approach to inclusion rather than a reactive approach.

Transparent/open government: open government creates more transparency, which is an important aspect of building trust between citizens and government.

Public realm is connected & protected: Connectivity is a human right, but it's framed as more of an exchange in the smart city. Personal data is a resource and is considered a new form of capital within the smart city context and framed as a private asset (artyushina, 2020).

Decision and implementation process remains citizen-centric and citizen-driven: Arnstein's ladder of civic participation is recognized as a best practice in the planning profession, which establishes a benchmark for measuring levels of power in the participatory process.

Technology as a tool that enhances the participatory process, not a magic wand: The role of technology as a magic wand is problematic. Technology is a tool that can help to solve problems.

Root cause approach to solving problems: The importance of taking a more holistic approach to solving urban issues by clearly identifying the problems prior to adopting technology as a solution.

Works within cultural context of city: Sidewalk Labs did not clearly understand the cultural context of Toronto and the core problems, where City of Mississauga did this very well.

The following case studies illustrate two different local examples of smart city development and governance. The City of Toronto example highlights concerns around private sector led platform governance and the threat of surveillance capitalism. Lessons learned from the project's backlash will be compared alongside the City of Mississauga's vision for becoming a municipal leader in city-led smart city planning and governance. Focusing on smart cities as a whole vision instead of individual projects, these case studies were chosen for their proposed mission to become a smart city and therefore, provide the best learning examples of success and failure for future smart city planning and development efforts.

2.5 Case Study Analysis

2.5.1 Waterfront Toronto – Sidewalk Labs

In March 2017, Waterfront Toronto issued a Request for Proposal (RFP) call for an innovation and funding partner for Toronto's Eastern Waterfront. In October 2017, Sidewalk Labs won the RFP and started Sidewalk Labs Toronto. Their vision was to create a place that deployed emerging technology and people-first design innovations to address the challenges that face growing cities (Waterfront Toronto, 2017). In their RFP proposal, Sidewalk Labs claimed that it is the only urban innovation company that bridges the divide between urbanists and technologists (Waterfront Toronto, 2017). Their plans for a 'truly complete community' promised flexible and affordable real estate, a new frontier of urban sustainability, a vibrant public realm, a convenient mobility system as private as cars and less expensive, and a close-knit community that uses data to improve city services (Waterfront Toronto, 2017). Sidewalk Labs envisioned the project as a series of layers stacked together as a platform with a baseline for performance (Waterfront Toronto, 2017). In 2019, they finally revealed their Master Innovation and Development Plan (MIDP), which came under intense scrutiny and revealed a much larger vision for the Toronto Waterfront plans than originally presented.

While Covid-19 was cited as the final blow that ended the Sidewalk Labs smart city project along Toronto's waterfront, there were other factors brewing that signaled the demise of the large-scale visionary proposal. The Canadian Civil Liberties Association (CCLA) said the project was flawed from the beginning and issued a statement calling for a reset of the Sidewalk Labs project, because:

"The current Canadian regulatory landscaped simply lacks modernized privacy legislation to provide essential safeguards to protect residents and visitors from the kinds of ubiquitous and intensive sensor-laden infrastructure that was envisaged" (Canadian Civil Liberties Association, 2020).

In 2019, Joe Cressy, whose ward covers Quayside called for the development of a policy framework that would set the rules by which data can be collected in the public realm, how it's managed and how it's used, as he believed local government and not private companies should lead the way on rules for data collected in both the public and private realms (Vincent, 2019). The CCLA said that the withdrawal of Sidewalk Labs from the project signalled a victory for privacy and democracy and an opportunity to fix the privacy deficit and set a proper foundation for how technology can be used to meet real city needs, as identified by residents.

An article by the *Star Editorial Board*, acknowledged that although "there were concerns about technology running amok and residents being used as lucrative data mines," this could have been overcome with proper government oversight (Star Editorial Board, 2020). Though cities are under pressure to attract large-scale investments and may offer generous tax breaks to lure big tech companies in, the people who live in the neighborhoods subject to "revitalization" are increasingly uniting to block this from happening (Walker, 2020). The project had a lofty vision of re-imagining a new city within the city as a sustainable model for urban development, but one of the more alarming aspects of the project was the concept of a big tech global company like Google attempting to reimagine themselves as developers in a Canadian city. For Walker, this calls into attention "the degree to which smart city pioneers like Sidewalk Labs, who have a tremendous amount of lobbying power and funding, make a play not

only for more data or more money, but for the power to plan public space" (Walker, 2020).

Another issue was the leadership structure and planning role of Waterfront Toronto (WT). Research shows that the root of the accountability problem came from governance deficiencies of WT, which is a corporation created in 2001 by the federal, provincial, and municipal governments to help plan the city's vast waterfront. It was WT and not City of Toronto that entered into the agreement with Sidewalk Labs, which was kept private for over a year (Flynn & Valverde, 2019). In their statement, the CCLA said that "Waterfront Toronto never had the jurisdiction to sign off on a data surveillance test bed with a Google sibling" (Canadian Civil Liberties Association, 2020). According to researchers, the hostility towards Sidewalk Labs proposals was based on what was seen as a lack of respect for the political planning and decision-making process and opponents were critical of closed-door deals and corporate control over public life in the smart city communities portrayed in the Sidewalk Labs plans (Filion, 2020). Another issue was that the idea of an urban data trust proposed by Sidewalk Labs failed to frame this concept effectively within the ethics of the local public sector context, raising suspicions and getting bottle-necked around the issue of user consent and privacy and data governance (Tusikov, 2019).

Prior to the WT project deal, Sidewalk Labs had developed a book that detailed how a smart city would operate under their control that included rewarding citizens for how much data they shared, having the authority to tax residents, creating, and controlling public services, and even having its own policing authority and approach to jailing residents (Canadian Civil Liberties Association, 2020). The affidavit of Ellen

Goodman stated that the leadership arrangement between Sidewalk Labs and

Waterfront Toronto "lacked a public-first approach to digital governance" (CCLA, 2020,

pg. 315). She argued that "Sidewalk Labs promises are not a substitute for public digital

governance" and warned of path dependency on technology, especially once built into

fixed infrastructure and especially prior to the establishment of a digital governance

foundation (CCLA, 2020, pg. 316). Goodman also warned about how technology

companies had broken promises about data collection and sharing in the past and

changed terms-of service in ways that impair consumer consent and added surveillance

capabilities to services that were not expected to perform those functions and that "in all

these cases, it has proven difficult for regulators and courts to remedy the privacy

violations after the fact" (CCLA, 2020, pg. 313).

An important blind spot of the project highlighted in Goodman's affidavit is in the

approach to scope data and privacy challenges piecemeal rather than holistically

"ignoring the total 'surveillance load' that Quayside residents and visitors will experience

or how the technologies interact with each other to affect behavior" (CCLA, 2020, pg.

319). An additional blind spot is that this piecemeal evaluation approach wouldn't

address how the network of technologies Sidewalk Labs proposed would monetize

human behaviour and create a form of platform governance (CCLA, 2020).

One of the main issues about the Sidewalk Labs project involved the leadership

structure that saw WT and not the City of Toronto entering into the agreement with

Sidewalk Labs (under-the-radar) and a vague RFP that was asking for a plan for a

"digitally innovative neighbourhood" (Flynn & Valverde, 2019). This all happened without

any of the typical public consultations that were expected of WT and caught a lot of people off-guard. The public meetings hosted by Sidewalk Labs were absent of any local city councillors or officials, which was also uncanny and further suspicion was raised when details of a plan to privatize municipal revenues and planning work through tax increment funding were revealed (Flynn & Valverde, 2019).

WT appeared to be entering into a questionable relationship with a big tech global enterprise and buying into an idea without public consent, risking the democratic process in return for an elusive vision of a digital future that failed to highlight some very important fine print. The planning law question of who has the legal authority to propose plans for what kinds of infrastructures and services became as "fuzzy" as the definition of smart cities within the literature (Flynn & Valverde, 2019).

2.5.2 City of Mississauga – Building a "smart city for everyone"

In 2020, as tensions surrounding the Sidewalk Labs project were mounting over public concerns around data security and affordability, concerns that arguably led to the withdrawal of the project, the City of Mississauga was experiencing a wave of success for their smart city planning work. They were certified as a Smart City ISO 37122 'Early Adopter' by the World Council on City Data (WCCD), awarded the title of Smart21 Intelligent Community of the Year by the Intelligent Community Forum, ranked #8 in North America in openness by the Open Cities Index, and ranked #10 in North America for their Geospatial program by the Geospatial Maturity Index (City of Mississauga, 2021). Mississauga's Smart City annual report provides key metrics about what makes the city a Smart City, which are: 200+ open data sets, 1100 Wi-Fi access points, 820km of fibre optic cables of Public Sector Network (PSN), 340+ nodes across the city

connected to the PSN, 80+ smart city assets (City of Mississauga, 2021). The City of

Mississauga defines a smart city by the British Standards institute as:

> *"The effective integration of physical, digital and human systems in the built environment to deliver sustainable, prosperous and inclusive future for its citizens" (City of Mississauga, 2020).*

In July 2019, it was announced that City of Mississauga had approved a 10-year smart

city master plan. The plan identifies a smart city as "an urban centre that employs

technology to provide support to people who live, work and play there" and includes

allowing residents to pay bills or register for parks and recreation classes online

(Draaisma, 2019). City of Mississauga's Chief Information officer, Shawn Slack stated

that "new technology is changing urban planning" and that with technology now in the

public realm, there is a need to pay attention to how it can be used to improve the

quality of life (Draaisma, 2019). Mississauga's smart city plan aligns with the city's

strategic pillars, which are: move, belong, connect, prosper, and green. One key action

item identified in the plan is the creation of a smart city policy, which is currently in the

process of being developed. The City of Mississauga defines a smart city policy as a

policy that "governs the use of digital in the physical realm. It sets guardrails for how the

city implements new Smart City initiatives," which they believe is important for achieving

privacy, freedom, and democracy that are foundations of a digital society (City of

Mississauga, 2021). The City of Mississauga has launched an engagement strategy to

consult with the public on key issues related to the development of a digital society,

which are: Privacy by Design, Data Governance, Compliance, and Security (City of

Mississauga, 2021).

City of Mississauga believes that the smart city needs to be city-led instead of led by technology and that the master plan is about supporting digital literacy, learning and innovation, which provides a framework that is a "Smart City continuous improvement plan" (Draaisma, 2019). The Master Plan aims to create a 'Smart City for everybody' that will help bridge the divide between those who have access to technology and those who do not" (Smart Cities Connect, 2019). City of Mississauga Mayor Bonnie Crombie said that:

> ""*Mississauga is working to become a municipal leader when it comes to leveraging smart technology and innovation to engage our residents and solve some of our city's most pressing issues" (Smart Cities Connect, 2019).*

The master plan mentions five living labs in Malton, Streetsville, Port Credit, Clarkson, and downtown Mississauga, which are to become highly connected areas where the city has plans to test new technology with public involvement (Smart Cities Connect, 2019). The city has already implemented many smart city initiatives including free public Wi-Fi, open data, hackathons, fibre network, advanced traffic management, LED lighting, mobile apps and has smart city projects underway, including 'Wireless Mississauga,' 'Virtual Campus' and the 'Centre for Civic Curiosity.'

Mississauga had participated with the smart cities challenge in 2017 and although it did not win the challenge, the city leveraged the opportunity to move forward with their master plan. Ethical Smart City interviewed City of Mississauga's Smart Cities former Project Lead, Anthea Foyer, who said that when looking to other countries as examples for their plan, she explains:

> *"It was important to look at the reasons why governments were implementing technology and how these technologies, tools and processes reflect the values of the people in these cities and to create a framework that was flexible and*

inclusive to ensure that this is a living processes that will adapt to both emerging
technologies as well as cultural context of the city" (Foyer, 2020).

Regarding digital inclusion, section 4.5.3 of the master plan states that:

"Technology is changing quickly and will provide opportunities to improve quality
of life in the city and require high levels of digital literacy. Mississaugans will need
to have a high level of digital literacy to navigate the technological changes and
the big data they will produce. This will be key to bridging the digital divide and
providing opportunities for all Mississaugans" (City of Mississauga, 2021).

Feedback from the master plan's initial community engagement found that some

members of the community, including low-income residents, youth, new immigrants,

and seniors felt disadvantaged when it came to accessing digital tools and services,

training opportunities, services and supports, which created barriers to success. To

address this issue, the master plan includes what they call "The Kit," which is a set of

tools to help bridge the digital divide by providing basic digital tools to residents of

Mississauga. The master plan states that Mississauga will serve as a model of

government-led smart city urban development. When asked about the Sidewalk Labs

project in Toronto, City of Mississauga's Chief Information Officer (CIO) Shawn Slack

said that it was obvious that the project did not define Toronto but that it was clear that

corporations, not Toronto city council, were in charge (Draaisma, 2019).

The chart below uses the characteristics of good governance identified

throughout the research to highlight the differences between the Sidewalk Labs Toronto

approach and the City of Mississauga approach to smart city governance:

Table 2: Case Studies Comparative Analysis Chart		
Analysis Criteria – characteristics of smart city governance	**Waterfront Toronto – Sidewalk Labs Project**	**City of Mississauga**
Established smart city plan and/or strategy	Master Innovation and Development Plan (MIDP)	Smart City Master Plan
Smart city policy	No	Data governance policy in progress
Collaborative governance framework	Project led by Waterfront Toronto and Sidewalk Labs – project was disconnected from local municipal government & processes.	Plan is government-led and approved. Creation of a smart city team and steering committee
Measurable outcomes	Priority outcomes established through public consultations	Have established a framework for measuring smart city outputs
Fosters civic literacy among citizens	unknown	Creation of the Centre for Civic Curiosity
Fosters digital literacy among citizens	Creation of Collab – prototype version – digital tool created by SWL and Digital Public Square (DPS) to help more people participate and provide feedback	Master plan included a digital toolkit to help empower citizens to participate
Transparent/open government	uncertain	Smart City annual report
Public realm is connected and protected	Public realm would become connected without appropriate privacy measures in place	Public Sector Network (PSN), privacy by design principles
Decision and implementation process remains citizen-centric and citizen-driven	Fears about a sensor -laden city were at odds with the projects plans to enhance evidence-based decision-making processes	Rigorous citizen engagement prior to plan implementation and ongoing
Inclusive digital citizen engagement	Yes, although public concerns around surveillance capitalism prevailed	Yes, the city aimed to build a 'smart city for everyone' and included local resident voices and experiences
Technology as a tool that enhances the participatory process, not a magic wand	Project envisioned the ideal 'smart city of the future'	Technological tools and processes reflect the values of City of Mississauga
Root cause approach to solving problems	Technological solutionist approach to solving the city's issues	The city's planning process highlighted a digital divide and the plan aimed to solve it
Works within cultural context of city	The projects vision for an ideal smart city created suspicion and backlash from residents and neighbourhood groups	The city's diversity is at the centre of the plan and the plan leverages the city's collective intelligence

2.5.3 Conclusion

Smart cities involve the creation of new relations between technology and society, that redefine the role of governments (Meijer et al., 2016). The overall aim of the smart city is to use technology as a transformational tool to enhance quality of life regarding the six dimensions of a smart city. While some definitions identify the smart city with its technical infrastructure, the smart city is not equivalent to any single technology or collection of technologies but rather by association with the idea of a smart city and its symbolism (Sadowski & Bendor, 2019). How you define a smart city impacts smart city objectives and outcomes.

To answer the question of "What is good smart city governance?", this paper contributes the following insights. Firstly, it is evident from the research that smart cities are complex systems, and a technological solutionist approach is not sufficient alone to address the systemic challenges facing the urban environment. Both researchers and practitioners have argued that many of the challenges for cities to become or to be smart exceed the scope and capabilities of their current organizations, institutional arrangements, and governance structures (Ruhlandt, 2018). It is argued that transformation of governance is required to enable the smart city, including the creation of social capital in the form of "smart citizens," though some researchers warn that "social rights seek a balance that is not always easy between conservation and transformation, and in many cases, the process is corrupted." (Garau et al, 2016, pg. 6). The smart city promises to liberate both the urban environment and its citizens through the power of technology, yet some of the research indicates that citizen engagement is limited to roles rooted in what Arnstein termed 'tokenism' and 'non-participation'

(Cardullo & Kitchin, 2019). There are also concerns that smart city development could create new problems or create polarisation in cities (Zwick & Spicer, 2021).

The second consideration is that within the smart city context, digital literacy and civic literacy build the foundation of awareness, understanding, inclusion and empowerment. The portrayal of technology as a magic wand or algorithm is problematic, as it could threaten to diminish or replace the role of responsibility and accountability between government and citizens within the public realm. The data privacy issues, exemplified through the sidewalk labs experience, forced governments to look at governance practices surrounding data collection and citizen privacy rights regarding smart cities, pushing the issue of data governance to the surface, and calling for policy solutions. Sidewalk Labs "built from the internet up" smart city proposal raised concerns about the project's scope and intentions, resulting in the project getting scaled back significantly as a result of a lack of trust in Google and what has been associated as "surveillance capitalism" (Zuboff, 2019). Lessons learned from the departure of Sidewalk Labs in Toronto's first visionary plan of a smart city should cause concern about the role of big tech giants in urban planning. It seemed to be a huge point of contention for many local Toronto residents and activists who raised such concerns from the beginning.

Finally, in contrast to the City of Toronto experience, City of Mississauga has established a governance model for creating an inclusive "smart city for everyone." From the identification of smart city assets to an extensive Public Sector Network (PSN), 5G, iParks, the creation of an innovation corridor, and the Centre for Civic Curiosity, Mississauga is also working to future proof the city through ethical AI and

other leading-edge technologies embarked on through a rigorous citizen engagement

process (City of Mississauga, 2021). Mississauga has taken a different approach to

becoming a smart city, based on community feedback that highlighted digital disparities

and aimed to solve them. The Smart City Master Plan takes a collaborative,

government-led approach to smart city planning and a smart city policy is currently

being developed that will focus on data governance and privacy by design. The master

plan includes a digital kit with tools for all residents to help bridge the digital divide.

Despite taking such proactive measures to ensure an inclusive smart city,

Mississauga has moved forward with smart city capital building and infrastructure

investments prior to having a smart city policy in place. Highlighting concerns that

emerged decades ago about how technological progress would make whole categories

of people useless without making it possible to support them with the wealth produced

by the progress, more research is needed to fully understand the impacts of digital

transformation on society, how this effects the relationship between government and

citizens and the inherent social risks of the digitalization of society (Ellul, 1970).

3. **Understanding the Impacts of the COVID-19 Pandemic on Smart City Planning & Development in the GTA: Has the Pandemic Become a Catalyst for Smart City Governance?**

3.1 Abstract

Since the government of Canada launched the Smart cities challenge in 2017, municipalities across the Greater Toronto Area (GTA) have been competing for funding to develop smart city plans, strategies, initiatives, and projects that offer innovative technological solutions to the complexities of urban life. In 2020, the COVID-19 global pandemic created a public health crisis, which forced governments to connect, communicate and deliver services to their constituents through increasingly digital platforms. This digital citizen engagement is described in smart cities literature as the main component of 'smart governance.' Previous research has shown that the digitalization of cities without social governance frameworks increases the risk of planning governance and decision-making being filtered through "tech goggles" that fail to consider the complex social dynamics of cities. As the pandemic poses a unique and rapidly evolving challenge to governments at all levels, this study will add new local insights into what influence the pandemic has had on smart city planning and governance in the GTA, what impacts this has had on citizen participation, and the role of smart cities in post-pandemic recovery. Drawing upon an analysis of 11 interviews with municipal staff and industry experts, an environment scan, and a review of government documents and local media, this study finds that as the pandemic became a catalyst for digital transformation and the modernization of government, it also

highlighted digital equity issues across the GTA. Solving this issue has become a

priority for many local governments through their smart city platforms, however, a

regional strategy for smart city governance remains lacking and local municipal

approaches and priorities vary across regions. The study results suggest that a gap

may exist in the governance of smart cities across the province.

3.2 Introduction

The Organization for Economic Co-operation and Development (OECD) is an
intergovernmental organization focused on the development of policies that foster
prosperity, equality, opportunity, and well-being and has referenced smart cities as
being disruptive to established models of governance (OECD, 2020). In the "Smart City
Solutions for a Riskier World" study, COVID-19 was cited as the top disruption by 81%
of cities, followed by declining economic growth and rising digital expectations and over
two-thirds of cities will reconsider urban planning and the use of space (ESI
ThoughtLab, 2020).

The pandemic shifted government services online, closing customer facing
counters, in-person services, and in-person public meetings, making it more difficult for
Canada's marginalized populations to stay connected during the crisis. In the article
"Pandemic-Driven Technology Adoption: Public Decision Makers Need to Tread
Cautiously," Robinson & Johnson warn that the Impacts of COVID-19 on vulnerable
populations and the simultaneous rise of new technology tool deployment in these
communities causes further inequities to accelerate at a larger scale (Robinson &
Johnson, 2021).

Smart city governance is an emerging field of research. Both researchers and practitioners have argued that many of the challenges for cities to become or to be smart exceed the scope and capabilities of their current organizations, institutional arrangements, and governance structures. There is a growing pressure for digital and governance transformation without solid evidence of the impacts this would have on society. Critiques of the smart city include the argument that "effective societal uptake of digital means is not yet supported by enough metrics on whether they can actually improve living conditions in the world's cities" (Castelnovo et al., 2016, pg. 725).

This study asks the research question, "what impacts has the COVID-19 global pandemic had on smart city planning and governance in the GTA?" The purpose of this study is to understand how the pandemic has modified smart city measures, from the perspectives of the study respondents. The pandemic is a rapidly evolving issue causing new challenges for governments. There is an immediate need to understand the institutional dynamics at play between smart city planning and governance and pandemic-driven technology adoption. The risks associated with believing technology to be a magical wand for cities is a common critique of the smart city. This study provides an overview of smart cities across the GTA , including a snapshot of governance approaches and strategic directions and how, according to the study respondents, the pandemic has influenced their smart city directions and the adoption of new technologies and what impacts this is having on citizens. Because this research study involved human participants, approval from the Research Ethics Board (REB) was sought. An application was submitted and received ethics clearance through a University of Waterloo Research Ethics Board (ORE #43107).

3.3 Approach & Methodology

The main method used for this study is thematic analysis of key informant interviews, rooted in grounded theory. The approach to grounded theory and thematic analysis of interviews follows the processes described by Glaser & Strauss (1967), Strauss & Corbin (1990), Charmaz (2004), and Braun and Clarke (2006). This approach included the use of memos and coding to develop core categories and concepts, followed by the use of constant comparison between data with a focus on context and complexity to the point of theoretical saturation (Charmaz, 2004; Glaser & Strauss, 1967). Thematic analysis seeks to identify patterns of meaning within qualitative data (Braun & Clarke, 2006). To identify key informants for the semi-structured interviews, an environment scan of the GTA was conducted. Municipal websites, smart city plans, documents, and reports to council were reviewed for indications of smart city status to identify strong case study municipalities. Selection criteria used for assessment purposes included whether a municipality had a clearly defined smart city strategy and/or digital strategy, plan, policy, and projects. This study also included a review of local media articles that highlighted smart city associations, such as recognition and awards such as the Smart 50 awards and the Intelligent Community Forum (ICF) Smart21 communities for smart city related work. The environment scan provided a background context for further exploration in interviews with municipal staff and relevant experts.

The limitations of these methodologies are that they only provide a sample or snapshot of the issue, based on individual perspectives. Interviews were selected as the main method because they provide context sensitive insights into the research topic. In grounded theory, the researcher acts as a co-constructor of meaning, so it was

important to identify my own assumptions going into the interviews as well as the study participant's (Charmaz, 2004). Interview participants were selected from Census Metropolitan Area (CMA) cities that were identified through the environment scan as "smart cities" and/or municipalities with populations >100,000 that are active in smart city planning, indicating that they may be working towards becoming a smart city. Study participants were recruited based on their municipal staff positions and responsibility for smart city and/or digital file deliverables. Among the study participants, 2 roles identified as consultants, 3 roles related directly to IT, 2 roles referenced 'smart city' in their titles, 3 roles related to corporate or strategic initiatives, and 3 roles were identified as topical experts in digital transformation and/or smart city governance. This included representation from Digital Main Street, Strategy of Things (Canada), and the Municipal Property Assessment Corporation (MPAC). Eleven (11) interviews were conducted in total representing all regions within the GTA, however, two municipal interviews involved two participants instead of one. Participating municipalities included City of Toronto, The Regional Municipality of Durham, City of Mississauga, City of Brampton, City of Burlington, Town of Oakville, Town of Ajax, and City of Vaughan. No participants could be secured in the Town of Milton, City of Markham, City of Richmond Hill, City of Pickering, City of Oshawa, and Town of Whitby. Additional experts on smart city governance were also selected, who were identified through the literature review, environment scan, or by referral of key informants, through a snowball effect, however they declined to participate.

Interviews lasted approximately 60 minutes with municipal staff and 30 minutes with additional experts. Semi-structured interviews allowed for a consistent set of

questions but also the freedom and flexibility to follow up on new insights and concepts

that emerge. The interviews were recorded where consent was given and/or

transcribed, and manually coded by theme and subject matter. The qualitative data

collected from the semi-structured interviews using open-ended questions was then

organized into core themes and patterns that emerged and aligned with the research

question and hypothesis. Finally, the findings from the interview data were analyzed

against the literature to identify any research gaps.

3.4 Background Context

According to a recent report published by PwC, cities are at the forefront of the

impacts of COVID-19 (PwC, 2021). As schools, businesses and government institutions

made a sudden shift to work-from-home models and citizens were ordered to stay

home, the pandemic created a rapid push for governments at all levels to adopt

technologies in response to COVID-19 to stay connected with citizens and deliver

critical community services (Robinson & Johnson, 2021). In the policy paper *OECD*

Policy Responses to Coronavirus (COVID-19): Cities policy responses, digitalization is

cited as a major game changer during the crisis that will remain a key component of the

new normal (OECD, 2020). In a report from the first OECD roundtable on smart cities

and inclusive growth, two of the five takeaways included the need for smart governance

and the active engagement of citizens and stakeholders throughout the policy cycle

(OECD, 2020).

The pandemic has disrupted cities around the world and smart cities are disrupting established models of governance. According to Jarendra Reddy, Director of Urban Solutions with HATCH,

> *"The pandemic has taught us both low-tech and high-tech lessons. It has laid bare issues of social and economic vulnerability, increasing our focus on public health, diversity, and inclusion. It has underscored the importance of a city's social fabric; the seemingly intangible benefits of a neighborhood—and neighbors—are now strikingly tangible"* (ESI ThoughLab, 2020, pg. 19).

In the book *City as Interface,* Martijn de Waal draws attention to Hannah Arendt's concept of the public domain and its essential role in a democratic urban society as being "the place where city dwellers with different backgrounds meet, are confronted with each other, and must come to terms with each other" (de Waal, 2014, pg. 92). He states that good public spaces lead to the development of a "democratic public that is open to all city dwellers, with all their different backgrounds" and argues that the choices we make about the technologies we deploy in our cities emerge from an ideology we have about how a city should function as a community (de Waal, 2014, pg. 92 & pg. 8).

Two critical questions de Waal asks are "what are the underlying urban ideals concealed in technologies?" and "what is the significance of all these new means of communication for urban societies?" (de Waal, 2014, pg. 9). Three ideals are presented in the book: the libertarian city (city as a market, citizens as consumers, freedom with no commitment), the republican city (Individual freedom, allows for divergent ways of life, shared responsibility for the city), and the communitarian city (common identity, shared culture, "the village"), proposing that many urban media support the libertarian ideal, which identifies public space as markets (de Waal, 2014, pg. 10 & pg. 11). Peter Johnson, et al., argues that it is easy during the early days of smart city technology

adoption by local governments to equate adoption with innovation and progress and highlights that there is "an opportunity to critically consider these different ways that the citizen is conceptualized in the smart city" (Johnson et al., 2019, pg. 8).

de Waal brings to light an important paradox within the smart city's ideology, which is that "on one hand technology contains an idea about what the ideal world should look like; on the other hand, the very same technology can also intervene in our everyday world and radically change our experience of and ideas about it" (de Waal, 2014, pg. 9). The extent to which technology impacts how city dwellers interact with their physical surroundings and how this will transform community life has important implications on how the city functions as a democratic community (de Waal, 2014 Pg. 9).

There is a dominant belief that transformation of governance is desirable and needed to make cities smart (Albino, et al., 2015). Smart governance can be scored on a scale ranking from conservation (traditional governance of a smart city) to transformation (smart urban governance) (Meijer & Bolivar, 2016; Castelnovo et al., 2016). The interviews with case study municipalities compare the similarities and differences in approaches to smart city planning and governance within the GTA. From their respected positions and perspectives, the study respondents share what impacts the pandemic has had on their smart city work and future directions. The open-ended questions explore pre-COVID barriers to smart city development, acceleration of smart city development because of COVID, governance priorities, digital tools, civic technology, citizen participation, public space, decision-making, and post-pandemic recovery scenarios.

3.5 Local Context & Smart City Snapshots

Figure 2: Case Study Municipalities in the Greater Toronto Area

Source: https://alfarenovations.ca/service-area/
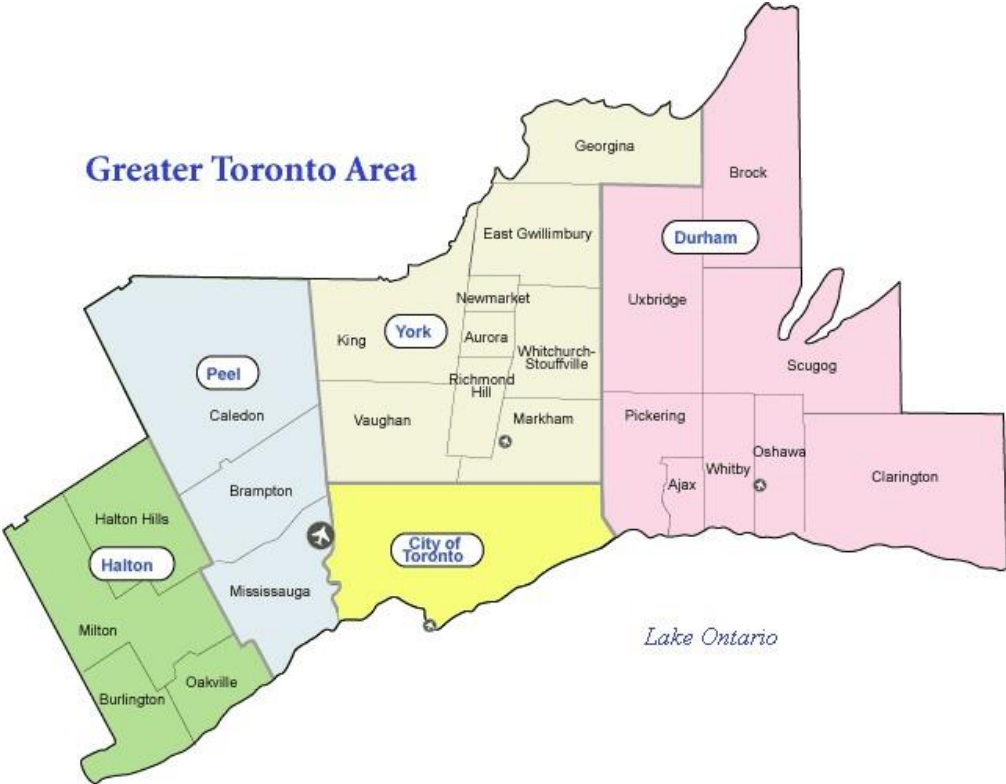
The City of Toronto sits at the centre of a larger metropolitan area called the

Greater Toronto Area (GTA), also known as the Toronto Census Metropolitan Area

(CMA) by Statistics Canada (City of Toronto, 2021). The GTA is the most populated

metropolitan area in Canada and is made up of 25 local municipalities and 4 regional

municipalities. City of Toronto is the capital City of Ontario with a total population of 2.7

million according to the Statistics Canada census profile for 2016 (Statistics Canada,

2019). It is the largest populated city in Canada and the 4th largest populated city in

North America.

Halton Region is comprised of the City of Burlington and the Towns of Oakville, Milton, and Halton Hills with a total population of 548, 435 according to the Statistics Canada census profile for 2016 (Statistics Canada, 2019). Burlington and Oakville are largely urban and suburban while the towns of Milton and Halton Hills are more rural, although between 2001 and 2011 Milton was the fastest growing municipality in Canada and the 2016 census population for Milton was 110, 128 compared with 84, 362 in 2011.

Peel Region is comprised of the cities of Mississauga and Brampton and the Town of Caledon with a total population of 1.3 million according to the Statistics Canada census profile for 2016 (Statistics Canada, 2019). Mississauga has the largest population in Peel and is the sixth largest lower-tier municipality in Canada, the third largest in Ontario and the second largest in the GTA, after City of Toronto.

York Region is comprised of the cities of Markham, Vaughan, and Richmond Hill, the Towns of Aurora, East Gwillimbury, Newmarket, Georgina, Whitchurch-Stouffville, and the Township of King with a total population of 1.11 million according to the Statistics Canada census profile for 2016 (Statistics Canada, 2019). The largest settlements in York Region include Markham, Vaughan, and Richmond Hill.

Durham Region is comprised of the cities of Oshawa and Pickering, the towns of Whitby, Ajax, the Municipality of Clarington, and townships of Scugog, Uxbridge and Brock with a total population of 645, 862 according to the Statistics Canada census profile for 2016 (Statistics Canada, 2019). The largest populated areas in Durham Region are Oshawa, Whitby, and Ajax.

The Smart City status of the GTA regions and local municipalities varied significantly. Durham is the only Region that has established a smart city framework at the regional level, although engagement varied across the region's local municipalities. For the purposes of this study, Town of Ajax was the most engaged. Region of Peel has the most extensive smart city planning and implementation through the municipalities of Mississauga and Brampton. Mississauga is the first GTA city to proclaim smart city status. The City developed a comprehensive smart city master plan and governance framework in 2019 and are in the process of developing a smart city policy.

York Region has taken more of a business approach to smart city development, especially in Markham where a platform governance project with BELL was piloted in 2019 (City of Markham, 2019). In July 2021 it was announced that City of Markham had won a Smart Cities North America award for an AI pilot project to detect potholes using the ROVER AI app by Visual Defense (City of Markham, 2021). City of Vaughan has a digital strategy and are in the process of developing a 5-year business plan to guide smart city development. Vaughan was recognized as being the first Gigabit community in Canada. In 2018, council established a Mayor's Smart City Advisory Task Force (City of Vaughan, 2019). Vaughan is also now home to Canada's first "Smart Hospital" (City of Vaughan, 2021).

Halton Region's smart city work is active through partnerships with Silicon Halton, a grassroots, industry-led, technology focused community of Professionals. Town of Milton are engaged with smart city work through the Milton Education Village Innovation Centre (MEV), an initiative of the Town's Economic Development department focused on supporting small businesses and entrepreneurs. The Town of Oakville has

identified itself as a "Smart Town" (although its population of about 200,000 makes it as large as a city) and they have established a digital strategy.

City of Toronto is taking a "digital rights" approach to smart city governance in response to the backlash over the platform governance approach of the Sidewalk Labs project. In 2019, Toronto became the first Canadian City to sign the Declaration of Cities for Digital Rights (NNL, 2019). At the time of the interview, City of Toronto was in the process of developing a Digital Infrastructure Plan (DIP).

The title and placement of staff within municipalities also varied, as seen in the chart below:

Table 3: Municipal Staff Study Participants, Titles	
Title	**Department**
Director, Strategic Initiatives & Communications	Office of the CAO
Manager, Strategic IT Service Delivery	IT
Manager, IT Infrastructure & Operations	IT
Grants & Strategic Initiatives Coordinator	Office of the CAO
Senior Manager, Innovation & Information Technology	IT
Team Lead, Smart Cities	IT
Project Manager (Consultant), Smart City Business Program	Special Projects
Management Consultant, Smart City	Technology Services
Manager, Smart City	IT
Manger, Corporate Initiatives	Office of the Regional Chair & CAO

Overall, City of Toronto, York Region, Peel Region, Durham Region, and Halton Region had a range of municipal activity in smart city planning and/or projects, which the following chart highlights. Smart city status was less obvious in municipalities such as Town of Whitby and Town of Milton.

Table 4: Environment Scan of Smart Cities within GTA

Municipality	Region	Smart City Status	WCCD certified/ Open Data Portal	Smart City Plan	Smart City Strategy	Smart City Policy	Smart City Initiative/Projects
City of Toronto	Toronto	Redefining - with a core focus on smart governance, community connectivity, access to digital services and digital rights	Platinum Certified (2014-2017)	Yes - Digital Infrastructure Plan (DIP) in progress	In progress	In progress - in response to Sidewalk Labs learning experience	ConnectTO, King Street Pilot, Smart Traffic Signals, MyWater Toronto App, DineSafe map, Civic Innovation office, Transportation Innovation Zones, Automated Water Meters, Digital Canopy – free Wi-Fi pilot project for low-income communities
City of Mississauga	Peel	Smart City declaration, Named a Smart21 Community of the Year (March 2021) by Intelligent Community Forum (ICF)	Platinum Certified (2018, 2019)	Smart City Master Plan	Included with plan	Data Governance Policy currently in progress	5G, Smart City Assets (map), digital billboards, district WIFI & Wireless network, Public Sector Network (PSN), dog waste energy pilot program, 5 smart city living labs, Advanced Traffic Management Systems (ATMS), Smart LED streetlights, iParks pilot project, Lakeview Development, Brightwater Communities, Centre for Civic Curiosity

City of Brampton	Peel	Yes – have won 2 smart 50 awards recognized as a smart city for AVM technology (Automatic Vehicle Monitoring)	Platinum Certified (2019)	Technology lens included with Brampton 2040 Vision Plan	No	No	GeoHub, Brampton Transit Technology, Pingstreet Mobile App, AVL + AVM technology – transit and fleet monitoring systems
City of Burlington	Halton	No, but were part of Intelligent Communities quite a while ago	No, but open data practices	No	No	No, but have developed a community engagement charter	Open GIS portal 'Navigate Burlington', 'smart parking' parking pucks, blue tooth travel time, iParks
Town of Oakville	Halton	In progress – media references to defining/becoming a 'Smart Town'	Platinum Certified (2016-2018)	Digital Oakville Plan/Report to Council	Digital strategy	Information Technology General Use and Practices Policy	ServiceOakville (online), partnership with Silicon Halton, smart technology pilots, GE LightGrid streetlight control system
City of Oshawa	Durham	Intelligent Community Development through Durham Region	Platinum Certified (2018)	No, but Region of Durham has developed a myDurham Intelligent Communities Framework (2020) and is working on their plan	Framework for Durham Region established in regional plan	No	CityStudio Durham, TeachingCity Oshawa (2017)
City of Pickering	Durham	Intelligent Community Development, recognized by ICF as a Smart21 Communities of 2017 & 2018	Unknown	No, but Region of Durham has developed a myDurham Intelligent Communities Framework (2020) and is	Broadband strategy (implemented through region)	No	open data and maps portal, , digital skills training through libraries, iHelp Service, LED streetlights, sustainable Seaton

				working on their plan			
City of Markham	York	Not directly	Platinum Certified (2019)	Platform Governance - in partnership with BELL – PILOT	Digital Markham Strategy	unknown	Partnership with Bell - smart city accelerator research program, asset management, water leak detection, storm/flood water monitoring, environmental monitoring, energy management
City of Richmond Hill	York	unknown	Platinum Certified (2019)	unknown	No	No	Richmond Hill Smart Street Lighting Conversion Project by Ameresco
City of Vaughan	York	working towards this	Platinum Certified (2015-2018)	5-year smart city business plan in progress	Mayor's Smart City Advisory Task Force, Digital Strategy	No	Activate!Vaughan Innovation Program, Smart Hospital - Cortellucci Vaughan Hospital

3.5.1 Municipal perspectives on the role of technology

One of the main themes that emerged throughout the study regarding smart city governance was the role of technology. City of Toronto's approach to technology is coming from an equity and digital rights lens, which makes sense given the public's response and backlash to the Sidewalk Labs project. The Digital Infrastructure Plan (DIP) currently being developed is founded on six principles, which are: 1. Equity and inclusion; 2. Well-run city; 3. Social, environmental, and economic benefits; 4. Privacy

and security; 5. Democracy and transparency; and 6. Digital autonomy (City of Toronto, 2021). Connect T.O is Toronto's smart city brand. The purpose of Connect T.O, according to municipal staff #1, is to identify connectivity gaps and serve as a platform for the municipality to step in where it needs to. City of Toronto is a signatory of the Declaration of Cities Coalition for Digital Rights and was recently invited to become a core member, along with other cities such as Amsterdam, Barcelona, and NYC. The Coalition for Digital Rights meets monthly in a working group format to tackle community issues and covers best practices for smart cities and digital rights.

City of Brampton's approach to technology is that technology is an enabler. Brampton's smart city vision is based on an urban planning vision for the city. For Brampton, technology is a lens to view the city from and a tool that enables smart city development. City of Brampton is not technology driven, but rather urban planning driven, according to the study participants. The 2040 Vision Plan includes a technology lens, where smart city work is identified indirectly. The City of Brampton municipal staff interviewees considered themselves "tool providers," providing the tools and technology for interacting with business and public interface. Their moto was "let planners be planners," which they stated is baked into their business process (municipal staff #2 & 3). They also identified themselves as "enablers" who support the technology lens in the 2040 Vision Plan. They stated that "where there is a business need and or requirement identified through the Term of Council Priorities, we respond with tools to meet that need" (municipal staff #2 & 3). Brampton does not see the need to create a smart city plan, as they already have urban design plans. Their focus is on the deliverables of the current plans and how technology can help to achieve those deliverables.

City of Mississauga's approach to technology comes from a data governance framework, which they prepared internally using a DMBoK framework identifying 12 or 13 governance areas. They have established a smart cities ethics checklist that asks the questions, "does this technology help or hurt people?" The City of Mississauga municipal staff interviewee stated that "we need a Canada-wide focus on data governance standards" (municipal staff #4). City of Mississauga has hired Ann Cavoukian, Ontario's former information and privacy commissioner as an advisor to help develop their smart city policy, which the city will be sharing with groups across Canada prior to approvals for comments.

Town of Oakville's approach to technology is that smart city work should provide mutual benefits to both the business side (internal) and the customer side (external). Oakville takes a decentralised approach to smart city work – an embedded model approach where departments lead and report back to a director who oversees the digital strategy file. The Town of Oakville Municipal staff interviewee stated that "you need to be weary of window dressing solutions that just look good on the outside and look nice for the customer and that without process redesign behind the scenes, you miss the true savings – where the benefits are really captured" (municipal staff #5). The Town of Oakville municipal staff interviewee warned of a "look modern" versus "be modern" approach to smart city development, which could stem from a lack of resources. City of Burlington takes a projects-based approach to smart city planning and management. Digital transformation is a council priority.

City of Vaughan's approach to technology is to have a smart city lens integrated into all departments – to institutionalize a smart city mindset and philosophy. The City of

Vaughan municipal staff interviewee stated that they are using technology to enable and meet the needs of the municipality versus chasing technologies. Vaughan's approach is to "really take the time to learn about the city and how people are using it – to really get to know the city and use this knowledge to build foundation pillars" (municipal staff #6). They don't want a standard smart city strategy and are taking the time to figure out the how of implementation. Vaughan's aspirations are to become "a truly transformed smart city" by focusing on problem solving and that the "how" is technology. The goal is quality of life for citizens and the data provides insights into the problems. The City of Vaughan municipal staff interviewee stated that, "we need new data to understand the problems" (municipal staff #6).

Durham Region's approach to smart cities is through the intelligent community's framework, which includes a transparent data governance process, an evaluation framework with KPIs, and community collaboration. The framework takes an integrated approach to smart city projects across the region. The principles guiding the framework are Open, Collaborative, Connected, Inclusive, Prosperous, and Sustainable and the region has established a smart city working group. Town of Ajax's mayor is a strong supporter of smart city projects. The Town of Ajax's main goal is to ensure that most people can access the town. Town of Ajax municipal staff interviewee states that Sidewalk Labs was "smart" but day-to-day adaptations are less sexy smart" (municipal staff #7).

From an economic development perspective, Digital Main Street was recruited to weigh in on the topic. Digital Main Street is a local non-profit organization that connects main street businesses to the most innovative digital providers and assists all main

street businesses as they navigate the digital transformation process through the adoption of tools and technology to meet business needs and grow. The Digital Main Street interviewee warns of the macro and micro-level dangers of technology mindsets which include at the macro-level the idea that "we have to do something tech-related" that is attributed mostly to the public sector (expert #1). At the micro-level, the interviewee warns of the reactive response that businesses often implement tech through, like "e-commerce" and the "let's do something to say we are doing something" approach (expert #1). The Digital Main Street interviewee states that we need to look for new approaches towards technology and shared that the key success factor for Digital Main Street was taking the time to get all the right players involved, which took them 18 months, and the need for extensive public consultations and engagement to identify needs and priorities. The Digital Main Street interviewee states that "if you have the right process in place, the results will follow" (expert #1).

An expert from the Municipal Property Assessment Corporation (MPAC) was also recruited to weigh in on the topic, given that the interviewee had taken a hiatus from his role between April 2020 to September 2020 to join City of Toronto, leading their efforts to support businesses during the pandemic. Previously, the MPAC interviewee had worked for City of Toronto on the innovation file in Economic Development and created Digital Main Street, which grew out of the City of Toronto into a non-profit. The MPAC interviewee also started Civic Hall Toronto, adapting technology, and improving processes. The MPAC interviewee states that Toronto's overall vision and architecture is missing a coherent strategy and the city has been moving from one locked in technology to another. For example, in May 2021, City of Toronto Council approved a

contractual agreement with PayIt Digital Government Inc. (PayIt) to design a digital experience and platform for residents and visitors to make payments to the city (City of Toronto, 2021). The MPAC interviewee stated that "without a strategy driving technology adoption, you have technology looking for a solution versus problems looking for a solution" (expert #2). The MPAC interviewee's perspective is that Toronto has an adoption problem because Toronto already has the platforms to do what they are looking for, they just aren't integrated and that the city hasn't built an overall experience and fully utilised what it has. The MPAC interviewee believes that the approach to technology should be based on thoughtful speed to solve a problem, to avoid the risk of buying the sales pitch and states that you need the right problem and stressed the importance of having a clear definition of the problem so that it doesn't get lost in the speed. The MPAC interviewee states that once a vendor gets locked-in, integration with systems is not always possible and emphasised the need to be strategy-led and move more thoughtfully over being task-led and adopting on the fly, as local municipalities are typically more task led.

Strategy of Things Canada was also recruited for the study. Strategy of Things (SoT) is a Silicon Valley based innovation firm that helps government and business organizations solve complex problems in new ways to help cities, communities, and business enterprises become smarter, safer, more responsive, and resilient (Strategy of Things, 2021). SoT Canada interviewee states that he witnessed a common pandemic approach to technology, which was more reactive than responsive. For example, some of the common pandemic driven solutions were HEPA filters, UVC, Ionization, contact tracing apps, infrared heat cameras, and occupancy sensors, many of which raised

concerns around the privacy of users and proved over time to have limited

effectiveness.

SoT Canada interviewee stated that "new tech gets the testing phase, although

the number 1 company takes over" (expert #3). What the SoT Canada interviewee saw

to be a more effective approach to technology was to develop a dashboard for services

that stacks stuff together to truly integrate. SoT Canada interviewee stated that most of

the smart city technologies are tactical stuff and that only about 30-35% is truly smart

and states that a common approach is to throw money at the technology to solve the

problems and when they can't be solved there is a mindset of "we've done everything

we can" (expert #3).

SoT takes a holistic approach to smart city development, using a quad of safety

framework. SoT Canada interviewee states that you still need to develop a strong "show

me the numbers" integrity and can't be too subjective in your framework and believes

the true smart city work involves pulling people along, not just pushing technology and

that you need to figure out where you are and vet innovation to see if it is actually doing

anything. SoT Canada interviewee states that there needs to be alignment and strategy,

that we need "strategic tech," frameworks for inner-operate, open innovation for how to

solve problems, and more of a lean approach to the start-up model. From the SoT

Canada interviewee's perspective, there is a lot of noise and inefficiency in the start-up

realm. The danger of pandemic-driven technology adoption, the SoT Canada

interviewee states, is relying on a single technology and inconsistent processes and that

there are private cloud companies instead of Google or Microsoft, to get benefits at

scale.

SoT Canada interviewee believes there is no silver bullet technology, but rather stacking services and measuring performance through a holistic framework (expert #3). Smart cities need to start with a strategy, which SoT Canada interviewee didn't see working with Halton Region and Town of Milton through their innovation labs. According to the SoT Canada interviewee, planning must start with the why, and that its best if this happens at the regional level, but it's usually at the municipal level through initiatives and projects. The SoT Canada interviewee states that Regions need to get aligned on purpose and get the politics out so that it's possible to co-create a willed future together. "Once aligned, the drivers are all going the right way and the smart city is the vehicle to get there" (expert #3). The SoT Canada interviewee believes the how needs to be figured out at the regional level, the who involves local jobs and the work to be done, urban planning is the why and aids towards alignment and you need to put the data behind it, taking a solving problems approach vs. organized chaos. The SoT Canada interviewee suggests looking at alternatives to large Internet Service Providers (ISP) providers, as Canada only has 1 small wireless ISP.

3.5.2 5G needed to advance smart cities

5G technology, which is said to be 100 times faster than existing 4G networks, is cited as an enabler of specific technologies that will advance smart cities, such as Autonomous Vehicles, smart grids, and a large-scale deployment of Internet of Things (Moore, 2020). 5G requires extensive infrastructure investments that not all municipalities have the resources to fully capacitate. There are multiple 5G networks available for purchase in the GTA, which started rolling out in 2020. This includes Rogers, Bell, Telus, and TeraGo. In early 2020, TeraGo launched a 5G Fixed Wireless

Technical trial in the GTA that advanced speeds up to 1.5 Gbps (Fisher, 2021). The

below map captures an idea of capacity established through Rogers Network within the

GTA, which rolled out the first and largest 5G network at the beginning of 2020. In 2021,

BELL announced that it will be making a capital investment of at least 1 billion dollars

over the next 2 years to expand its fibre, wireless and rural network rollouts to support

the national economic and employment recovery from COVID-19 and will also be

doubling it's current 5G network population coverage by the end of 2021 (BCE, 2021).

Figure 3. Rogers 5G network map GTA

Source: https://www.rogers.com/mobility/network-coverage-map?icid=R_WIR_NTW_HEUQFZ
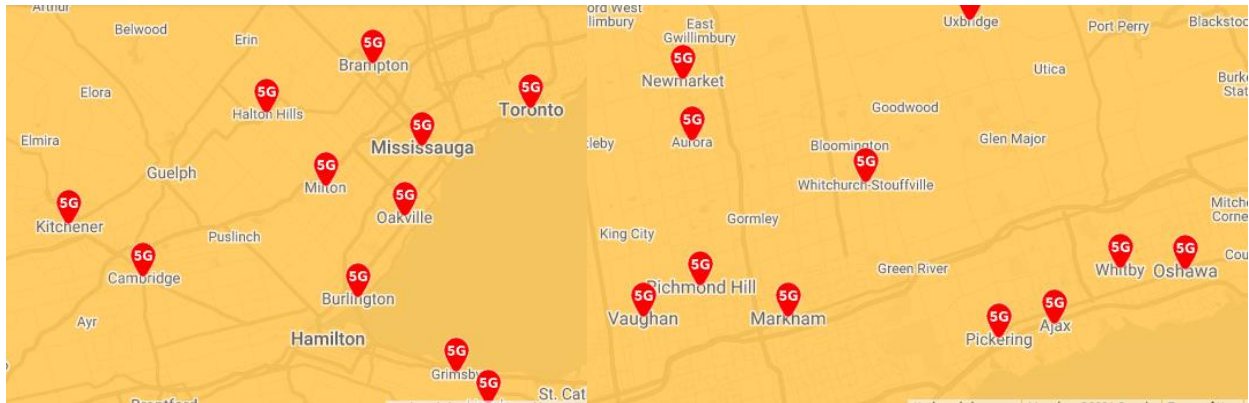
City of Mississauga has launched a 5G program and is releasing a report in fall 2021. City of Mississauga municipal staff interviewee states that their smart city plan has been a conduit to the city becoming the most connected city in Canada. Peel region has the largest municipally owned fibre optics network in North America, which the City of Mississauga municipal staff interviewee states has saved 20 million dollars for City of Mississauga since 2000. City of Brampton is currently exploring 5G Hyper-Connectivity Options and have launched a public consultation platform and information website, including bi-directional channels for public feedback.

City of Burlington is working with Halton Region towards a 5G rollout. Burlington is looking at vertical assets, as 5G requires more density. City of Burlington municipal staff interviewees said that the city needs to make it easier for carriers to play in Burlington and needs to do a better job at supporting carriers trying to do the work by reducing red tape and increasing infrastructure investments. York Region's budget initiatives for 2021 included continued growth of the Region's fibre network to help

improve the delivery of regional services and create future opportunities such as 5G

support (York Region, 2021).

3.5.3 Impacts to smart city priorities/funding

City of Mississauga is leveraging their smart city assets to support the recovery

efforts of the city focusing on Social and Economic resilience. The City of Mississauga

municipal staff interviewee states that there is a balance of short-term and long-term

initiatives planned that are designed to drive economic opportunity and to level the

playing field for those at risk (municipal staff #4). Previous funding for the smart cities

team within Mississauga was scaled back due to pandemic, and they are in the process

of requesting more funding from council for the next 5 years. No major changes were

cited by City of Brampton and the technology lens of the 2040 Vision Plan is still a

council priority. Smart city work continues to be a medium to high priority for City of

Toronto. Funding is stable, although ConnectTO is a capital project. Making connectivity

more equitable is a key priority. No comments were given by City of Vaughan.

City of Burlington does not have specific funding for smart cities, but they have

taken advantage of the Safe Restart funding from the government of Canada. For Town

of Oakville, smart cities continue to be a priority, but the day-to-day gets in the way.

Smart cities work more has become more urgent now. The Town of Oakville municipal

staff interviewee states, "the pandemic got us out of our rut" and "there is now a real

recognition that its not going to be as easy as it was prior to the pandemic going

forward" (municipal staff #5). For Durham Region, MyDurham311 is now a key priority.

Their new goal or moto is "omni channel experience for residences." The regions

Intelligent Community strategy brings smart city-type projects under the same umbrella, including MyDurham311. The Town of Ajax is undergoing a staffing review to determine space planning requirements and better explore how much of services can continue to be offered online to make the town more efficient and more effective. Council chamber is currently undergoing renovations for digital infrastructure and capacity, with COVID recovery funding.

3.5.4 COVID Challenges and Opportunities

The pandemic impacted all levels of government, forcing municipal staff to work from home. Study participants were asked to identify pre-covid barriers to smart city planning and implementation efforts and the most common answer's given were the lack of a regional and/or policy framework (5 out of 8 municipalities); culture and attitude towards change (4 out of 8 municipalities); funding/resources (4 out of 8 municipalities); lack of speed and urgency (3 out of 8 municipalities); and digital infrastructure (2 out of 8 municipalities). Municipal purchasing was often cited as causing obstacles to smart city work due to the amount of bureaucracy in the approvals process. City of Brampton takes a unique approach to procuring technology and services. They developed a Request for Pre-Qualifications (RFPQ) and have defined 5 elements/components of a smart city for the purposes of pre-qualifying a vendor, which include: 1) Smart City framework, processes, and best practices; 2) IoT data management and data analytics platform(s); 3) IoT sensors, data collections and edge computing; 4) connectivity technologies; and 5) AI & machine learning platform.

The City of Toronto municipal staff interviewee mentioned that they struggle with figuring out the right process for when to engage with the public and said that the city has an existing process for when to do this regarding physical infrastructure and it would be beneficial to also have a similar process for digital infrastructure. It was also mentioned that there is a 2-tier issue of getting everyone together to build a collaborative framework for smart city planning and that municipalities are all competing for resources for smart city infrastructure, similar to the smart cities challenge.

Infrastructure Canada is now offering $31 million over 2 years through the Canada Healthy Communities Initiative (CHCI) to "help communities adapt public spaces and local services in a way that meets people's needs both during and following the COVID-19 pandemic" (Government of Canada, 2021). Grants will support projects that fall into three categories: 1. Creating safe and vibrant public spaces; 2. Improved mobility options; and 3. Offering digital solutions. For the municipalities who referenced culture, examples given were departmental silos, fear of surveillance capitalism, fear of technology and change, and a distrust and/or disbelief in smart cities. The City of Brampton municipal staff interviewees mentioned that the Global Village was the trend pre-pandemic, seeing mass volumes of people at events and public gatherings, but now there is a switch back to the local village, where everyone is going back to the small, local village mindset.

Study participants were also asked to identify smart city work that was accelerated because of the pandemic. Every municipality mentioned that technology became essential to the City's response to COVID-19. Some municipalities had already established hybrid Work-From-Home (WFH) models for their organizations, which was

already embedded in their work cultures, and other's pivoted quickly to the WFH model, giving them greater confidence in technology. Similarly, for councils to meet virtually, a Canadian municipal law had to be changed, but otherwise the transition was relatively quick. Many municipalities are now undergoing significant city hall renovations to equip council chambers with digital infrastructure with COVID recovery funding from the government.

In addition to pivoting to a WFH model, municipalities had to pivot around citizen services, which became the primary focus. A major accomplishment cited by a few of the municipalities was also the successful digitalisation of their permit and applications process. The closure of customer facing counters was a major change for many municipalities. For some municipalities like City of Mississauga, it gave them the proof that they no longer needed them, which led to the decision to close them permanently. All municipalities in the study mentioned the addition of Wi-Fi hotspots and a significant increase in park and active trail usage. This also included the expansion of iParks to help better understand how parks are used. For City of Vaughan, the pandemic really accelerated the need for smart city governance, including how to keep things fair and sustainable through the procurement process.

Prior to the pandemic, a strategy was already in place for MyDurham311 online service delivery, but the pandemic really accelerated this project. Like Durham Region, City of Brampton had already put in place a front-desk digital solution with their Skip the Line initiative, which the pandemic helped to accelerate. Efficient customer service became the main priority for all municipalities. Most of the municipalities shared that the

pandemic helped to speed up the decision-making process, as there was not enough time to consider all the options.

The Town of Ajax municipal staff interviewee stated that they now have a more open-minded approach towards innovations that benefit smart cities. A few of the municipalities mentioned the success of their smart parking programs, including the installment of parking sensors, also known as 'parking pucks.' A few of the municipalities also mentioned the acceleration of their Autonomous Vehicle research and exploration and/or expansion of their fleet electrification. For example, in August 2020, Town of Oakville announced that they were getting a $66 million investment fund in partnership with the Federal and provincial governments to electrify their entire transit fleet. According to the MPAC interviewee, the pandemic helped to accelerate the adoption of technology and the modernization of municipal process, which was significantly delayed, even through smart city strategies and cited City of Brantford's innovation in shutting down several their municipal offices and letting staff work from home permanently. According to the Digital Main Street interviewee, the pandemic accelerated what people are doing and how they are thinking about it, especially in reference to making smart choices and tech-related placemaking.

City of Toronto formed an urban innovation steering committee as a result of COVID, and their Wi-Fi connectivity work through the CANOPY project was also in direct response to the pandemic, although there still exists city-wide challenges for reaching vulnerable populations. Another equity issue highlighted by the pandemic was racial inequality, which impacted decision making. The Durham Region municipal staff interviewee stated that the region held their first anti-black racism town hall in summer

of 2020, which led to new criteria and objectives, including a new diversity director in the central unit and the development of an anti-racism strategy. The Town of Ajax municipal staff interviewee stated that Ajax has established an internal diversity committee and an anti-black racism taskforce and has created a new diversity role in the CAO's office. City of Vaughan also hired a new diversity and inclusion officer to target people not being reached and are also looking at how to include seniors.

3.5.5 Impacts on citizen participation

When asked about specific impacts on citizen engagement, such as changes to demographics, whether this had increased or decreased, become more or less inclusive, or more or less effective during the pandemic, about half of the municipal reps either choose not to comment or said they couldn't be certain about this and that more studies need to be done to determine the impacts. The other half cited engagement increases due to the nature of the crisis and weren't sure whether the demand will still be there after the pandemic. It was mentioned in general that the virtual component is expanding the reach and 2 out of 8 municipalities said that the pandemic was widening the spectrum of engagement and that the pandemic had flatlined demographics.

Durham Region municipal staff states that more geographic pockets were now being represented and that they have new participation pockets. Town of Ajax has some very active neighbourhood groups on social media. The Town of Ajax municipal staff interviewee stated that it is challenging to know how to manage expectations and handle misinformation within these groups and that the mayor and council members have become active members in the groups along with relevant town staff. The Town of

Ajax municipal staff interviewee states "this is a good example of government and citizen participation and informal but active citizen engagement through the use of social media" (municipal staff #10). Other municipal reps also referenced how the pandemic had ramped up social media and other communications channels. Every municipal rep said that they were in the process of developing or upgrading their websites, communication channels, and/or engagement platforms, if this hadn't already been done prior to the pandemic to make it a more user friendly and streamlined experience.

COVID-19 has highlighted the digital divide in many parts of the GTA and local governments are struggling to close the gap, especially regarding vulnerable populations. Many Canadians and especially those in rural and remote areas do not have adequate access to basic internet services, let alone 5G (Government of Canada, 2021). The City of Toronto municipal staff interviewee stated that "the pandemic highlighted digital equity issues and the digital divide became more apparent" and that "there is now an across-the-board recognition of vulnerable sectors needing help – especially digital help" (municipal staff #1).

In direct response to the pandemic and this issue, the city launched the Digital Canopy pilot project, funded through Cisco's Country Digital Acceleration (CDA) program in collaboration with Cisco's Toronto Innovation Labs. The project provides free Wi-Fi to 25 low-income residential tower communities. City of Toronto conducted research in collaboration with local colleges and universities to analyse Toronto's digital divide. The objective of the research was to look at where it is and what's causing it. Results from the study found that there were several "divides", including affordability, access, and digital literacy. In response to this, City of Toronto distributed an affordable

broadband project for tender, targeting business and non-profit sectors to see how they can work with the City of T.O on this issue of solving the divide. The project is designed to leverage public assets, like public spaces for infrastructure to deliver broadband more affordably. Toronto will be taking a phased approach and focusing on communities identified as having a higher/great level of need. The City of Toronto municipal staff interviewee states, "we found that the traditional market approach has a tipping point that at a certain level becomes financially unviable" (municipal staff #1). Other considerations towards addressing the digital divide included language barriers, social media access, as well as access to a TV.

The City of Vaughan municipal staff interviewee stated that local libraries are doing a lot of digital literacy work helping to address the digital divide and tackle issues such as Wi-Fi availability and access issues, although libraries were closed to in-person services throughout the pandemic shut-downs. Durham Region has developed a Broadband Strategy (2019) and conducted a broadband survey, where different broadband capacities were identified. The survey found that there was more access where there is better Wi-Fi. The purpose of the study was to identify where the digital divide is happening and make sure that underrepresented community groups who the region wanted to reach have access. City of Brampton municipal staff interviewees stated that the number of people not using technology is decreasing each day, because of technology expanding in reach. The federal government has set a goal to have Canada-wide broadband coverage by 2030 (Stewart, 2020).

For City of Toronto, the pandemic and more specifically vaccine rollouts taught them lessons regarding their assumptions about people and technology. For example,

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the assumption that people will know how to navigate online safety measures, which proved not to be the case. The city learned more about seniors regarding civic literacy but there is a gap regarding youth, which is not yet known. For city of Brampton, the assumption was regarding digital inequality and the digital divide, which they found was shrinking due to the number of people not using technology shrinking everyday. The complaints they receive have more to do with "when can I register and how?" For City of Mississauga the connection between private internet speed and income groups was not what they thought. They found that speed was correlated to the age of the community mostly, so older neighbourhoods had lower connectivity despite some of them being affluent neighbourhoods and that it was more of a provider issue. It was locational versus income-based, and they had originally assumed that their digital divide issues were income-based. The City of Mississauga municipal staff interviewee did stipulate that this was at a mass glance, and that more details are needed to be certain of this.

3.5.6 Post-Pandemic Recovery Scenarios

When asked about what newly implemented digital elements will remain post-pandemic, all municipal reps said that a hybrid-approach will be the new normal. Many cited that technology was allowing them to better manage resources and that better data will enable them to make better evidence-based planning decisions. City of Vaughan municipal staff interviewee stated that the idea that you can access services anytime, not just government hours will stay. Many of the municipalities were still assessing what lines of business could transform fully to online delivery, but not all services could make this transition.

The biggest area of uncertainty was in reference to municipal offices and space planning, as many municipalities were running out of space prior to the pandemic. City of Mississauga municipal staff interviewee stated that they are in the process of transitioning to more "WE" and "ME" space. In this context, WE means hotelling space and ME means WFH. City of Burlington municipal staff interviewees stated that this is creating new challenges, as previously they had been working with one workplace model, which was everyone in the office OR at home. City of Burlington municipal staff interviewees stated that the either/or approach is easier to implement and manage than a hybrid approach and also cautioned against creating second class citizens through a hybrid workplace model, where you have staff that can or can't work from home due to the nature of their job, which could create inequities for staff. A few municipalities also mentioned taking more of an inclusive lens to planning and participatory processes.

Towards the end of the study, participants were asked to envision post-pandemic recovery scenarios. Many study participants mentioned how COVID had shifted the public sector mindset towards digital tools and WFH, which people are now more open to or rather more comfortable with. GTA municipalities shared core priority areas for focusing their efforts, which related to people and public space, transportation, and the environment and building digital capacities. The City of Vaughan municipal staff interviewee mentioned the challenge of having limited resources and fast growth, where infrastructure can't keep up. They are taking the time to work on smart city governance policies. Collaboration was also cited as a critical recovery component, including how cities and regions work together more effectively and how cities can share assets and infrastructure.

City of Brampton's perspective was that "you need to address silos first, then consider process, THEN use technology" (municipal staff #2 & 3). City of Burlington municipal staff interviewees stated that they are now in better shape with plans and technology to advance smart city work and will be focusing on Automatic Vehicle Locator (AVL) systems and exploring virtual reality technologies. For Durham Region, communications will be an important piece of recovery. The Region has become a stable source of information for their communities during the pandemic, but the COVID divide has created echo chambers that will need to be managed through social media. City of Toronto municipal staff interviewee stated that the pandemic showed city of Toronto what's possible, what works and what doesn't and will enable them to get smarter about using technology.

According to SoT Canada interviewee, we need to do a better job at identifying futurism versus pragmatic solutions and that a big issue now is safety and security risk. He stated that a resilience strategy is needed that takes a playbook approach and this starts with buildings, and that you need to build the strategy around regions (expert #3). The Digital Main Street interviewee states that smart city has a cool factor that will help bring people back to cities. The idea to bring people back to a "cool smart city" that reflects modern advancements. The Digital Main Street interviewee referenced new businesses moving to Toronto, such as Netflix, Shopify and The Well on Spadina. From the Digital Main Street interviewees perspective, you need strong leadership, engaged communities and a strong stakeholder network working together. The MPAC interviewee believes that one of the biggest successes during the pandemic was getting internet into high-risk neighbourhoods, helping to shrink the digital divide.

FedDev Ontario is investing $11.1 million towards Innovate Cities, "a non-profit consortium of seven ICT companies involved in launching a four-year made-in-Canada initiative to provide safer, more accessible, and more energy-efficient spaces for all Canadians through smart city technology" (Mongeon, 2020). Innovate Cities will be creating two new cloud-based platforms to help with collaboration and education. The first online platform that is being developed will be called CommunityHub, where Canadian start-ups can design, co-develop and validate solutions to key urban issues. The second online platform is a series of programs educating citizens and public and private sector leaders in smart building expertise and capacity (Mongeon, 2020).

> *"Through this first-of-its-kind collaboration, Innovate Cities will develop a full stack, cloud-based CommunityHub platform for innovative start-ups and scale-ups to rapidly design and deploy new capabilities for our communities" (Innovate Cities, 2019).*

4. Discussion & Recommendations

The pandemic has disrupted cities across the GTA, and smart cities are disrupting established models of governance. Seven (7) themes, described in the below chart, emerged from the thematic analysis of the key informant interviews. The chart gives an overview of the study interviews organized around the research themes and provides a snapshot comparison of municipalities across the GTA. When comparing the status of smart city planning and governance across the GTA, the City of Mississauga has the most comprehensive and established smart city plan and governance framework. They are currently in the process of developing a data governance policy, with help from Ann Cavoukian, Ontario's former Information and Privacy Commissioner. Durham Region is the only region that is taking a regional approach to smart city planning and governance. They have established an Intelligent Communities framework and are in the process of developing their Plan. The City of Toronto is also in the process of developing their Digital Infrastructure Plan (DIP).

Table 5: Research Themes

Research Themes	City of Toronto	City of Mississauga	City of Brampton	City of Vaughan	City of Burlington	Town of Oakville	Durham Region	Town of Ajax
Approach to Smart City Governance	First Canadian city to sign the Declaration of Cities for Digital Rights Digital Infrastructure Plan (DIP) in progress ConnectTO – smart city platform	First city in GTA to declare smart city status master plan and governance framework data governance policy in progress	Brampton 2040 vision plan – technology lens Does not see the need for additional smart city plan	Smart City Advisory Task Force established in 2018 Digital strategy 5-year smart city business plan in progress	Were once part of Intelligent Communities Project-based approach	Digital Strategy de-centralised approach change management approach	myDurham Intelligent Communities framework established at regional level myDurham Intelligent Communities Plan in progress	No formal framework for smart city work, but part of Region's Intelligent Communities framework
Role of Technology	Digital equity lens Purpose of ConnectTO is to identify connectivity gaps and serve as a platform for the municipality to step-in where needed to help close those gaps	Smart city governance framework developed in-house using DMBoK framework - smart cities ethics checklist	Technology as a lens and tool that enables smart city development & helps to achieve the city's business deliverables	Goal to have a smart city lens integrated into every department Goal to become a 'truly transformed smart city'	Digital transformation a council priority	Transformation of process and modernization of government	Technology as a tool to enhance Durham Communities around 5 goals: community vitality, environmental sustainability, service excellence, social investment, and economic prosperity	Technology to enhance accessibility to Town services
Impacts on Priorities/funding	Smart city work is still considered a medium to high priority. Making	Funding cuts to smart city team	No major changes cited – technology lens	No comments	No specific internal	Smart Cities work now more of an urgent	myDurham311 now a key priority. New	Undergoing space planning review to make

	connectivity equitable remains a key priority Funding is stable, although ConnectTO is a capital project.	because of COVID. New budget for smart city work submitted to council for approval for the next 5 years. Focus is on social and economic resilience	of 2040 Vision Plan still a council priority		funding for smart city work Have taken advantage of Safe Restart funding from Government of Canada	priority because of the pandemic	moto is "omni-channel experience for residents"	the town 'more efficient and effective' Council renovations for digital infrastructure and capacity, with COVID recovery funding
Challenges	City had no policy framework pre-pandemic	City doesn't have the underlying data platform to move forward Competing for resources for smart city infrastructure	2 barriers: people's perception about technology and people's willingness to change Speed of digital solutions	Lack of resources to purchase investment technologies siloes Resistance to smart cities Fear of surveillance capitalism	Lack of resources Lack of urgency No formal place in organization for smart cities work	Culture and speed of change Public sector mindset of "you're not allowed to make mistakes" Lack of belief that smart cities really work and are better Cost of technology and smart city infrastructure Lack of a regional model	2-tier issue of getting everyone together to build a collaborative framework – delayed by pandemic Major barrier was a lack of a smart city strategy	Culture and mindset towards innovation and technology. Municipal policy and procedural barriers

Opportunities	Establishment of the Digital Canopy pilot project Establishment of the Urban Innovation Steering Committee Development of Digital Infrastructure Plan (DIP)	The use of technology became essential to the city's response to COVID-19. Response aided by smart city technologies already in place Wi-Fi expansion for those at risk 5G program	Pandemic accelerated Skip the Line initiative Pandemic has sped up decision making processes Approval of 5G report to council	Internal digital transformation Adoption and uptake of collaborative tools	COVID-19 became the business case for immediacy - to drive innovation Working with Region of Halton towards 5G rollout Expansion of public Wi-Fi and iParks	Pandemic accelerated fleet electrification work Getting permits and application processes online – had tried for years	Pandemic accelerated myDurham311 project New comfort with using technology Development of myDurham Intelligent Communities Plan Establishment of CityStudio – civic literacy aspects	Pandemic gave the Town more confidence that smart city work is doable. Council more open-minded
Impacts on Citizen Participation	Pandemic highlighted digital equity issues and awareness of vulnerable sectors needing help, especially digital help Public consultation in October 2020 – significant uptake in engagement from vulnerable groups. Topic was on affordable internet for all – hosted by ACORN Assumption that people will know how to navigate online	Smooth transition to digital public services – already part of culture and business processes At a mass glance, the city discovered that connectivity issues were more related to age of neighbourhood's vs income – provider issues	2 biggest rivals for increase: supply and demand Pandemic is a big topic, but will the demand still exist post-pandemic? Pandemic flatlined demographics Number of people not using technology	Local libraries were doing digital literacy work to address the digital divide and were closed during shutdowns, creating a barrier for accessibility to services New engagement strategy developed in 2020	Increase in virtual participation - more public interest in COVID-related news and issues Pandemic flatlined demographics	No comments	Online engagement increased policy gaps were recognized through the pandemic regarding how to engage citizens and how to treat citizen data Region is becoming more aware of who might be left out of the digital	Increased social media and other communication channels neighbourhood group activity on social media – challenge of how to manage expectations

	safety measures – proven false, especially with seniors Youth engagement still unknown		decreasing each day because of technology expanding reach	Focus on groups not being reached Participation and engagement are relative to the project and/or topic			engagement experience Participation pockets and echo chambers – divide about COVID-19 COVID fatigue	
Post-Pandemic Recovery and Smart Cities	Hybrid approach City to use lessons about what works and what doesn't to get smarter about using technology	Hybrid approach City permanently closed customer facing counters because of the pandemic Municipal buildings will transfer to Me (work from home) and We (hotelling) space Call for a Canada-wide focus on data governance standards and a	Hybrid approach Transformation of office space – more hotelling space Future-proofing business through omni-channels Question of "what if this happens again" – adaptive approach Pair underlying business needs with smart city	Hybrid approach Transparent public space Figuring out implementation aspects and "the how" Need to deploy more public education about data collection	Hybrid approach Need to be weary of the creation of second-class citizens – those who can work from home and those who can't 5G carrier investments	Hybrid approach Launching new website in 2022 - Better access for citizens to online services – make it easy Space on website for live engagement Downtown Oakville in the process of launching several digital technologies, like parking	Hybrid approach More inclusion through services Focus on downtown and main streets – placemaking	Hybrid approach Increase in use of public space throughout the pandemic - reconsidering purposes of public spaces, for example, are hockey rinks still in demand? Better data and evidence-based decision making

| | | common data trust for all of Canada

Focus on the experience as a citizen – parking, payment, Wi-Fi and make these better through technology | solutions – tech as an enabler | | | pucks, and wayfinding | | |
|---|---|---|---|---|---|---|---|---|

City of Vaughan has a digital strategy and are in the process of developing a 5-year smart city business plan. Town of Oakville also has a digital strategy and are working on a reporting framework and plan. They are taking a de-centralised approach to smart city governance. City of Brampton's planning and governance framework comes from Brampton's 2040 Vision Plan, which has a technology lens. They did not see a need to develop an additional smart city plan. The Town of Ajax is guided by Durham Region's Intelligent Communities framework, although this has not been formalized at the local level. City of Burlington currently takes a project-based approach to smart city work and they are still figuring out where smart cities fit within the organization.

Most municipalities referenced technology as a transformational tool to advance the modernization of government and processes. Other references given were the ability to achieve business deliverables, advance connectivity and improve communities, including access to government services. When comparing the impacts of the pandemic on smart city prioritization and funding across the GTA, no major changes were cited. Some of the municipalities that did not have existing smart city funding were able to take advantage of COVID recovery government funding, especially for upgrades to digital infrastructure in council chambers. A couple of different municipal staff interviewees stated that smart city work was now a more urgent priority because of the pandemic.

When comparing pre-pandemic barriers towards smart city development and implementation work to smart city work that the pandemic helped to accelerate, some common challenges and opportunities were heard across the GTA. The most common

challenges were a lack of a smart city governance framework and a lack of digital infrastructure and/or required resources to fully realize smart city capacities. Other common challenges were organizational siloes, procurement barriers, resistance towards change/culture, a lack of trust in smart cities, a lack of urgency to take action, and the challenges of collaboration and getting everyone on the same page.

What the pandemic helped to accelerate across the GTA was the digital transformation of public facing services, including government buildings and offices and council meetings, which had to transition to virtual meeting platforms. The pandemic also helped to accelerate the digitalization of planning processes that were previously paper based, like planning application and permits, which some municipalities had failed to achieve pre-pandemic, despite great efforts. The pandemic also helped to accelerate Wi-Fi hotspots and connectivity across the GTA. City of Mississauga rolled out their 5G program during the pandemic and City of Brampton had their 5G council report approved. Other impacts to the public realm included the expansions of active trails, as their demand for use increased. For City of Mississauga and City of Burlington this also led to "e-park" projects, to more accurately measure how public parks are being used. Many of the municipal staff interviewees stated that the pandemic gave them more confidence in technology and smart city work. It was also stated that the pandemic had become the business case for immediacy and sped up decision making processes.

When comparing the impacts of the pandemic on citizen participation, it was evident across the GTA that the pandemic really highlighted digital equity issues and a greater awareness of those needing help. However, the digital divide was much larger in Durham Region and City of Toronto than in Peel Region, and Halton Region. Peel

Region has the largest municipally owned fibre optic network in Canada. In the development stages of Mississauga's smart city plan, the city's planning process highlighted a digital divide and the plan aimed to solve it. City of Toronto and Durham Region are currently going through a similar process with the development of their smart city plans. City of Brampton municipal staff interviewees stated that the amount of people not using technology is shrinking each day. For City of Vaughan, the closures of libraries during the shutdowns impacted their work on bridging the digital divide, as their local libraries were running the City's digital literacy efforts.

When it came to measuring changes in participation levels resulting from digital citizen engagement, the results were inconclusive due to limited information and data on engagement numbers and many of the municipal staff interviewees stated that any significant increases in engagement were most likely related to pandemic specific topics. It was mentioned that the pandemic helped to flatline participant demographics, though more studies are needed to be sure of this. Some key issues in Durham Region were an increase in social media and active neighbourhood groups and the rise of participation pockets and risk of echo chambers.

When comparing post-pandemic recovery scenarios across the GTA, all municipal staff interviewees stated that a hybrid approach to government services will remain. City of Mississauga made the decision to permanently close their customer facing counters and transition their government offices to more flexible workspaces and continue to let their staff work from home where possible. City of Toronto are taking lessons learned from the pandemic to get smarter about using technology. City of Brampton and Durham Region municipal staff interviewees mentioned the need to

future-proof their business through the development of omni-channels. City of Vaughan are really taking the opportunity and time to figure out the 'how' of their smart city planning, implementation, and governance process. The Town of Oakville received a $66 million investment fund in partnership with the federal and provincial governments to electrify their entire transit fleet. They are in the process of redeveloping their website to make it more user-friendly and customized to the needs of their residents.

Both the City of Brampton and City of Burlington are in the process of exploring 5G programs, which City of Mississauga has already launched. Other common themes were a reconsideration of public space and the use of digital technologies, better data collection for evidence-based decision making, public services that are more inclusive, and digital upgrades to government facilities and services. City of Burlington municipal staff interviewees warned of the need to be weary of the creation of second-class citizens regarding work from home policies, as not all staff are able to work from home. City of Mississauga is currently in the process of developing their smart city policy, which will focus on data governance. They will be sharing their smart city policy with groups across Canada, prior to approvals for comments.

The key takeaways from the interviews with experts are:

- Smart cities need to start with a governance strategy prior to technology adoption
- Taking the time to get all the right players involved and the need for extensive public consultations and engagement to identify the needs and priorities of communities.

- Without a strategy driving technology adoption, you have technology looking for a solution versus problems looking for a solution.

- Cities like Toronto have an adoption problem because they already have the platforms to do what they are looking for, they just aren't integrated, and they haven't fully utilised what they have or built an overall experience for the city and its citizens.

- Importance of having a clear definition of the problem, so that it doesn't get lost in the speed of technology

- The public sector needs to be strategy-led and move more thoughtfully over being task-led and adopting on the fly.

- The need to become more responsive with technology rather than reactive

- The need for more of a holistic approach to smart cities

- The need for a more integrated approach to smart city governance – strong leadership, engaged communities, and a strong stakeholder network working together

- Stacking services and measuring performance though a holistic framework

- Looking at alternatives to large Internet Service Providers (ISP) – Canada only has 1 small wireless ISP

- Identifying futurism versus pragmatic solutions

- Issues of safety and security risks and the need for resilience strategies

- There is a cool factor of modern smart cities that will help bring people back to cities and drive economic investments

The smart cities challenge (2017) was a conduit for much of the smart city planning and development work currently underway across the GTA. Impact Canada defined a smart cities approach as achieving meaningful outcomes for residents using data and connected technology (Government of Canada, 2020). The challenge motivated cities to start thinking about problems and how technology could help to solve those problems. However, the challenge also set cities up to compete for funding and created smart city status anxiety. The City of Mississauga's submission was not a successful winner, but they leveraged the opportunity and support from council to create their plan, which set a foundation for becoming a municipal leader in ethical, government-led smart city planning and governance. The City of Mississauga municipal staff interviewee stated that we need a Canada wide focus on data governance standards – a national standard and a common data trust for all of Canada. Their policy, which they are recommending that other municipalities consider using as a template, will focus on data governance. While there are policy solutions developing around data governance, thanks to the lessons learned from the Sidewalk Labs project, and while the pandemic helped to highlight a digital divide across the GTA, expanding digital connectivity is only one aspect of the solution.

This study revealed that a gap may exist in the oversight and governance of smart cites across the province that could benefit from the development of a standardised holistic framework and root cause approach to guide smart city development through post-pandemic recovery. This is especially important as COVID

specific studies revealed that digitalization is as a major game changer during the crisis

that will remain a key component of the new normal (OECD, 2020).

4.1 Areas of Further Research

This study reveals that more research is needed to fully understand the impacts

of digital transformation on society, how this effects the relationship between

government and citizens and the inherent social risks of the digitalization of society.

More research into echo chambers and their influence on smart city governance and

decision making are also recommended.

This field of research would also benefit from holistic research studies that

explore the root causes of digital and civic literacy gaps and the demographics most

impacted. Through the pandemic, the City of Toronto learned more about seniors

regarding civic literacy but there is a gap regarding youth, which is not yet known.

Comparative analysis studies of traditional versus digital citizen engagement and

participation outcomes are recommended, as the results from this study were

inconclusive. It was too early to tell and/or because of low survey results, likely from

COVID fatigue.

4.2 Final Thoughts

Cities reflect time and are the outcome of a series of evolving mechanisms that

influence their design, organisation, and planning (Garau et al., 2016). By 2050,

approximately 68-70% of the world's population is projected to live in cities (UN, 2018;

Albino, et al., 2015). According to the UN, sustainable urbanization is key to successful

development. This includes the incorporation of a triple bottom line that values people,

planet, and profits. Complex ecosystems of people, institutions and stakeholders are

significantly harder to organize and manage and special attention must be paid to

issues of equity and accessibility to avoid digital disparities and spatial polarization

(Angelidou, 2015). Both researchers and practitioners have argued that many of the

challenges for cities to become or to be smart exceed the scope and capabilities of their

current organizations, institutional arrangements, and governance structures.

A comparative case study analysis between City of Toronto's Sidewalk Labs

project and City of Mississauga's journey to becoming a smart city revealed what can

go well and wrong with smart city governance. When it goes well, as illustrated by the

City of Mississauga example, the participatory process can be enhanced by digital tools.

When it goes wrong, as illustrated by the Sidewalk Labs example, smart cities can be

monopolized by corporate interests, exposing citizens to digital vulnerabilities. In

Finding Peace, Jean Vanier warns of the seduction of powerful political groups who can

use clever, psychological tricks to play upon our weaknesses in order to sway us

towards their way of thinking and manipulate us into illusion (Vanier, 2003).

The case studies revealed that good governance can have an impact on what

goes well and what goes wrong. City of Mississauga's leadership in smart city planning

and governance is an example of this. This research finds that the foundation of good

smart city governance begins with the creation of a smart city plan and policy that helps

to protect citizens from digital vulnerabilities. Another potential characteristic of good

smart city governance involves the development of a collaborative governance

framework that establishes accountability for smart city outcomes, such as quality of life,

and pays attention to the local context of the city and unique problems.

A few paradoxes emerged from the research. de Waal brings to light an

important paradox within the smart city's ideology, which is that:

> "On one hand technology contains an idea about what the ideal world should look like; on the other hand, the very same technology can also intervene in our everyday world and radically change our experience of and ideas about it" (de Waal, 2014, pg. 9).

The paradox that emerged from the Ardler Investors project was that:

> "Participants must take control of the (participatory) process to be invested in it but creating a community of invested local residents initially required a carefully designed process" and that "a commitment to participate in local political processes is something that technology can facilitate but not cause" (Taylor et al., 2018, pg.10; Ramos, 2019).

The second study revealed that the pandemic has disrupted cities across the

GTA, and that smart cities are disrupting established models of governance. An

overarching conflict throughout the research is that you need a transformation of

governance to realize the full capacity of the "smart city", yet no clear framework exists

to assess what is meant by "smart" in relation to cities. The research revealed that the

digital transformation of society without a social governance framework that identifies

digital vulnerabilities, creates digital equity issues that digital connectivity alone will not

solve, as participatory processes require a commitment to participate that technology

can only facilitate. In a report from the first OECD roundtable on smart cities and

inclusive growth, two of the five takeaways included the need for smart governance and

the active engagement of citizens and stakeholders throughout the policy cycle (OECD,

2020).

The pandemic presented unprecedented challenges, but it also provided many opportunities. The pandemic forced governments to modernize their services, creating efficiencies and a more adaptive framework for delivering services. It also made the issue of digital vulnerabilities more visible. For many municipalities, the pandemic unwillingly forced a digitalisation of government. The municipalities with more advanced smart city measures in place cited being more prepared, although a lack of digital infrastructure and resources were a common theme across the GTA. Digitalization became a major game changer during the pandemic that will remain a key component of the new normal, as all case study municipalities stated that they would be maintaining a hybrid approach to delivering services.

The research identified a need for a more integrated approach to smart city governance, including strong leadership, engaged communities, and a strong stakeholder network working together. A common theme across the GTA was that the pandemic helped to break down barriers that had previously existed, such as organizational siloes, fear of change, and a lack of trust and confidence in technology. It was acknowledged by all municipalities that a major barrier is the lack of a regional framework for smart city governance. Some of the case study municipalities were able to leverage the pandemic to push for policy solutions, but the research identified a large variance in approaches to smart city governance across the GTA, signalling a potential overarching governance gap in Ontario.

One of the perspectives throughout the research is that smart cities can be viewed as performance organizations on a path of continuous improvement, innovation, and accountability. The study results reflected this perspective, with cities at different

points along a path. What is inconclusive throughout the research, is the destination. The closest description to a destination would be a city that is fully transformed into a smart city, although the term 'smart city' remains broad, all-encompassing, and lacks a single definition. What is clearer throughout the research is that foundation of good smart city governance begins with the creation of a smart city plan and policy that helps establish boundaries and protects citizens from digital vulnerabilities. Given the risks highlighted by the research, there is a need for a more coordinated and integrated approach to smart city governance in Canada.

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APPENDICES

Appendix A: Interview Questions

Questions for Municipal Staff

1. Were there any previous smart city implementation barriers identified prior to the COVID-19 pandemic? Why did these barriers exist?

2. What smart city elements were being rolled out and/or accelerated because of the pandemic? How so?

3. Has priority or funding for smart city strategy and/or plan implementation changed because of the pandemic?

4. Which of these elements will stay or what will go in a post-pandemic "new normal" environment?

5. Are any digital tools more useful because of COVID-19?

6. To what extent has the pandemic accelerated smart city governance in (name of local municipality)?

7. Has citizen engagement and participation increased or decreased from the switch to digital governance platforms?

8. What does your demographic of citizen participants typically look like? Do some groups participate more than others? Are certain neighbourhoods and communities represented more than others?

9. How has citizen participation changed with the shift to digital planning participatory processes? More or less effective? More or less inclusive?

10. What impacts has this had on planning decision-making processes?

11. What kinds of citizen data are you collecting, why and what are the main methods of collecting this data (survey's, sensors, feedback at public meetings, etc)?

12. What will planning participatory processes look like post-pandemic? Consider various recovery scenarios (new normal, more waves causing instability, vaccinations, etc.)?

13. What does public space and public participation look like post-pandemic?

Questions for topical experts

1. To what extent do you think the pandemic has accelerated smart city implementation in the GTA?

2. What role will smart cities play in post-pandemic futures?

3. How much do you think pandemic recovery efforts will influence smart city governance?

4. What benefits and dangers can you see from pandemic-driven technology adoption?

5. What is the difference between a local government who has implemented digital tools and platforms in response to the pandemic and a smart city government?

6. What do good participatory planning practices look like in the smart city?

7. Do you think more cities will emerge as smart cities post-pandemic?