

**The Open Data Smart City: A Case Study of Smart City Progress through Open Data
Initiatives**

by

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Abstract

Smart cities, cities that are supported by an extensive digital infrastructure of sensors, databases and intelligent applications, have become a major area of academic, governmental and public interest. Simultaneously, there has been a growing interest in open data, the unrestricted use of organizational data for public viewing and use. Drawing on Science and Technology Studies (STS), Urban Studies and Political Economy, this thesis examines how digital processes, open data and the physical world can be combined in smart city development, through the qualitative interview-based case study of a Southern Ontario Municipality, Anytown. The thesis asks what are the challenges associated with smart city development and open data proliferation, is open data complimentary to smart urban development; and how is expertise constructed in these fields? The thesis concludes that smart city development in Anytown is a complex process, involving a variety of visions, programs and components. Although smart city and open data initiatives exist in Anytown, and some are even overlapping and complementary, smart city development is in its infancy. However, expert informants remained optimistic, faithful to a technologically sublime vision of what a smart city would bring. The thesis also questions the notion of expertise within the context of smart city and open data projects, concluding that assertions of expertise need to be treated with caution and scepticism when considering how knowledge is received, generated, interpreted and circulates, within organizations.

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Table of Contents

Abstract	ii
Acknowledgements	iii
Chapter 1 Introduction	1
1.1 Introduction	1
1.2 Purpose	1
1.3. Methodology	2
1.4 Significance	2
1.5 Outline of Thesis	3
Chapter 2 Literature Review	5
2.1 The Smart City	5
2.1.1 <i>Smart City Definition</i>	5
2.1.2 <i>Origin of the Smart City</i>	7
2.1.3 <i>Digital Cities and Intelligent Cities</i>	7
2.1.4 <i>Smart City Components</i>	8
2.1.5 <i>The Actually Existing Smart City</i>	9
2.1.6 <i>Smart Cities and Privacy</i>	10
2.2 Open Data	11
2.2.1 <i>Open Government Data</i>	11
2.2.2 <i>Evolution towards Open Data</i>	13
2.2.3 <i>Benefits of Open Data</i>	14
2.2.4 <i>Transparency and Accountability</i>	14
2.2.5 <i>Innovation and Entrepreneurship</i>	15
2.2.6 <i>Increased democracy</i>	16
2.2.7 <i>Benefits in practice</i>	16
2.3 Critique of Open Data	17
2.3.1 <i>Quality of Information</i>	17
2.3.2 <i>Digital Divide</i>	18
2.3.3 <i>Financial Risk</i>	19
2.3.4 <i>Privacy and Surveillance</i>	19
2.3.5 <i>Open Data and Privacy</i>	21
2.3.6 <i>Alternatives to Surveillance in the Smart City</i>	22

2.4 Previous Research Studies.....	22
2.5 Conclusion.....	23
Chapter 3 Theory	24
3.1 Science and Technology Studies (STS).....	25
3.2 STS and Public Participation.....	25
3.3 Technology and the City: Coded Spaces.....	28
3.4 Government, Citizens and Technology	30
3.5 Technology of Organizations.....	33
3.6 Conclusion.....	38
Chapter 4 Methodology	40
4.1 Methodological Approach	40
4.1.1 Case Study Approach.....	41
4.1.1 Interviews.....	42
4.1.2 Participants	42
4.1.3 Interview Format and Questions	44
4.1.4 Secondary Research Analysis.....	45
4.2 Data Analysis	46
4.2.1 Coding	46
4.3 Ethics	47
4.4 Reflexivity	49
4.5 Limitations.....	50
4.5.1 Power Dynamics.....	50
4.5.2 Varying Interview Style	51
4.5.3 Self-censored Responses.....	51
4.5.4 Sample	51
Chapter 5 Analysis.....	53
5.1 Smart City Definition.....	53
5.2 Smart City Buzzword.....	56
5.3 Smart City Components	57
5.4 Specific Smart City Component.....	59
5.5 Smart City Vision	60
5.6 Anytown’s Smart City Initiatives	62

5.7 Smart City Leaders	64
5.9 Open Data Benefits	70
5.10 Open Data Users	71
5.11 Anytown’s Open Data Initiatives	74
5.12 Open Data Challenges	78
5.13 Open Data Accessibility	83
5.14 Open Data and the Smart City	84
5.15 Analysis Conclusion	87
Chapter 6 Discussion	88
6.1 Smart City Definition	88
6.2 Open Data Definition	92
6.3 Open Data Sharing	95
6.4 Co-Productive City Planning	97
6.5 Open Data as a Component of Smart Cities	99
6.6 The Social Construction of Expertise	102
Chapter 7 Conclusion	105
7.1 Findings	105
7.2 The Actually Existing ‘Anytown’ Smart City	106
7.3 Future Considerations	108
Work Cited	111
Appendix A: Coding Table	119
Appendix B: Qualitative Interview Guide	124
Appendix C: Confidentiality Agreement	127
Appendix D: Letter of Information	128
Appendix E: Consent Form	129

Chapter 1 Introduction

1.1 Introduction

Recent discussions on efficiency and urban improvement have led to a shift towards a smart city framework. For the purposes of this thesis, the smart city is seen as a system of systems which can benefit from extensive information management tools (Santoso and Kuehn 2013:5), the promotion of innovative planning and management (Naphade et al. 2011:1), the encouragement of environmental stability (Harter 2010) and convivial living conditions. Thus, the smart city seeks to improve operations, efficiency and quality of life within a city environment through the usage of information technologies and data (Harrison et al. 2010:1).

Simultaneously, there has been a growing governmental and public interest in open data. Open data is the unrestricted use of organizational data, which are released for public viewing and usage (Anytown 2015). It is often touted as a tool which can increase government accountability (Kassen 2013:512), encourage increased democratization and foster opportunities for innovative solutions to an indefinable number of everyday problems (Huijboom and Van den Broek 2011:4). Thus, open data holds the potential to integrate citizen, businesses and government together in order to assist in the shaping and construction of a smarter city.

1.2 Purpose

This thesis examines how digital processes, open data and the physical world can be combined to develop a smart city. It not only investigates the current state of smart city development through a case study of the a Southern Ontario Municipality, but it also examines the progress of open data and its potential to be utilized as a tool to promote smart city

development, and explore whether or not open data can be utilized in ways that encourage smart urban planning and improvements to city services and management.¹

The main questions explored by this thesis are:

- What are the challenges associated with smart city development and open data proliferation?
- Is open data a complimentary component of smart city development?
- How is expertise about the smart city and open data constructed?

1.3. Methodology

This thesis takes a qualitative methodological approach, based on the case of a municipality in Southern Ontario. It uses two qualitative methods: fifteen (15) semi-structured in-depth interviews and secondary document analysis.

1.4 Significance

Since this thesis is at the forefront of understanding smart city developments and open data proliferation, it provides several potential benefits to smart city and open data practitioners.

Firstly, actors engaged in the development and promotion of smart city initiatives can benefit from findings which may further guide their knowledge of how smart cities work in theory, how they function in practice and how they may perform in the future. Moreover, it may provide city planners and those concerned with open data and smart city initiatives with methods of more efficient and participatory service delivery.

Additionally, by establishing contemporary definitional understandings of the smart city and open data, and how each is integrated in the urban environment, start-up and established

¹ This thesis is related to a larger SSHRC funded project titled “Smarter Cities? Ubiquitous Surveillance, Big Data and Urban Management in Canada, the UK and the USA”, (AKA “Ubcity”), which explores the development of smart cities in three countries; Canada, the USA and the UK. Although this thesis uses the same basic protocols as the Ubcity project, it is an independent piece of work.

companies alike may utilize finding in order to tailor more innovative content or better informed versions of smart city or open data initiatives.

Finally, this thesis uncovers critiques and challenges to smart city and open data developments, and encourages a re-examination of smart urban development and open data proliferation in order to protect human rights, privacy and to ensure socially and environmentally just and equitable urban areas.

1.5 Outline of Thesis

Following this introduction, Chapter 2 investigates a range of smart city and open data literature.

Chapter 3 outlines the theoretical approach, which combines Science and Technology Studies (STS), Urban Studies and a broad political economy.

Chapter 4 discusses the methodology and methods for the study. It explores why particular methods were selected for this thesis, and how data was collected and analyzed.

The heart of the thesis, the analysis, is divided into three sections. The first section of this chapter offers a comprehensive exploration of the smart city and related concepts as understood by interviewees. Secondly, this chapter examines various understandings of open data and associated developments. Finally, this chapter considers interviewees' views of the place of open data in smart city development, and whether or not it can assist in the promotion of a smarter urban landscape.

Chapter 6 provides a critical discussion of various themes that emerged from the analysis in Chapter 5, and how these relate to the theory and existing academic literature outlined in Chapters 2 and 3.

Chapter 7, the Conclusion, summarizes the current state of smart city and open data developments in this case study, and provides thoughts on the efficient and successful progress of smart city and open data initiatives in Canada.

Chapter 2 Literature Review

The chapter begins by defining the smart city and its various characteristics. Next it explores open data and, in particular, open government data. Finally, it concludes with a discussion of privacy and security as they pertain to both data collection practices in the smart city as well as the proliferation of open data.

2.1 The Smart City

2.1.1 Smart City Definition

The term ‘smart city’ does not have one single definition. Instead, a variety of visions exist, each with varying emphasis on specific components that constitute it. Here, two broad conceptions of this term will be outlined. The first conception of the smart city emphasizes the usage of information and communications technologies applied in an urban landscape to ensure the creation and maintenance of a sustainable city. This conception focuses on topics of urban quality including ‘housing, economy, culture, social and environmental conditions’ (<http://www.smart-cities.eu/>; Kitchin 2014a:1), and promotes the creation and maintenance of a sustainable city. This vision views “technically inspired innovation, creativity, and entrepreneurship, enacted by smart people” as a driver of economic progress (Kourtiti et al. 2012). Caragliu et al. explain that smart policies and efficient investment in suitable assets, technological infrastructure, human capital and programmers will ultimately draw businesses to a smart urban landscape, and subsequently aid in the creation of new job opportunities, increase savings and escalate productivity and efficiency within government and business (Caragliu et al. 2011).

The second conceptualization of the smart city is directly linked to public policy. According to this view, software enabled technologies are woven into the fabric of the urban environment

(Kitchin 2014a:1), and operational data produced by these technologies are used to optimize urban areas (Harrison et al. 2010:1). By connecting real-world data and complex analytics to an ‘enterprise computing platform’, city services can be optimized effectively in an urban landscape (Harrison et al. 2010:4). Thus, infrastructure such as: electrical and water consumption, waste management or public transportation can be enhanced through the integration of technology and data (Santoso and Kuehn 2013:2). This vision encourages the improvement of city operations, efficiency and quality of life within an urban environment through the integration of information and communication technologies and efficient data usage in an urban environment (Harrison et al. 2010:1).

Conceptualizations of the smart city also vary between academic, business and government literature, and are often divided with respect to theoretical orientation and ideology. For instance, academic literature typically emphasises that the production of technologies can stimulate economic growth, and enhance urban governance (Kitchin 2014a:2). It often scrutinizes specific usage of urban infrastructure by citizens, and often attempts to remedy issues regarding traffic and parking, as well as exploring methods of optimising energy usage and waste disposal (Glasmeier and Christopherson 2015:4). On the other hand, business literature commonly highlights citizen-oriented ways of understanding smart city initiatives. It often promotes an all-inclusive nature to smart city development, while maintaining business ideals which seek to promote capital gains (Kitchin 2014a:2). Finally, government literature typically promotes the smart city as “the path to socio-economic progress and more liveable, secure, functional, competitive and sustainable cities” (Kitchin 2014a:2).

2.1.2 Origin of the Smart City

The origins of the smart city are quite complicated but two distinct accounts of smart city development are apparent.

The first is that the idea of the smart city emerged from a reimagining of city management by neoliberal visionaries in the 1980s and 1990s (Hollands 2008). Thus, the ‘smart’ aspect of the ‘smart city’ simply implies a technological addition to this urban vision. It is the synthesis of technology and urban planning, in which technology can assist in the achievement of smart growth and optimal city management in the urban environment.

The other account sees smart cities as the latest iteration of a series of visions of technologically-infused urban environments. These include wired cities, cybercities, digital cities and intelligent cities, and are significant, since they are often confused or combined with the ‘smart cities’ concept. This amalgamation of terms may be a result of the recent popularization of smart cities discourse (Glasmeier and Christopherson 2015:3).

2.1.3 Digital Cities and Intelligent Cities

It is not hard to understand why the various precursor concepts to the smart city are seen as interchangeable. Two examples, the ‘digital city’ and the ‘intelligent city’ were routinely mentioned throughout the interviewing process, and so will be considered here in more detail.

Digital cities “integrate urban information (both achievable and real-time) and create public spaces for people living in the city” (Ishida 2000:1). The concept of digital cities came out of the first Internet boom, and placed emphasis on the Internet and its ability to enable seamless sharing of information across vast distances. It encouraged the integration of people’s daily lives and business on the Internet (Ishida 2000:1). Much of the emphasis was on the potential to network local communities through centralized expertise. Thus, the digital city envisioned the

organization of urban information in a comprehensive manner which could subsequently be delivered to users via the Internet.

Intelligent Cities, on the other hand, are cities “that have applied information technologies and virtual spaces to urban functions and activities” (Komninos 2002:11). This vision emphasized that the urban landscape is a motivator of technological innovation, and a space in which digital processes could be implemented in order to manage and diffuse knowledge and technology (Komninos 2002:11). The intelligent city ultimately promoted digital communication in order to propel knowledge and learning within an urban community (Komninos 2002:12).

Each of these predecessors of the smart city emphasize the usage of technology and data in an urban environment. Neither of these forerunners differ drastically from conceptions of the smart city, but an evolution towards the smart city is apparent.

2.1.4 Smart City Components

Information and communication technologies and data collection are integral components of a smart city. Smart city advocates claim that the city, seen as a system of systems, would benefit from extensive information management tools, which encourage efficiency and optimization of urban processes (Dodgson and Gann 2011:5; Naphade et al. 2011:1). Cities become “receptacles for technology”, where technology is integrated seamlessly within the urban environment (Glasmeier and Christopherson 2015:4).

In order to achieve these goals, massive amounts of seemingly unconnected data must be collected and converted into actionable information through processes of data analytics and interpretation (Harrison et al. 2010:2; Dodgson and Gann 2011:4). This furthers notions of ubiquitous connectivity, which encourages the proliferation of networked computers and sensors built into urban infrastructure (Steinert 2011:3).

A final component is the Internet of Things. This concept sees the fitting of sensors and computers into various mundane object including objects within the urban landscape, ultimately incorporating all objects to communicate and send information to computer systems and to one another. This allows for the measurement of things that could not be measured before (Raiwani 2013:2250), and is therefore strongly implicated in the growth of big data. For some, connecting physical things to the internet facilitated through sensors, enables the sublime concept of a synthesis of the physical and the digital worlds (Kopetz 2011308).

2.1.5 The Actually Existing Smart City

These conventional views are far from the only ones. Shelton et al. (2014) offer a critical analysis of promotional smart city literature, and compare it to the actual state of smart city development. They explain that the actors, ideologies and technologies rarely resemble notions perpetuated in smart city literature. Instead, “smart city interventions are always the outcomes of, and awkwardly integrated into, existing social and spatial constellations of urban governance and the built environment” (Shelton et al. 2014:14). They argue that the existing smart city sees a reconfiguration of relations between government and private actors who provide the expertise required to realize the smart city. As a result, government is only just beginning to recognize the value of technical skill and knowledge required for smart city development. Moreover, contemporary literature often overlooks the reconfiguration of socio-spatial relations within the city and beyond its borders (Shelton et al. 2014:17). Smart city visions rarely consider how problems would be resolved in real world social contexts. For instance, smart city implementation does not occur evenly throughout the city, as there are various subjective representations of the urban environment in addition to discriminatory practices related to both urban development and the ‘digital divide’ (Shelton et al. 2014). Although smart city initiatives

are not required to address inequalities, it is apparent that the data driven focus of smart city initiatives “often narrows its focus onto much smaller deliverable that may have minimal effect” (Shelton et al. 2014:21).

Thus the implementation of a smart city is not as simple as often envisioned. In order to establish a smart city, socio-spatial relations must be critically analyzed. Problems associated with smart city implementation are less about data, and more about the “uncritical, ahistorical and aspatial understanding of data” promoted within smart city discourse (Shelton et al 201:22).

Moreover, smart cities should not be seen in binary terms. Rather, they should be regarded as existing on a continuum of “smartness” within an urban environment. This “smartness” could be understood in terms of the embeddedness of technology and data in the urban infrastructure. Thus, there are varying degrees of the uptake and usage of technology and data in the urban landscape. Based on review of relevant literature, it is apparent that the region chosen for this case study *should* fall on the higher end of smart city adoption as it demonstrates significant progress in various smart city initiative projects including the improvement of transit efficiency and robust smart building development.

2.1.6 Smart Cities and Privacy

Finally, in the smart city, there is a constant flow of information surrounding all ongoing city processes. Thus, notions of privacy and surveillance in the smart city must be considered (Cuff 2003:44). IBM emphasizes the necessity of pervasive measures in a smart city environment, and state:

The availability of vast collections of data about all aspects of city life makes it possible for civic leaders to understand how things really work so they can make better decisions. Much of this data comes from sensors and video cameras that are being used to monitor everything from

public safety to traffic jams. In addition, city agencies are increasingly sharing their data with one another and with the public. This allows leaders to get a holistic view of the city, and to unlock the value of all of that data they're collecting (IBM 2013:6).

On the other hand, few scholars explore broader issues and potential consequences surrounding the amalgamation of technology and data in the urban landscape. Potential consequences of a technologically fitted urban landscape may wreak havoc for citizens and city administration (Kitchin 2014a:2). Kitchin explains that without proper reflection, issues regarding, “panoptic surveillance, technocratic and corporate forms of governance, technological lock-ins, profiling and social sorting, anticipatory governance, control creep, the hollowing out of state provided services, widening inequalities and dispossession of land and livelihoods” may surface as severe outcomes of the smart city (Kitchin 2014a:5).

2.2 Open Data

Open data can be defined as the unrestricted use of organizational data, which are released for public viewing and usage (Anytown 2015). Thus, open datasets are compilations of open data which are “freely accessible online, available without technical restrictions to re-use, and provided under open access license that allows the data to be re-used without limitation...” (Jetzek et al. 2013:102). For data to qualify as “open”, they must be downloadable, free, machine-readable and structured without being previously processed (Lakomaa and Kallberg 2013:558).

2.2.1 Open Government Data

Open government data varies slightly from open data. Open government data is “data and information produced or commissioned by government or government controlled entities” (Jetzek et al. 2012:2) which is published in a reusable form (Huijboon and Van den Broek

2001:5). Thus, open government data is comprised of two main components: 1. Government Data: which is any data and information produced or commissioned by public bodies, and 2. Open data: data that can be freely used, re-used and distributed by anyone, only subject to (at the most) the requirement that the users attribute the data and that they make their work available to be shared as well (Ubaldi 2013:6).

Data may only be considered open government data if it follows ten explicitly defined principles. The Open Government Data Principles, compiled by 30 open government advocates (Ubaldi 2014:8) are as follows:

1. **Complete:** All public data are made available. Public data are data that is not subject to valid privacy, security or privilege limitations.
2. **Primary:** Data are as collected at the source, with the highest possible level of granularity, not in aggregate or modified forms.
3. **Timely:** Data are made available as quickly as it is necessary to preserve the value of the data.
4. **Accessible:** Data are available to the widest range of users for the widest range of purposes.
5. **Machine processable:** Data are reasonably structured to allow automated processing.
6. **Non-discriminatory:** Data are available in a format over which no entity has exclusive control.
7. **Non-proprietary:** Data are available in a format over which no entity has exclusive control.
8. **License-free:** Data are not subject to any copyright, patent, trademark or trade secret regulation. Reasonable privacy, security and privilege restrictions may be allowed.

9. **Compliance must be reviewable:** A contact person must be designated to respond to those trying to use the data and respond to complaints about violations of the principles. An administrative or judicial court must have the jurisdiction to review whether the agency has applied these principles appropriately.
10. The work shall be available as a whole and at no more than a reasonable reproduction cost, preferably downloading via the Internet without charge (Kulk and Loenen 2012:198).

Although there are several variations of this list of principles, these original 10 principles serve as a template to evaluate the accessibility and openness of government data to the public (Ubaldi 2013:8).

Finally, governmentally led open data initiatives are initiatives directly linked to a government agency. In these instances, the government agency maintains direct oversight over the initiative's functions and processes, and encourages a strict focus on providing ease of access to government data particularly related to politics and law (Jetzek et al.: 2012:1). Often, this data is made available on an official web portal made available by municipal, provincial and federal governments to the general public (Kassen 2013:508).

2.2.2 Evolution towards Open Data

Next, it is necessary to understand the evolution of data and information from an offline, paper format, to an online, digital format. Firstly, technological innovations, specifically the explosive growth of internet bandwidth, as well as increased data storage capacities, are of central importance in this evolution (Davies and Edwards 2012:19). Moreover, a variety of other conditions spawned by a range of private and political groups have also encouraged the evolution towards online open data. These conditions include:

1. Large firms- interested in moving towards a more liberalized, American model, where copyright or charging regimes do not restrict government data.
2. Small enterprises- who seek to spawn innovation with public datasets.
3. Technological communities- who prefer a collaborative model of production and problem-solving offered by open source. They believed that value lays in corporate data, and should be shared openly.
4. Open science advocates- who believe that sharing data is necessary to maintain accountability in research as well as for solving complex new research challenges.
5. Political actors- who believe that increased transparency and accountability can be offered through open data.
6. Governments and development agencies- who intend on exploring the effect open data has on the development of a country (Davies and Edwards 2012:20).

2.2.3 Benefits of Open Data

Given its freely available and unrestricted nature, potential applications for open data are vast and diverse. The benefits identified by advocates include increased government accountability, enhanced innovation, strengthening of law enforcement and increased democratization.

2.2.4 Transparency and Accountability

One benefit of publishing open government data is that it enables citizen empowerment, granting the ability to easily exercise democratic rights (Huijboom and Van den Broek 2011:4). Many published datasets allow citizens to track government performance and spending, making the government more accountable for their actions. Open data acts as a window, giving citizens a glimpse of what the government is actually doing, in aims of encouraging fairness and due process (Jetzek et al. 2012:5). Advocates of open government data explain that more information

reduces government corruption; “the misuse of public power for private benefits”, or wasteful spending (Jetzek et al. 2012:5).

2.2.5 Innovation and Entrepreneurship

Open data is held to have benefits in conventional economic terms. With increased access to information and communication technologies and freely accessible open data sets, innovators are able to “convert ideas and creativity into practical solutions to everyday problems” (Huijboom and Van den Broek 2011:4). Evidently, this data can be used in innovative ways by releasing untapped enterprise and entrepreneurship which can ultimately bring economic benefits to citizens and businesses (Chief Secretary to the Treasury 2009:26). Since there is no one particular way to use open data, users are left to their own devices to make use of this data in whichever way they please.

Open data can also aid in the creation of several web-based applications and information services, which may lead to increased economic growth and efficiency (Lakomaa and Kallberg 2013:561). It provides innovators with data that can be used as a test bed which can simulate the application of a potential project, thus relieving innovators of possible fears of application failure. Thus, open data allows for a feasible and functional method of detecting flaws and optimizing high-risk innovations (Huijboom and Van den Broek 2011:4).

Additionally, open data usage encourages increased funding from venture capitalists and businesses, which can accelerate the creation of better and more accurate services. More than this, it can also provide information about potential markets (Lakomaa and Kallberg 2013:561). Since a copious amount of open data is released by a variety of sectors, with proper manipulation, users are able to gauge significant developing markets.

2.2.6 Increased democracy

Open government data also allows citizens to become more participatory in democratic decision making. This optimistic benefit draws upon the philosophical view that open government data not only provides access to government information, but that the citizens may “become participants in a meaningful way” (Harrison et al.:2011). One feature that has encouraged proactive participation from citizens is the introduction of Web 2.0 capabilities, which facilitate communication between government and citizen. This includes engaging the public through interactive communication such as social networking or blogging, where citizens are able to express ideas or suggestions to public officials. By combining information communication technologies and open data, citizen participation and collaboration are increased, “leading to improved citizenship and collaborative behaviour through crowdsourcing activities” (Jetzek et al. 2012:5). More than this, “the Internet empowers people through transparency, e-voting, collecting opinions on public matters, and increased political self-efficacy among citizens” (Lakomma and Kallberg 2013:558). Thus, citizens can engage with politics in order to reform policies and suggest new ideas of governance or assist in the shaping of city services (Jetzek et al. 2012:5; Worthy 2014:4).

Open government data encourages the notion that, ‘strong feedback can create redistribute benefits, creating supportive communities and compelling actors to endorse policy’ (Worthy 2014:1). The public sector ultimately relinquishes its role as information gatekeeper and adopts a new role as information publisher (Jetzek et al. 2012:2).

2.2.7 Benefits in practice

Although open government data is promoted as a method which enables civic participation and improves government services, its practical usage in an urban landscape has seldom been

studied in any systematic way. However, one case study by Kassen (2013) of an ongoing open data project in the Chicago area surveyed the potential opportunities offered by open data to empower citizens through civic engagement. Kassen concludes that open data holds the potential to advance transparency and accountability, and ultimately promote democratic processes in the urban environment. He argues that open data encourages civic engagement, “by providing a real opportunity for independent developers to create applications by using available datasets from the web-portal without any official permission” (Kassen 2013:512). Thus, citizens are invited to partake in the development of open data initiatives, and ultimately foster an environment where local government and citizens can cooperate.

2.3 Critique of Open Data

Despite several affordances of open data, many skeptics of open data usage believe that it will fail in the short term as its influence is bound by the intricate nature of politics and inherent flaws which lie in the actual proliferation of open data (Worthy 2015:3). These flaws are typically in relation to the type of data shared, inaccessibility of open data and lackluster business model.

2.3.1 Quality of Information

Application of open data may be quite limited, and may not be applicable to what users want to do. To explain, data is collected for a specific purpose and for a particular audience, ultimately limiting its applicability to a wider range of uses. Collected data is ultimately bound to the context of its collection (Jetzek et al. 2012:8).

In the case of open government data, accuracy is questionable, since data collection and distribution is state funded, making it sensitive to political pressure. Thus, government open datasets may be manipulated in order to illustrate negative figures in a more positive light (e.g. unemployment figures) (Martin et al. 2013:354).

More than this, quality of open datasets may also be compromised due to lack of funding. As expressed by Martin et al., funding for open data databases are often minimal. Consequently, integrity data quality, including its accuracy and validity are hindered (Martin et al. 2013:355).

2.3.2 Digital Divide

Open data inherently possesses traits that exacerbate the digital divide, as not all individuals are equally able to easily access or utilize open data. Firstly, several open data portals lack a user-friendly design, and may potentially discourage wider usage. This is compounded with factors such as mandatory registration or login information required to access the data (Martin et al. 2013:357). The tedium associated with accessing open data ultimately limits the types of users willing to access the data, leaving only those who are truly driven to make use of it.

Another often overlooked issue is in regards to non-representativeness of the population. Although open data is marketed as a tool which is accessible to all, this is not the case. Cantijoch et al. note that there is an over-representation of males and an asymmetrical percentage of highly educated individuals who use open data (Cantijoch et al. 2014:11). Additionally, in order to use open data, one must possess the appropriate technical literacy required to understand, program and code available datasets. Ultimately, open data usage favours those possess IT skills, statistical competence or knowledge of local government finance (Worthy 2015:9; Martin et al. 2013:357). Thus, technical skills not only are essential to read the data, but are also required to apply it in a novel and appropriate manner to generate tangible benefits (Davies and Edwards 2012:9).

Even more fundamentally, usage of open data requires access to a computer with internet access. This inadvertently excludes portions of the population who lack access to such devices, further demonstrating absence of representativeness. Thus, open data usage is limited to those

who occupy a particular social class and with particular knowhow for usage. As Eversole implies, ‘participation’, which is sold as a main driver of open data usage, is simply a term used to mask power inequalities and difference, and the pursuit of a personal agenda by the elite class (Eversole 2010:2).

2.3.3 Financial Risk

A final criticism of open data proliferation is its business model and financial return. Although open data is provided to the user at no charge, costs incurred in generating open data are often overlooked. These cost include hardware, software and labour necessary for the proliferation of open data. In the United States, it is estimated that approximately \$10 million a year is spent nationally on open data databases (Martin et al. 2013:351).

A related criticism is the difficulty of determining a specific financial return of investment of open data. To explain, the value generated by open data lies not only within the production of applications and services, which have a dollar value associated with it, but aspects which do not have a monetary return on investment. As expressed, many affordances offered by open data include opportunities for collaboration, increased citizen participation, cost savings, the generation of economic activities and increased transparency. Each of these benefit may eventually lead to economic gain, but a specific dollar value is difficult to deduce (Martin et al. 2013:352). As a result, investors often shy away from funding open data initiatives due to its unpredictable monetary return.

2.3.4 Privacy and Surveillance

Privacy is of great concern across the realms of smart technologies and all kinds of data collection and use, and this has had real effects. For example, the proliferation of the Internet of Things has been stifled as a result of privacy concerns, according to some commentators (Atzori

et al. 2010:2802). Smart systems and devices, “are designed to harvest, store, and communicate a wealth of data” (Maras 2015:102). This data provides real-time information regarding health, finances, locations, contacts, habits, behaviours, and activities (Maras 2015:102) and can be utilized to map whole ‘patterns of life’ (Amoore 2013:109).

Thus, a landscape is being created in which private information is constantly collected, stored, analyzed and monitored as well as shared with a variety of other devices, users and third parties (Maras 2015:102). Individuals are potentially left without a full understanding of the implications of such a massive gathering of data, and as a result, several questions and concerns in relation privacy and surveillance are apparent. Users are not made aware of who may benefit from collected data, to whom this data is collected by, who this data may be transferred to, when data is collected and the potential outcomes of data collection.

An important issue for consideration when analyzing potential outcomes of privacy and surveillance, is the possibility for collected data to assist in user profiling and targeting (Hasan et al. 2013:25). Profiling entails the usage of datasets and algorithms which, “reflect choices, among others, about data, connections, inferences, interpretation, and thresholds for inclusion that advance a specific purpose” (Dwork and Mulligan 2013:35). To expand, aggregate data is a collection of data which is gathered and organized according to specific criteria such as names, addresses, telephone numbers, e-mail addresses, age, ethnicity, number of children, income and any other distinguishing marker of an individual (Kitchin 2014c:42). Thus, it is necessary to consider how providers of smart services aim to create a comprehensive user profile by utilizing a diverse catalogue of ‘surveillant’ products in order to amass an all-encompassing, aggregated data set.

As Kitchin states, “What data brokers and analysis companies (data aggregators) desire, is a wide variety of data, relating to as large a segment of the population as possible...The more data a broker can source and integrate the more likely their products work optimally and successfully, and they gain competitive advantage over their rivals.” (Kitchin 2014c:44). Thus, through usage of smart systems and devices, clearer and more encompassing user profiles can be formulated. As such, without proper consideration, aggregated datasets have the potential to be distributed to a wider variety of third party companies, resulting in unintended usage of collected data.

2.3.5 Open Data and Privacy

As noted by the Open Knowledge Foundation ‘private data’ and ‘open data’ are two subsets which do not converge (Kulk and van Loenen 2012:201). Through the evolving capacity of technology and data analysis techniques, de-identified information is able to be re-identified, ultimately linking private data to actual persons (Ohm 2010; Kulk and van Loenen 2012:196; Dawes 4:2014). As a result, ‘open data policies may be in conflict with the individual’s right to information privacy...’ (Kulk and van Loenen 2012:196). While technology enables access to an ever increasing plethora of public data, there remains an indeterminable boundary between data which is personal and non-personal (Kulk and van Loenen 2012:197). For example, in the case of open data regarding house appraisals, one may learn the value of individual houses. Since ‘houses are assets of their owners, and their value can be used to determine the extent a person’s obligation to pay taxes’, personal information is made available to a public audience when manipulated in specific ways (Kulk and van Loenen 2012:196). Thus, there lies a point of contention which currently fuels an active debate over the distribution and usage of open data. A main purpose of open data policies is to allow free access to data, yet its availability and usage expose many inherent issues in data collection.

2.3.6 Alternatives to Surveillance in the Smart City

Several alternative methods of data collection have been encourage in attempts to diminish threats to privacy. One potential method is self-regulation of data. Through this method, users of various technologies, are able to control which data is collected and to whom it is distributed to (Atzori et al. 2010:2802; Maras 2015:103). Currently, it is difficult for users to manage personal information collected by and shared between smart devices, since by default, private data is automatically shared between devices (Maras 2015:102). Thus, as suggested by Atzori et al., any collected data should only be utilized by service providers which are authorized by the user. Moreover, they recommend that collected data should only be used by service providers only for its initially stated purpose, and on a need to know basis (Atzori et al. 2010:2802). Other resistant methods in a smart urban environment is the enforcement of anonymizing data, and blurring images of individuals captured within the urban landscape.

None of these methods completely eliminate issues surrounding privacy. In order for smart city technologies to function as they should, certain personal information is required. This results in a paradox where privacy and smart technologies cannot coexist (Wiseman 2013). There is always a trade-off. In exchange for better, more feasible and more reliable services, a user must relinquish certain details about themselves. Privacy is sacrificed in exchange for tangible benefits promised by the adoption of smart devices and smart cities.

2.4 Previous Research Studies

It must be noted that this research was influenced, in part, by various other Master of Arts theses regarding either the adoption of smart infrastructure or open data in Ontario. Firstly, Cody Skinner's thesis explores open data usage in the Waterloo Region through review of grey

literature and informant interviews. He finds that there is a lack of awareness about open data and its usage, and describes various challenges which hinder the proliferation of open data.

Similarly, Liam Currie explores Canadian municipal open data initiatives and assesses how they may improve public engagement in local government issues. He expresses that open data initiatives in Canada differ in their approaches to public engagement, and that several Canadian cities have established strong collaborative relationships with advocates of open data as open data provides several affordances. Despite this, open data is hindered by various challenges including limited resources and limited knowledge regarding its usage.

Finally, Kent Hakull explores the challenges and opportunities afforded by “smart growth strategies” in the City of Guelph. Hakull concludes that in order to establish a plan-making process, various actors must “define, steer and direct the process of private interests at each and every step along the road” (Hakull 2012). As such, Hakull suggests that long term objectives be established in order to ensure Smart Growth. These former theses will become important in later discussions of the findings of this research.

2.5 Conclusion

This chapter has considered a range of literature on the benefits and pitfalls of smart cities and open data. The next chapter will outline a variety of key theoretical ideas that will assist in the understanding of the role of technology and data in society.

Chapter 3 Theory

This thesis draws on three theoretical domains, Science and Technology Studies (STS), Urban Studies and Political Economy, to provide a foundational understanding of the ways in which technology and data are understood and used in the social world. Moreover, this chapter allows for an understanding of how individuals, particularly in social organizations including government and business, define themselves as ‘experts’. This chapter begins by broadly exploring Science and Technology Studies (STS), considering the role of Information and Communication Technologies (ICTs) in society, its relation to public participation, and the extent to which non-experts and citizens contribute to scientific and technical knowledge. The section continues by considering Science and Technology Studies in a specific locale, the urban landscape. Here, Kitchin and Dodge’s concept code/space, provides a framework used to understand the usage of software and code in an urban environment.

Finally, this chapter explores the roles of ICT in realms of business and government. It allows for an understanding of how technologies are understood in an exact social context, and how individuals in such organizations define themselves as “experts”. The chapter concludes with a theoretical account of expertise within organizations. It also explores some political economic concepts which assist in an understanding of how power relations influence the adoption and spread of technology in society, in particular organization theory, ‘marketing ideology’ and Mosco’s notion of ‘the digital sublime.’

Together, these will enable a critical analysis of smart urban planning and open data initiatives, and their social relations.

3.1 Science and Technology Studies (STS)

STS is an interdisciplinary field of study that emerged in the 1970s, and sought to “understand and control science and science-based technologies, together with public attitudes to such technologies” (Law 2008:624). The field understands that both science and technology are social (Law 2008:626). Rather than viewing science and technology as phenomena which have definite and measurable properties, sources of knowledge and artifacts are diverse and multifaceted (Sismondo 2010:11). More than that, interpretations of knowledge and artifacts are also quite complex and varied, and as a result, “claims, theories, facts, and objects may have very different meanings to different audiences” (Sismondo 2010:11). Both scientific knowledge and technological artifacts are socially constructed and evidently shaped by the social circumstances surrounding their production. Thus, if we are to understand scientific change, it is imperative to study the specific circumstances surrounding its creation, understand the nature of pre-existing scientific knowledge and comprehend the rationale of those creating the knowledge. When considering the construction of a smart urban environment or the usage and implementation of open data in the urban environment, it is possible to understand the relevance of STS, as actors and objects are closely integrated in the development of smart urban infrastructures.

3.2 STS and Public Participation

STS can be used as a framework to explore the artificial boundary between scientific and technical knowledge as derived from ‘experts’ and the general public.

Firstly, an understanding of ‘knowledge’ is essential when considering how expertise is applied to individuals. Constructivist social scientists express that knowledge are produced within specific communities and is a result of intersubjective agreement (Evans 2008:283) as it is

a product of “thoroughly social processes” (Sismondo 2010:168), and thus offers a humanization of science and technology.

Next, it is necessary to define ‘expert’, and how experts differ from non-experts. As Evans suggests, expertise is a significant topic for sociology, as it is socially constructed and influenced by culture and context (Evans 2008:281). Thus, if we are to consider expertise as a result of particular cultural contexts, we must also consider the interconnected nature of power and knowledge (Evans 2008:282). As such, expertise “is the result of successful socialization within a particular community.” (Evans 2008:283) It is “social fluency within a form-of life” or “the ability to act naturally and appropriately in new and unexpected settings.” (Evans 2008:283)

The view that knowledge is socially constructed has been highly contested by scientists, as it appears to negate the status of scientific findings and the ‘natural’ unfolding of technological developments. Instead, it recognizes these advancements as socially influenced (Sismondo 2010:169). In this context, distinctions between ‘experts’ and non-experts are constructed, not always clear, and overlook the various ways scientific and technical problems can be framed and evaluated (Sismondo 2010:181). As a result, STS scholars express that appeal to expertise may not always prove to be a viable solution to pursuing scientific and technical issues. Instead, STS suggests that ‘more public participation in technical decision-making improves public value and the quality of science and technology (Sismondo 2010:183). This will be further explored below.

In the post-war era, the notion of democratizing science and technology emerged, which would allow for productive dialogue between citizens and experts regarding technical issues. These views are rooted in ideals of deliberative democracy (Sismondo 2010:183). Technical decisions are comprised of several normative and social assumptions, and can potentially benefit from public input. This view asserts that although an average citizen may not possess expert

knowledge regarding a particular technical circumstance, their relative knowledge of a situation places them in a position to provide relevant insight (Sismondo 2010:184). As Bijker states, “more is involved in designing large projects such as nuclear power stations and water management systems than is described in the engineers’ handbooks” (Bijker 2001). Thus, increased dialogue regarding technical decisions should, in theory, better reflect public interests and improve technical and normative decisions (Sismondo 2010:184). This relates directly to open government data since open government data allows for increased participation by citizens in democratic decision making. Thus, citizens are able to participate in a meaningful way. Citizens are able to interact with various actors and suggest new ideas of governance which better reflect public interest (Worthy 2010).

Moreover, open dialogue between citizens, experts and decision makers allow a universal understanding of a particular scientific or technical phenomenon by granting insight into each respective groups’ knowledge, perspectives and concerns (Sismondo 2010:184). It allows for increased transparency and trust between various actors, and ultimately legitimizes decisions through democratic processes. Accordingly, through deliberative democracy, openness and scrutiny of scientific and technical decisions by a range of actors can be increased, “...participation exercises are more successful to the extent that participants represent the population, are independent, are involved early in the decision-making process, have real influence, are engaged in a transparent process, have access to resources, have defined tasks, and engage in structured decision-making” (Rowe et al. 2004). There are several ‘traditional’ forms of public engagement including citizen’s juries and town meetings (Sismondo 2010:185), and can be further extended by considering open data and open government. As noted in Chapter 2,

open government seeks to increase public participation in government decision making processes through transparency by releasing a variety of datasets for public consumption.

Finally, “one route toward citizen science and technology is by making scientific and technical resources available to interested groups” (Sismondo 2010:186) in order to allow a grassroots approach to science and technology. This reflects the very essence of open data. By allowing citizens to access readily available data, datasets can be manipulated to fit the needs of the user. With open data, innovators are able to “convert ideas and creativity into practical solutions to everyday problems” (Huijboom and Van den Broek 2011:4). A general audience is ultimately encouraged to produce creative solutions to issues by adding value to simple datasets. This is in accordance with STS literature which promotes the democratization of technology, where multiple actors coordinate to produce successful technologies (Sismondo 2010:186).

3.3 Technology and the City: Coded Spaces

How do we understand the incorporation of intangible data into the tangible city? As Stephen Graham explains, “With computerized systems now actually becoming the ‘ordinary’ sociotechnical world in many contemporary societies, code orchestrates a widening array of public, private and public-private spheres and mobility, logistics and service systems and spaces” (Graham 2005:562). Computer software is ubiquitous and is deeply entrenched in everyday life. It has become a passive process, as it underlies and shapes people’s everyday practices, and these coded practices are grounded in ubiquitous computing which “blend seamlessly into the wider urban environment” (Cuff: 2002).

Rob Kitchin and Martin Dodge offer a spatial approach to analysing software. They emphasize the effects of information and communication technologies on the compression of time, and its ability to enable a user to control software encoded objects from a distance.

Through this, they examine how urban landscapes can be “reconfigured and restructured” through the implementation of information and communication technologies and software (Kitchin and Dodge 2011:13). Their concept of “code/space” provides a structure that enables the analysis of software and spatiality. In essence, code/space is when intangible software and the tangible world are seen as relational and unified (Kitchin and Dodge 2011:16). With the absence of one, the other cannot function or even exist. In this instance, code produces a tangible landscape. Moreover, code/space is simultaneously territorialized, in that there is a tangible interface which we can interact with, and deterritorialized, which amounts to immaterial space and exists across extended network architectures (Kitchin and Dodge 2011:16).

This is primary to understanding smart cities, as coded practices are bound with infrastructure in the urban environment. In a smart city, it is possible to interact with a physical object such as water maintenance systems or public transit at a local level, but also interface with such systems on an individual level, thus making the smart city a space embedded with code. There are “...millions of lines of code that have come to run cities as computing power has increased and as many former bodily practices have been written into code” (Amin and Thrift 2002:125).

Evidently, smart cities allow for the enactment of datafied knowledge about the world, and enables an understanding of everyday practices and behaviours through codified processes. Software and code represent, as well as participate, in the physical world, they increase the capacity of technologies, and are able to adjust and adapt to various external scenarios (Kitchin and Dodge 2011:39). Moreover, software possesses secondary agency. This is to say that software extends the agency of absent actors in order to benefit potential users. Kitchin and Dodge discuss how software is often invisible to an end user, and demonstrate this by exploring how software is used in tandem with water supply infrastructure. Here, software is used to

“monitor demand quality and actively regulate flow rates to ensure acceptable pressure in the pipes” (Kitchin and Dodge 2011:39). Thus, an end user of a water tap in a remote location indirectly engages with software mediated through ‘dumb’ technology.

Software and coded practices can be seamlessly implemented into the urban environment. Code allows urban infrastructures to operate in terms that can be deemed ‘smart’ or technologically enhanced. Code is both a product of the world and a producer of the world (Kitchin and Dodge 2011:43). Thus, technologies are closely linked to the transformations of “place- and space-based social world” (Graham 2005:563).

3.4 Government, Citizens and Technology

There are a variety of ways in which scholars and government agencies alike have responded to technology in the urban environment. Scholars have often discussed the links between technology and society including David Bell (1973), who developed the idea of the post-industrial society, and Manuel Castells (1996) who first discussed the network society.

Dawes (2009) offers an alternative perspective when analyzing the relationship between technology and government. She explains that as technology advances, scholars tend to focus on specific components of technology’s impact on society. This includes government organization, performance and bureaucratic reform, access to government information, as well as personal privacy. Dawes explores the importance of future considerations and concerns regarding the relationship between government, society and technology, and analyzes “appropriate infrastructure for continued development of government and governance in the digital age” (Dawes 2009:257). This alternative method of analysis offers a holistic approach in order to properly conduct future-oriented government infrastructure (Dawes 2009:258).

Dawes argues that “an infrastructure for digital governments requires an extended view of enterprise that goes far beyond a single organization to encompass all the parts of a government as an interconnected whole operating in a complex social and economic environment” (Dawes 2009:258). In addition to requiring effective and adaptive infrastructures, sustainable infrastructures such as government, should also consider legal and political factors as well as public policies, legitimacy, trust, power relationships, stakeholder engagement, and unifying goals and visions amongst government entities (Dawes 2009:258). Thus, Dawes provides an adaptable framework which considers various concerns regarding the future of government, governance and society. This framework serves as “a guide to comprehensiveness rather than a blueprint for achieving a particular set of outcomes” (Dawes 2009:264), and demonstrates future oriented concerns regarding the relationship between government, society and technology. According to Dawes content analysis research, current infrastructure considerations mainly highlight the importance of changing technologies and information management, but typically overlook societal trends and human-computer interactions (Dawes 2009:262). Thus, without addressing such crucial elements, Dawes states that infrastructures which simply emphasize the importance of technology society, will ultimately fail since they will be unable to confront how social and political environments, governance and the ways in which individuals and groups are bound and interact with technological advancements.

Future oriented research is an important consideration for this thesis, as open data proliferation is still in its infancy, and many smart city components are yet to be implemented even individually. As a result, government officials must consider their impact on a grander scale, and reflect on future usage and consequences of these technological implementations.

Existing theoretical literature surrounding government understandings of digital processes also focuses on government-citizen relationships, and the impact information and communication technologies impose on privacy. Scholars such as Miriam Lips have explored how government organizations understand technology in relation to citizen identity, as well as privacy concerns related to the implementation of information and communication technologies. Evidently, there are “fundamental changes happening to citizen-government relationships as a result of the introduction of new digital forms of citizen IDM (identity management)” (Lips 2010:273). ICTs shape the way in which citizens share information with government agencies, and influence the ways in which government agencies collect information from citizens. Thus, traditional forms of citizen identity information, including name, address and date of birth, typically collected in paper-based form, are extended to include information collected by CCTVs, smart cards and SMS messaging, as various new methods of information collection are introduced by new technologies (Lips 2010:273). Several considerations arise from increased ICT usage. One is the social contract between citizen and government, and how information collected by various electronic devices are utilized. There is an information imbalance between government and citizen which has sparked much debate amongst government scholars. Scholars urge critical analysis of issues such as: privacy, trust, equity, and effectiveness (Lips 2010:274). Lips identifies two distinct perspectives on this matter. One perspective critically analyzes government usage of technology as surveillance, while a second perspective considers how information and communication technologies can be utilized for the betterment of public services.

The “Surveillance State” perspective acknowledges that there currently exists an extraordinary number of ways to gather and process citizen information and behavioural

patterns. Thus, this perspective emphasizes that new technologies take the form of surveillance systems, leading to a surveillance state. Moreover, the collection of mass information by government raises questions about efficient security and responsible usage of private information (Lips 2010:277). Ultimately, this perspective urges a reassessment of potential implications for citizens' democratic rights.

The "Service State" perspective, on the other hand, views this as the provision of beneficial opportunities to citizens (Lips 2010:279). According to Raab and Bellamy, the sharing of citizen information can allow for increased cross-governmental collaboration, resulting in "efficient and effective public service outcomes" (Raab and Bellamy 2005). Dunleavy et al. describe three broad themes of "Digital Era Governance": reintegration, in which ICTs reduce duplication of citizen information across government; needs-based holism, in which ICTs shift resources in order to tend to citizen-focused public services; and digitization changes, in which ICTs are central components of administrative and business practices (Dunleavy et al. 2006). This perspective sees ICTs as a means to "improve access to public services, increase effectiveness of public service provision, and, with that, decrease information asymmetries between the citizen and the State" (Lips 2010:279).

In both cases, attention has been drawn to privacy concerns around data collection and usage, which is significant for open data and the smart city.

3.5 Technology of Organizations

This section will explore the social context of the usage and understanding of technologies, as they will be examined in the context of social organizations such as government and business. As such, this section sees the intersection of Sociology of Organizations and Political Economy as it

explores how ‘knowledge’ and ‘expertise’ regarding technology are diffused through bureaucratic organizations, and how individuals are defined as ‘experts’.

Brown and Duguid explore how knowledge and expertise are diffused in the context of social organizations. Rather than viewing knowledge as a “well-defined substance” and as solely culturally constructed, Brown and Duguid view knowledge and organizations through the lens of practice. That is, they attempt to understand how work is accomplished and how knowledge is created (Brown and Duguid 2001:200).

Brown and Duguid suggest that socialcultural explanations of knowledge and organizations reflect upon the relationship between individual learning and social identity. Learning not only implies the acquisition of knowledge. It also entails the acquisition of identity (Brown and Duguid 2001:200). Thus, learning “doesn’t just involve the acquisition of facts about the world, it also involves acquiring the ability to act in the world in socially recognized ways” (Brown and Duguid 2001:200). Evidently, it is not enough that one possesses particular know-how in order to be considered an “expert”. Individuals, including other experts in a relative field, must also recognize this expertise. As a result, learning is a complex process which involves more than just acquiring knowledge. It is a process which is social and collective (Brown and Duguid 2001:200).

Communities of Practice allow for an analysis of work, learning, knowledge and work identity formation. They are dynamic since they change as communities themselves change. Knowledge formed in a community is cumulative, and as the community develops, so do the practices (Brown and Duguid 2001:202). Knowledge of the members in these communities reflect a collective outlook of the organization as a whole, and most intensely, the outlook of the local community. As a result, knowledge can be readily shared amongst those who occupy a

position in this community. von Hippel explains that helpful knowledge within an organization is not necessarily best developed by “specialists” (or “experts”) within an organization, as they tend to be detached from the problem. Rather, the most suitable individuals for this task are most commonly those who directly benefit from the solutions. These are likely to be members of the community of practice that are directly affected by both the problem and the solutions (von Hippel 1999).

It is important to consider that although the notion of community may suggest an underlying assumption of cultural homogeneity, the practices within organizations are often largely heterogeneous (Brown and Duguid 2001:203). Although individuals who are deemed “experts” possess specialized knowledge, this knowledge is equally accessible to all in a community. This is significant for this thesis, as it analyzes the perception of ‘expertise’ of individuals in fields of smart city development and open data proliferation.

Political economy allows us to further explore the power relations associated with the adoption and spread of technology in smart urban development. Mosco explains that political economy is “the study of the social relations, particularly the power relations, that mutually constitute the production, distribution, and consumption of resources, including communication resources” (Mosco 2009:24). In order to fully appreciate political economy, one must also understand historical events and their relation to the shaping of social structures, social reproduction and agents and forces of change (Clement 2001:406). As such, the political economy of communication allows for an examination of how ICTs pass from producer to distributor, and finally, consumer. It also allows for an examination of this process in the reverse, by analyzing how a consumer decides on a product, and how these decisions inform a producer.

By using a political economy approach, it is possible to critically examine what it means to be a producer, distributor or a consumer, and the social relations pertinent to power and control.

Political economists argue that we have shifted to an era of ‘digital capitalism’, where powerful forces transform media and audiences into marketable commodities (Schiller 1999). These powerful forces include: visionaries, politicians, businesses, public relations firms and advertisers. Thus, in order to understand the relations between producer and consumer in a market economy, one needs to understand marketing. Marketing ideology is “a relatively stable set of arguments that provide legitimacy to marketers and the market economy” (Marion 2006:245), and assists marketers in maintaining their ability to meet the demands of their occupation (Boltanski and Chiapello 2005). As such, marketing ideology underpins the production of both legitimacy and legitimization.

Marketing ideology is crucial to this thesis, as it provides an understanding of how marketers of ICTs gain legitimacy and continually perpetuate their own legitimacy. Since this thesis explores the promotion of smart infrastructure and open data proliferation in an urban environment, marketing ideology allows for an understanding of how and why certain technologies are selected for implementation over others, and how these technological implementations are normalized in society.

The spread of ICTs is not only the result of marketing, but many other processes, including the way in which digital technologies are commonly envisioned as “the end of history, the end of geography, and the end of politics” (Mosco 2009:122), called by Mosco, “the digital sublime”. Time and again, technologies are introduced into society, and time and again, there is an “almost willful historical amnesia about technology” (Nye 1994). Thus, this view advances the belief that

digital technologies are repeatedly sold as ways that enable one to surpasses the constraints of everyday life.

This is exemplified with the introduction of the telegraph, electrification, the telephone, the radio, the television and the internet, each of which saw a similar promotion that each would end history, geography and politics, and usher in world peace, gender equality, universal education and radical harmony (Martin 1991). In acts of “willful historical amnesia”, attention is diverted from previous iterations of a technology, and shifted towards a newer ‘novel’ technology. As expressed by Mosco, “we want to believe that our era is unique in transforming the world as we have known it” (Mosco 2004:118), and therefore, we often forget that previous eras viewed ‘new’ technologies in much the same way current culture does. This raises questions as to who controls the promotion of new technologies, and who encourages the promises that these technologies are said to fulfil. In terms of the smart city, as shown in Chapter 2, there have been several former iterations of technologically enhanced urban landscapes. Each new iteration is presented as a novel method of city planning, and promises of increased efficiency and sustainability of city services are made. Thus, rather than a new technology introducing a final end, the introduction of a new technology marks the end of a chapter in a never-ending story (Mosco 2004:119). This relates to Brown and Duguid’s discussion of Communities of Practice. In such a community, knowledge is produced in a cyclical fashion similar to claims made in Mosco’s ‘digital sublime’ in that technologies are regularly reintroduced and rebranded as novel.

Finally, an important consideration for this thesis, given that the context is that of government organizations and businesses that maintain a bureaucratic structure, is that organisational structure. We need to consider the efficiency of such a structure, and how it may affect the implementation of smart urban initiatives and delivery of open data.

While some theories have noted various negative aspects of a bureaucratic structure, including its rigid, routine and initiative-stifling procedures (Adorno and Horkheimer 1972), Kallinikos (2014) notes several beneficial aspects. He argues that explanations of a bureaucratic form of organization are often oversimplified, and are typically criticized for reaffirming “organizational practices of capitalism or statism”, which perpetuates social inequalities (Kallinikos 2004:14). Furthermore, bureaucratic principles of organization are often cited to reinforce hierarchy and rule-bound behaviour. Finally, critics often note that ICTs have encouraged a shift in form for bureaucratic organizational structures, as they blur the boundaries between the private and public world.

Kallinikos attempts to dissociate bureaucracy from these criticisms, and demonstrates that bureaucratic organizational forms are efficient, and in fact the only organizational form able to contend with various social, economic and technological changes, claiming that rule-bound behaviour is necessary for modern organizations since it imposes a system for regulating human behaviour. This ultimately encourages worker efficiency (Kallinikos 2004:17). With a bureaucratic structure, “roles can be adapted, modified, redesigned, abandoned or reshuffled to address the emergent technical, social and economic demands the organization is facing” (Kallinikos 2004:23). Thus, contributions of workers to a larger project requires appropriate allocation of skills and knowledge in order to allow for efficient production.

3.6 Conclusion

This chapter has not only explored a general approach to understanding technology in society as a whole, but also the specific domains of government and business, and how each engages with technology. Through STS, an understanding of how business, government and society come to understand scientific knowledge was explored. Ideas of code/space enabled an appreciation of

how technology is increasingly intertwined in everyday life, and how everyday life can be understood through codified processes. The final portion examined how knowledge and expertise are diffused in the context of social organizations. It also explored the political economy of ICTs, future-oriented research and implications of ICTs for privacy, marketing ideology and the all-encompassing 'digital sublime', finishing with a consideration of the organisational context of smart city deployment. The next chapter explores methodological approaches used in this thesis.

Chapter 4 Methodology

This chapter outlines the methodological approaches used to investigate various research questions. Through secondary research, it became apparent that a gap in the literature overlooks a potential link between smart city development and open data initiatives. This research bridges this gap by investigating whether or not open data encourages smart urban planning and the improvement of city services and management.

The main questions explored by this thesis are:

- What are the challenges associated with smart city development and open data proliferation?
- Is open data a complimentary component of smart city development?
- How is expertise about the smart city and open data constructed?

This chapter explores the methodology used and specific methods deployed to answer these questions. The research is qualitative, based on a case-study approach, using interviews and documentary analysis. The data generated through these methods were then analysed using systematic and iterative multi-stage hand-coding.

4.1 Methodological Approach

Qualitative research “refers to the meanings, concepts, definitions, characteristics, metaphors, symbols, and descriptions of things (Berg 2009:16). I initially became interested in uncovering how representatives of various sectors of a specific municipality believe smart urban development is (or is not) progressing. I intended to understand how these individuals described their ‘life-world’ – the language and meanings an individual ascribes to particular phenomena, including their emotions and motivations and how they may affect their natural setting (Berg 2009:16) and changes they noticed in the surrounding area.

Since it is difficult to quantify an exact amount of ‘smart urban progress’ made in a specific locale, and since smart cities are still in their preliminary stages of development and implementation, a qualitative approach was particularly appropriate for this research. Many of the concepts and language used to discuss components related to smart city and open data discourse vary from source to source, each with unique nuances and distinguishing characteristics.

4.1.1 Case Study Approach

A case study allows for the examining of simple or complex phenomenon, with units of analysis varying from single individuals to large corporations and businesses (Creswell 2007). Through this, a researcher can learn how individuals address a specific issue (Creswell 2015:30). A geographically-bounded case study was chosen to examine smart urban development in a specific locale in a municipality in Southern Ontario (which will hereafter be referred to as “Anytown”). Anytown was strategically chosen since it is at the forefront of urban development, exemplifying characteristics of booming commercial and residential development, steady economic growth and increased population growth. Recently, a township within Anytown was granted the title of ‘city’ due to its population size and growth and expects increased development over the next decade. Moreover, I am personally connected to Anytown, as I was born and raised in this municipality, and wanted to gain an understanding of the types of changes that are currently taking place in this area.

Anytown is comprised of various individual townships. Two townships within Anytown currently publish their own open data on web portals which are distinct from the open data web portal offered by the municipality itself.

Rather than broadly exploring the possibility of open data's influence on smart city development, I wanted to examine how planning decisions and open data adoption were implemented in a unified area. This decision allowed me to understand how townships cooperated with one another, and how they utilized open data. It also allowed me to identify how the municipality as a whole is progressing towards smart urban development.

Within the framework of the case-study approach, I employed two specific qualitative methods for data collection: in-depth interviews and secondary document analysis. Each of these methods enabled a deeper insight into smart city and open data initiatives, and allowed me to draw upon a variety of sources to strengthen my understanding of each.

4.1.1 Interviews

Berg defines interviewing as “a conversation with a purpose” (Berg 2009:101). The purpose of my interviews was to explore any current or forthcoming smart city implementations or open data initiatives within Anytown, and whether or not open data proliferation is complimentary to smart urban development. In-depth interviews were most effective for this research since, according to Lichtman, they grant the researcher the ability to harvest powerful data and create more awareness and understanding through an individualistic and critical interpretation of an others reality (Lichtman 2014:247).

4.1.2 Participants

I conducted a total of fifteen (15) semi-structured, in-depth oral interviews with sixteen (16) participants (one interview was conducted with two participants) within Anytown. Interviews took place between February 3 and March 24, 2016. I employed purposive selection, interviewing those involved in open data and smart city initiatives within Anytown, suppliers of software and hardware solutions for Anytown initiatives, and those more broadly involved in

open data and smart city initiatives at the municipal and provincial level. Participants were strategically selected based on their association with corporations, organizations and government involved in open data and smart city initiatives. I categorized these participants as ‘experts’ regarding smart city and open data. As such, they were selected as representatives within the field based on the positions and involvement with open data and smart city projects. Their title conveyed a notion of in depth knowledge and experience with each of these topics, marking them as possessing superior knowledge in relation to other workers in these fields and ‘non-expert’ citizens. Several of these participants were also selected as their names appeared in various relevant news articles regarding smart city development in Anytown. ‘Non-experts’ or ‘ordinary citizens’ were not interviewed for this research since this research seeks to understand the development of smart cities and the adoption of open data within organizations that promote smart cities and open data. Necessary projects remain to be done on the relation between organizations and the public, and how citizens themselves understand or initiate smart city and open data initiatives.

A detailed breakdown of interviewees is as follows: Two (2) interviews were conducted with public servants who worked with government open data portals. Of these two, one interview was at the provincial level of government, while the other was at the municipal level of government. Two (2) interviews were conducted with public servants who were responsible for the urban development in two separate townships in Anytown. Four (4) interviews were conducted with private businesses interested in the development of smart city initiatives in Anytown. Two (2) interviews were conducted with private businesses who currently use provincial and municipal open data as part of their service initiative. Three (3) interviewees were selected for their expertise in smart city and open data initiatives in Anytown and surrounding areas. Finally, two

(2) interviews were selected for their proficiency in security and privacy implications regarding open data and smart city development- one with a public servant at the municipal level and a well-known scholar in the field of privacy and security.

4.1.3 Interview Format and Questions

The semi-structured nature of the interviews encouraged a more engaging and conversational flow (Berg 2009:105). Ultimately, this technique allowed for further probing and clarification of responses, and offered the opportunity to implement additional unscripted questions in order to elicit deeper, more substantial responses. Interview questions were designed to maintain an informal professional conversation, such that questions were not threatening or direct. This created a more comfortable atmosphere, and encouraged participants to speak openly and honestly. Throughout each interview, I was actively engaged, and took note of any significant language, concepts and body language.

Interviews focused on four major themes: smart cities, open data, security and surveillance, and big data². Interview questions broadly analyzed a possible association between open data and smart city development, understanding challenges to open data and smart city initiatives, and discovering security and privacy considerations regarding open data proliferation. I began interviews with general conversation and asked interviewees about themselves and their role in their respective organization. This facilitated a transition into more direct discussion related to my research aims. I was able to gather participants' descriptions of smart cities and open data, and their respective components. I was also able to gain an understanding of how open datasets are utilized by both government planners and independent open data initiative projects, and what benefit they serve to the general public. The interview process enabled me to garner expert

² Some of these themes related to the wider aims of the Ubicity project and the answers to those questions are not considered in depth in this thesis.

insight from key leaders and promoters of open data and smart city initiatives. Although some research participants were more fluent in certain themes than others (depending on their field of expertise), I encouraged research participants to answer questions to the best of their abilities.

Interviews lasted between 30 minutes and 1 hour and 30 minutes. In some instances, a follow up email was sent to respondents to clarify any responses or to ask further questions. The locations of the interviews varied. Seven (7) interviews were conducted face to face, two (2) interviews conducted over Voice over Internet Protocol software (Skype and Google Hangouts), and six (6) were conducted via telephone. Face to face interviews were conducted in the interviewee's business or government office. Differences in method of interview delivery were a result of several factors including: physical distance between myself and the interviewee, convenience for the interviewee and conflicting schedules.

4.1.4 Secondary Research Analysis

I also conducted secondary research analysis. Berg notes that unobtrusive measures “provide access to aspects of social settings and their inhabitants that are simply unreachable through any other means” (Berg 2009:268). Analysis of relevant literature was used to broaden my knowledge and understanding of smart urban development, open data, and open data initiatives.

In order to access relevant literature, a variety of university library databases, along with the Queen's University library database were consulted, using a variety of search terms. Documents were selected based on their relevance to smart urban planning and instances in which open data was used for the advancement of smart urban development.

Other secondary sources of information included databases, website, document and plans related to smart city development and open data initiatives in and around Anytown. These

sources served to expose the types of urban development and initiatives along with the ways in which open data is utilized in the urban environment.

I also conducted a review of academic, government and development literature related to open data and open data initiatives, smart, intelligent and ubiquitous cities, as well as other forms of urban digital-material integration. By examining prior academic research emergent patterns and characteristics of smart cities became apparent. It exposed what previous work had been conducted, and how I could contribute to existing literature.

4.2 Data Analysis

Subsequent to the data collection process, I spent a period of time reflecting upon the data. I wanted to consider the data as a whole, and deliberate any emergent patterns or themes that were noted throughout the data collection process. I summarized the interviews, noting any relevant patterns, word choices, and emphasized notable topics within each interview. This allowed me to address any new questions which became apparent during this initial analysis of data, and enabled me to understand the place of certain themes in relation to my larger thesis questions.

4.2.1 Coding

I then began the meticulous process of coding my data. As Saldana describes, a code is, “a word or a short phrase that symbolically assigns a summative, salient, essence-capturing, and/or evocative attribute for a portion of language-based or visual data” (Saldana 2009:3). Interview transcripts were printed and methodically analyzed. This process was in several stages, and was iterative, meaning I went back to the same texts several times to code and recode. Any emergent themes, phrases and topics were colour coded, not only to provide me with visual cues about data, but also offer a way to easily observe what was occurring within the data.

The physical nature of the documents enabled me to lay out each interview transcript side by side, and understand the interconnected nature of the interviews. This method aided me in drawing links between various interviews and note any broad thematic patterns. I then developed a large alphabetically organized chart comprised of various themes and codes. This proved to be an efficient method for distinguishing any notable patterns that emerged for specific respondents, as well as distinguish any patterns pertaining to specific categories of respondents. Ultimately, this rigorous process allowed me to develop the subsequent sections for the analysis portion of this thesis. Upon determining the appropriate content to include in my analysis section, I underwent a secondary compartmentalizing process. In this instance, I developed a series of charts related to the topics to be explicated in the analysis section. Tables were formatted such that respondents' names would correspond to relevant quotes and themes used to devise the analysis section. In total, 16 tables were made. This enabled the efficient execution of the analysis procedure and provided a quick reflection of collected data.

4.3 Ethics³

Potential research participants were first contacted directly via e-mail and invited to participate in my research study. I greeted the potential research participants by providing a brief description of myself, my research, and why I had selected them as interviewees. Attached to the email was a letter of information which described in greater detail the purpose of my research, its benefits and intended usage of collected data. Thereafter, appropriate arrangements were made in order to carry out the interview.

³ This thesis is related to the Ubicity project, and shares the same basic GREB-approved protocols. Interviews transcripts and research findings are shared with the other members of the Ubicity project. Interviewee information will be disclosed to members only in their most de-identified form, and made available for the duration of this thesis as well as the lifetime of the Ubicity project. All members of the Ubicity project have read and signed a confidentiality agreement.

Prior to conducting any interview, I provided each interviewee with a consent form. The consent form clearly stated that responses would be audio recorded, explained how interview responses will be used, described how confidentiality and anonymity will be preserved, and gave the right to the interviewee to change the conditions of their consent at any time before the end date of the project either by e-mail or formal letter. As a secondary measure, at the start of each interview, interviewees were asked if they understood the terms of the consent form and then asked to provide oral consent to be audio recorded.

The consent form also informed participants that any questions they chose not to answer could be skipped, and that they maintain the right to withdraw from the study at any time, up until completion of the analysis of the data. Participants were also reminded prior to commencing the interview that they could verbally request to cease interviewing or contact myself or my supervisor via e-mail or telephone at any time to withdraw from the study.

In order to ensure confidentiality, all interview data was numerically labelled. Each participant was assigned an identifying number, which was linked to the interview transcripts. Position, rank and affiliation with corporate, government and private entities were only disclosed upon obtaining consent by the participant. Privacy has been preserved in this research and respondents are only identified in the form of: 'Interviewee [Identifying Number]'. Instances in which a respondent has specifically requested to be named (i.e. not de-identified), their names and title may be used in public discussion documents (non-academic summary reports), academic publications and presentations at scientific conferences.

Since many interviewees have spoken on behalf of organizations or government in their official capacity, it may still be possible to identify the individual even with de-identification. Thus, I have taken the utmost care to minimize the possibility of indirect identification by

limiting the possibility of indirect identification through other available information. For instance, no publically accessible list of interviewees or acknowledgements by name have been composed. It is evident that context is a factor in this situation. Therefore, no risks has been taken that could ease the indirect identification of individuals, though, this possibility can never truly be removed.

All data collected for this thesis that include identifying characteristics of participants, as well as the master list of names and identification numbers which correspond to the participants were stored separately from all other data. Identifying data, master list of names and identification numbers were stored on a password protected hard drive and kept under lock and key in a drawer in my office at Queen's University.

4.4 Reflexivity

As Kathy Charmaz says, “[Researchers] are not passive receptacles into which data is poured” (Charmaz 1998:27). Charmaz argues that reflexivity consists of the analysis of the research process, experiences, decisions and interpretations in ways that bring the researcher into the process (Charmaz 2014:344). Finlay also notes that a researcher is able to maintain reflexivity through intersubjective reflection, introspection and social critique (Finlay 2002). My research process has been an interesting and insightful journey, often requiring me to consider what I have learned and experienced.

I meticulously scrutinized my research journey at every step of the way in order to ensure sound research. Often, I pondered whether or not a particular interview was conducted efficiently, what questions should be included or omitted in my next interview, whether or not my questions were clearly posed in order to elicit substantial responses, and my own demeanor or attitude with interviewees. In order to assist myself in preserving reflexivity, I habitually

maintained a research journal. This journal noted any patterns which emerged through the interview, such as repetition of certain words or phrases, significant names of people or entities which related to my field of research, the interviewee's demeanor when internalizing or reflecting upon certain questions and responses, and how comfortable interviewees were when discussing certain topics raised during the interview.

4.5 Limitations

4.5.1 Power Dynamics

Interviews required me to meet with several leaders and key figures of businesses or government. Seeing myself as simply an MA student interviewing authority figures, I often felt that there was a power dynamic which was difficult to navigate. This may have potentially hindered data gathering. Although I had a near perfect response rate, and most interviewees appeared more than willing to participate in my research, there remained a lingering notion that most interviewees were in a position of power. While I did try to mitigate any tension caused by a difference in authority through preliminary conversation, I bore in mind that my demeanor should maintain an aspect of professionalism, and respect the authority of my interviewee. I understood that my interviewees were granting me time from their busy schedule to partake in my research. Although most interviewees shed their authoritative stance while engaged in the interviews, there were a few instances in which there was a definitive delineation between 'professional' and 'student researcher' as noted by interviewee tone, attitude, abruptness of responses and language. These differences in authority may have inadvertently affected the quality of responses gathered. For instance, interviewees may have shunted the possibility of offering deeper, more revealing or more engaging responses, as I am not an authoritative or

superior figure. Until I learned to navigate this power dynamic, shyness may have stunted my drive to gather richer responses.

4.5.2 Varying Interview Style

As noted above, delivery of interviews varied throughout the research process. While most interviews were conducted face to face, some were conducted via VOIP or telephone. I recognize that as a result, responses derived in these various methods interview delivery may have altered potential responses, as non-face to face interviews tended to be more relaxed. In these instances, the interviewee seemed to speak more openly. On the other hand, notable visual cues, movements and expressions could not be recorded if the interview was conducted over the phone. As a result, emphasis was not placed on interviewee expression when coding and analyzing data.

4.5.3 Self-censored Responses

Since interviews were frequently with key figures in government or businesses, respondents typically spoke in their capacity as a representative of their organisations. As a result, responses may have been controlled as to limit the type or detail of provided information.

4.5.4 Sample

A final limitation is sample selection. When selecting research participants for my sample, I was keen to include those who were best suited to discuss at least one of the broad themes of this research. Unfortunately, not all respondents were able to formulate clear and detailed responses for topics less directly related to their field of expertise. Most respondents in this situation attempted responded in a general way and admitted their lack of specific knowledge, but some respondents who clearly had limited knowledge of particular subject matters provided answers to each question asked regardless. This was taken into account when coding and analyzing the data.

As well, there are a variety of limitations when employing a snowball sampling method. This method raises issues of biased selection for future interviewees as interviewees may suggest other potential respondents based on their own prejudgments of who may qualify as expert or more appropriate for research. As a result, individuals who may have been more qualified for this research were inadvertently excluded. As such, when conducting snowball sampling, one must consider how others recommend interviewees. In this research, recommendations of ‘experts’ in the field of smart city and open data initiatives were taken for granted.

Chapter 5 Analysis

The Analysis section is divided into three sections: smart cities, open data, and open data and the smart city.

The ‘smart city’ analysis section begins by examining various understandings of the term ‘smart city’ by interviewees. Next, this section analyzes whether or not respondents believed the term ‘smart city’ is simply a platitude used to describe a non-existent phenomenon. This section continues by analyzing particular components respondents feel are necessary to establish a smart city. Moreover, opinions regarding the current state of smart city development in Anytown are explored. The smart city section concludes with an examination of current smart city initiatives in Anytown.

The ‘open data’ section begins by investigating definitional understandings of open data by participants. Next, this chapter explores various open data initiatives in Anytown. This chapter then delves into various practical benefits offered by open data. This section also uncovers typical users of open data. This section concludes by examining challenges surrounding open data proliferation.

Finally, the ‘open data smart city’ analysis section investigates the main thesis question and examines if open data can aid in the promotion of a smarter urban landscape and why.

5.1 Smart City Definition

Although a clear academic explanation of the smart city was offered in the literature review chapter, it only provided academic expressions of the concept. In an attempt to demonstrate its relevance in practice, this section closely examines definitional expressions of the term as perceived by smart city leaders in government, business and academic settings alike, and how definitions compare between each group.

Public servants responsible for urban development in townships within Anytown provided fairly comprehensive definitions of the term smart city, and often resembled explanations offered by relevant scholarly literature. Each respondent expressed that a smart city is a city which uses technology, smart infrastructure and data in order to assist in ensuring smarter decisions in city management, which in turn, can aid in ensuring sustainability of population growth and city services. As stated by Interviewee 2, “Accordingly we collect information and make decisions that are based on facts and data to allow them to sustain services and accommodate that population growth and demand on existing infrastructure.” Although this respondent does not provide a clear ‘expert’ definition of the term smart city, each respondent in this category implicitly encouraged the usage of smart technology in order to maintain population growth and tend to the needs of the community. This lack of clarity raises sceptical attitudes towards what classifies as expertise. Discussion of expertise will be further explored in the discussion chapter of this thesis.

Business leaders in smart city development were also quite fluent in providing a definition of smart city. As eloquently stated by Interviewee 5, “a smart city is a city that utilizes technology to either save the city money, save budget, create a new revenue stream, engage citizens or a foster innovation in start-up companies, like economic growth.” Other respondents similarly expressed that technology and data are utilized in a smart city in order to generate more efficient city services. Interestingly, communication was often cited as an important facet of the smart city. Not only was communication raised as a component that allows for better collaboration between citizens, business and government, but it was also expressed as a component necessary for smart technologies to collaborate with each other. As stated by other respondents in the

business sector, machine to human communication allows data to become meaningful, enabling smarter decision making processes within the city.

Experts in the field of smart cities expressed that a smart city is a city which collects information and data using technology and, "...uses that information to drive improvements in services, and improvements in capabilities." Again, a smart city is described as a city which encourages the efficiency of city services. Although this group of respondents did not generate detailed definitions of the term, they did capture the essence of smart cities as described in relevant literature.

Definitions provided by public servants responsible for open data initiatives in Anytown demonstrated strong similarities with definitions provided by public servants responsible for urban development in Anytown. To explain, each interviewee expressed that technology and data are important for the efficient operation of city services. This, according to each open data public servant, is in aims to better serve the community. As stated by Interviewee 10, "I think it's about using technology and data effectively and involving citizens in that process." Once again, the smart city is noted as a method of serving the community.

Finally, each respondent related to private businesses associated with open data initiatives in Anytown required a prompt to elicit a definition of smart city. Despite this, each provided a general definition of the term. One respondent defined the smart city as one that uses more technology in the urban environment. They also demarcated their awareness of the term in relation to previous urban planning projects including intelligent cities and digital cities. Although this group of respondents lacked specific knowledge on smart cities, when assisted with a definition, respondents were able to articulate general familiarity with it.

In all, interviewees described a smart city as a city which integrates technology into the urban environment. All subjects unanimously conveyed the importance of data and data management, and a notion that the smart city uses data in order to ensure efficiency of city services. Moreover, each group also noted that smart city development is a form of urban development that can benefit the community. On the other hand, distinct differences are evident between each main group. Public servants heavily emphasized that smart cities enables the city to make smarter decisions for the community. Conversely, businesses related to smart city development universally asserted that in order to have a functioning smart city, broadband internet and a robust communication system was important to its development. As expected, smart city business leaders explained that smart city development could also encourage economic gain.⁴

5.2 Smart City Buzzword

This section considers whether the term ‘smart city’ is simply a platitude with no real bearing in real world applications. This served as a gauge to understand if a smart city could ever be achieved even outside of Anytown. Through analysis, it was discovered that respondents unanimously agreed that the term smart city is a tired expression, and felt that the term was “largely a buzzword.” One rationale for its status as a cliché is to market the smart city concept. As such, a specific term is required to label this particular phenomenon for planning or marketing purposes.

Although respondents were unanimous in expressing that the term may be overused, they explained that it does not negate the fact that the idea of the smart city exists, and that a smart city can actually be implemented. Respondents believed that the term possesses merit and is

⁴ Individuals specifically interviewed regarding their expertise in privacy and security were omitted from this section. This deliberate decision was executed since either these respondents were not fluent enough in smart city discourse to allow for thorough insight regarding the specific nature of smart city development.

currently gaining leverage in and around Anytown. Interviewee 2 stated, "...it could be a buzzword, but the concept underlying the buzzword, I think, is based on fact, and I don't think it's something that we should ignore." Similarly, Interviewee 6 stated that, "the term 'smart cities' might, overtime, fade..." Interviewee 6 also indicated that even within their company, a shift in the jargon used to describe this particular phenomenon is gradually shifting. Thus, it appears that the term 'smart city' is an interchangeable term. Although the label 'smart city' may cease to exist over time, conceptually, the smart city is capable of coming to fruition. Its importance rests in the fundamental meaning of the term.

After gauging respondents' sentiments towards the term smart city and its place in urban development, inquiry about smart city development in Anytown ensued. Of 11 respondents asked to comment about the state of smart cities in Anytown, seven felt that none of the townships within Anytown were smart cities. Despite this, each believed that townships within Anytown can become 'smart', and noted that several initiatives promote the development of smart cities. This will be discussed further below.

On the other hand, four respondents claimed that some townships in Anytown already demonstrate preliminary characteristics of a smart city. One respondent stated that they see "lots of work going on in the area of smart city development." Although there is a difference in opinion regarding Anytown's current status as a smart city, 11 respondents indicate that the possibility for smart city implementation in Anytown is likely. Thus, the term 'smart city' is not simply a platitude, and is demonstrated through its apparent implementation in Anytown.

5.3 Smart City Components

Interviewee 1 mentioned that smart infrastructure is a foundational requirement in order to entertain the possibility of a smart city. Upon investigation, several technological components of

the smart city were suggested by respondents, of which a staggering number were similar across each group. An aggregated list of smart infrastructural suggestions by respondents is as follows: health, smart grid technology, traffic, transportation, communication, video, sensors, smart buildings, waste disposal, smart utilities, automation, led, lights, cameras, water management, mapping, and broadband. The term 'broadband' is an important component raised by interviewees. Its significance will be further explored in the discussion chapter of this thesis. As clearly noted, there are an array of smart city infrastructural components which overlap between specific groups of respondents.

Upon further analysis, it was apparent that certain components emphasized by respondents were often related to infrastructure, technology or initiatives promoted by the respondent's respective business or profession. Thus, one's profession somehow informs them of certain components of the smart city.

To explain, each public servant related to urban development heavily emphasized the implementation of a robust broadband network and a 'smart' regional public transportation system. Each of these components are government led initiatives. A respondent in the field of marketing audio and visual solutions stressed the importance of dynamic communication technologies integrated within the urban environment. Another respondent, a representative from a condominium development company, highlighted smart buildings as an important aspect to the creation of the smart city. When inquired, a representative from a company which provides energy to areas within and around Anytown encouraged smart grids and more streamlined utilities as important components of the smart city. A respondent from a large international technology company expressed a variety of components that can be incorporated into the smart city. This ranged from smart buildings, lighting, transportation and traffic control and a variety

of other technologies that utilize sensors. It is important to note that this company is currently a leader in implementing and developing smart city solution packages for cities. As a result, it is not surprising that this respondent is familiar with a multitude of potential smart city technologies. Finally, each respondent affiliated with government or businesses that promote open data usage, particularly Geographical Interface Systems (GIS) encouraged efficient urban planning as important components of a smart city construction.

5.4 Specific Smart City Component

Respondents were asked if there is one specific component necessary to for an operational smart city. Each respondent noted either ‘technology’ or a specific technological device as a definitive smart city component. Interviewee 2 explained that there is not one single technological device that promotes a smart city. They stated, “Whether it's in our planning process, our requirements for example in planning, what kind of communities and infrastructure, whether it's the underground utility infrastructure or the buildings that we build above the ground. So there are those fundamental requirements.” Interviewee 8, a smart city expert, further explained, “I think technology is, first of all, inevitable at this point in terms of talking about smart cities.” As discovered, examples of technological components varied between respondents. Despite this, it is important to note that technology’s integration in the urban environment is certainly integral to the development of the smart city.

In this instance, technology not only indicates physical hardware implemented in an urban environment. It also includes the data generated by these technological devices. This, according to a variety of respondents, is essential for smart city progress. This phenomenon is fully explained by Interviewee 1 who stated that a smart city is about, “having an integration of information and data through technology talking to itself, and talking to us, and so the more we

can start to rely on technology and data to inform us....” Similarly Interviewee 12, an individual working for a private business associated with open data initiatives in Anytown, explained, “If you're going to have a smart city, you need to have data.” Thus, technology provides the city with “digital feedback”, which, as affirmed by Interviewee 11, enables the city to be “smart in the way they do things and the way they make decisions.” As demonstrated, both technology and the data they generate are noted as essential components of a smart city. Although technological components vary between respondents, they each deliver actionable data.

5.5 Smart City Vision

The interviews revealed a pattern in the terms ‘vision’ and ‘mindset’ being seen as a necessary component for the construction of a smart city. In this context, vision and mindset indicate a clear desire, plan and agreed upon criteria for a smart city, shared amongst smart city leaders, planners and the community, necessary for smart city implementation. Surprisingly, three of the four public servants interviewed within Anytown considered ‘vision’ as an integral component of the smart city. As Interviewee 2 stated, “The necessary components in my view, obviously you need to have a vision to buy into the big picture, what this is going to mean. Accordingly, it will have aspects of how to execute it. Whether it's in our planning process, our requirements for example in planning, what kind of communities and infrastructure, whether it's the underground utility infrastructure or the buildings that we build above the ground.” Public servants tended to place a heavier emphasis on a planning committee and a planning process in order to ensure the development of a smart city. This was further bolstered by Interviewee 1 who explained, “I think just a real commitment on the part of the mayor, council and senior staff that this is something we think can be a differentiator, can improve the quality of life of residents...”

As shown, a shared plan amongst individuals at the level of government is an integral aspect of the smart city.

This was echoed by smart city business leaders. Interviewee 3 stated that a main component of the smart city is, “a mindset and that is probably the starting point. The mindset of the leadership in the community has to be one of collaborative trust building, sharing, peering kind of mindset and these have to be the leaders.” Interviewee 6 explained that, “...you need to make sure that everybody’s rowing in the same direction.” In these instances, it is clear that government and city planners should uphold a common vision for smart city planning. Moreover, although government entities are weighted quite heavily as promoters of the smart city, the community should be consulted about current urban developments.

Interviewee 8, a smart city expert, also expressed that a specific mindset can help drive smart city development. As stated, “...I think it’s a matter of making sure that things are working together efficiently and that requires a lot of different pieces and communication and collaboration and creativity and innovation and open mindedness to change how things are currently done.” Once again, a common mindset is noted as an integral component to the promotion of a smart city.

The intended purpose of the question “What do you believe are the necessary components for a city to be a ‘smart city?’” was to understand particular technological or infrastructural components necessary to the physical building of the smart city rather than a metaphysical one such as ‘vision’ or ‘mindset’. Thus, it became apparent that a common vision and a shared plan of action amongst influential actors is equally important as physical components in the construction of a smart city.

5.6 Anytown's Smart City Initiatives

Respondents were asked about their awareness of relevant smart city initiatives in Anytown. Public servants responsible for urban development in two different townships within Anytown cited broadband internet, transit, smart LED lighting and solar panels as current smart city initiatives in Anytown. Members of private businesses associated with smart city initiatives in Anytown noted that broadband internet, smart buildings, smart grid and transit were significant ongoing Anytown smart city initiatives. Experts in smart city and open data unanimously mentioned transit as a notable smart city initiative in the Anytown. A public servant responsible for open data initiatives in Anytown described transit as a possible smart city initiative. Each member of private businesses associated with open data initiatives in Anytown stated that transit was an important smart city initiative in Anytown. Finally, a privacy and security expert briefly discussed their awareness of a smart transit system initiative.

As demonstrated, each interviewed group repeatedly cited broadband, smart buildings and smart transit as the most popular smart city initiatives in Anytown. These initiatives will be further discussed below.

Interviewee 3 explained that, “[Anytown] is investing now in a broadband network of their own as well, the [Anytown] Network”. This is further elaborated upon by another representative of a private business associated with smart city initiatives in Anytown who stated, “...they [The Anytown government] are building out the [Anytown] Network... in which they’re laying fiber down knowing very well that having access to high-speed broadband is one of the first steps in servicing any one of their municipalities.” Evidently, broadband is heralded as an essential first step to driving forward a smart city in Anytown.

As detailed by Interviewee 4, a smart building is an attempt to streamline the variety of automated systems components within a building which range from energy metering, lighting, and surveillance and security. Thus, “In a smart building, you put a network in the middle of the building and the network allows you to connect everything”, and “is just one of the solutions that you might look at in a smart city.”

Smart transit was also routinely noted as a potential smart city initiative in Anytown. Interviewee 10 stated that the smart transit program allows transit schedules and live feeds available to the public, and intends to increase transit efficiency. Interviewee 14 also mentioned a specialized transportation service called [Anytown] Plus, which caters to specially abled individuals. This service utilizes near field communication devices to notify transit services of their location, ultimately facilitating transit for those who require assistance.

Evidently, there are several smart city initiatives in Anytown which are currently gaining traction, however only a few hold popular consensus. When asked why initiatives are not more extensive, Interviewee 1 explained that Anytown is in its “very early stages when you compare it to some of the European cities that are quite advanced in this area”. Interviewee 6 was assuring, and noted that Anytown can make progress in smart city development. They stated, “...what I like about [Anytown] is they are taking a look at it and trying to take a lead step to assist their different cities.” Interviewee 6 went on to provide detailed examples of how Anytown is demonstrating progress, especially through their progressive broadband network initiative. In all, it is clear that smart city initiatives in Anytown are still in their infancy. On the other hand, several initiatives were discussed, and seem to be gaining momentum in Anytown. In light of previous analysis of whether or not Anytown is or can become a smart city, it is apparent that

although townships within Anytown are not smart cities in their current state, existing smart city initiatives demonstrate a progressive step towards constructing a smarter urban environment.

5.7 Smart City Leaders

Two dominant categories of responses emerged in this area: individuals who believe *government* inherently possesses most influence over smart city development, and individuals who believe that *collaboration* between government, business and citizens is essential for smart city progress.

An overwhelming majority of respondents felt that government is, and should adopt the role of leader in developing a smart city. Interviewee 1 explained, “I think that contrary to popular opinion, government tends to look further out than business and residents.” Interviewee 1 noted that government workers are committed to “improve[ing] the quality of life of residents”, more than businesses who seek high profit in relatively short spans of time. Interviewee 2 further detailed that government workers are responsible for progress in the community. “...in theory, council members are expected to, because you that's what you do every day in and out.” Additionally, Interviewee 4 stated that government must initiate smart city development because they are, “the only ones who have that ability to pull together the fact that they own so much, they have so many assets that are valuable, they have a connection to all the residents and the residents have a reason to see them.” Interviewee 6 explained that government entities have the most influence over the development of the smart city, as long as government bodies collaborate efficiently. They stated, “When you talk about policy makers or for politicians, city planners, I think all of them have got a great influence over it. If I took a look at things, one of the bigger challenges in dealing with trying to get things implemented is a lot of times you have departmental, operational and budget silos within the city or municipality.”

Several respondents who believed government holds most power in shaping the smart city also stated that citizens may actually hinder smart city development. Interviewee 2 explained, “Well citizens at the end, they also are recipients of all those capabilities, but I'm afraid citizens may not necessarily see those challenges as much as municipal employees.” This sentiment was shared by Interviewee 6, who explained that often a solution that may seem like obvious benefit to the urban landscape to a majority of citizens, can be significantly hindered by unapproving citizens.

Finally, three respondents believed that collaboration between government, business and citizens is necessary for smart city implementation. As Interviewee 3 explained, “...there's no one answer to who has the most influence.” They believe that collaboration is necessary to the development of a smart city in Anytown. Interviewee 12 indicated that government, business and citizens are each important. They continued by explaining that, “Citizens as a collaborative, like neighbourhood groups, are extremely powerful.” They also noted that government are quite influential. Accordingly, there must be balance between all groups in order to successfully implement a smart city.

Interviewee 13 expressed their lack of confidence in only government taking charge as promoter of a smart city, and suggested that “...governments have the greatest potential barrier in having it [smart cities] happen.” Instead, they believed that, “...all three [government, businesses and citizens] are onboard, talking to each other and have the same vision, that's what's really going to help it happen.”

As demonstrated, two categories of influential actors in smart city development emerged. While an overwhelming majority of respondents maintained that government leaders are most influential in these circumstances, three respondents felt that government alone cannot establish

a smart city. They believed that smart city development relies on the collaborative effort between government, business, and citizens.

5.8 Open Data Definition

Similar in structure to the smart city section, this section provides an understanding of the term ‘open data’ in practice.

Public servants responsible for urban development in Anytown only provided general definitions of the term ‘open data’, and often provided understandings of ‘open government’.

Interviewee 2 stated:

“Well the concept is really much broader than open data. I’m looking at open government. Open government means it’s about being transparent to the public as an accountable entity who is here in existence to serve the community and the open data is just a subset and the open data concept is really whatever we collect from the public, to serve the public, should be available to the public in a way that is easy to use and in a format that people can manipulate and add value to it for their own interests and for the broader community interests. So it’s really about sharing what we have.”

Although this definition encompasses certain components of open data, it is more akin to definitions of open government data. Interviewee 1 offered a less certain definition of open data as they explain that open data is, “...largely taking data sets that exist, but I suspect not always. I’m sure sometimes it could be the creation of them or the merging of them, but taking data sets that exist, and they’re used by government. In this case I’m sure it can apply to business as well, and that we, for whatever reason, didn’t really put out for public consumption.”

It appears that respondents' familiarity with open government is demonstrated by constant reference to transparency, which is an essential element of open government. For example, Interviewee 1 stated, "They [citizens] get a better understanding of what government's doing..."

It is important to note that neither respondent offered a clear definition of open data, and instead opted to define 'open government' in its place. It is obvious that public servants are versed in open government aspects of open data, as it is a component of their daily occupation. On the other hand, a lack of knowledge regarding open data certainly limits future responses regarding open data initiatives in Anytown. This too points to scepticism towards what qualifies as expertise, and will be discussed further on in this thesis.

Analysis of responses offered by business leaders in smart city development regarding open data discourse reveals that this group of respondents was also not well-versed in this field. Respondents typically spoke about data in general, and were not able to expand upon finer details of the concept. Interviewee 5 described open data as, "access to your energy usage at any time for you, by yourself or authorizing a third party to do that... Open data for us is dealing with the metre repository, metre depository system, the MDM, meter depository, meter repository system that the province has set up and we rely on that to allow an open data flow." Interviewee 3 explained that open data is a set of databases comprised of various search engines and social media websites which are viewable to the public. Neither of these definitions express accurate knowledge of open data and its components.

Although various business leaders in smart city development often described unrelated concepts as components of open data, on a few occasions, respondents demonstrated surface knowledge of the term. For instance, after including search engine and social media databases as components of open data, Interviewee 3 provided a description of government open data. They

stated, “So in the case of government, they’re trying to open that up to provide their data, which is actually owned by the citizens, right?” Interviewee 4 also demonstrated superficial knowledge of open data, and explained, “...like right now we’re looking at open city data for permits.” As shown, respondents from this group often confused open data with ‘data’ in general, while other respondents were able to demonstrate limited knowledge of certain components of open data, including its free accessible nature to the general public.

Definitions of open data provided by experts in the field of smart cities and open data varied drastically. Only two of the three respondents who comprised this group were able to provide a definition of open data. Interviewee 7 noted their limited knowledge of open data, but explained that open data is “public accessible information.” On the other hand, Interviewee 8 provided a cohesive definition of the term. They described open data as, “...making information in the public interest or public goods available to people. So, trying to make more excessive data as accessible as possible and to be used in different ways and just see what people can come up with.” They also noted that open government data is “public interest data...” which allows for informed citizenry. These definitions truly express a deeper understanding of open data and open government data.

The following three groups demonstrated more fluent knowledge of open data and its components. This was expected, as each of these groups utilize open data as part of their occupation.

When gathering responses from public servants related to open data initiatives, comprehensive definitions of both open government and open data were provided. As expressed by Interviewee 10, “Open government is more of an umbrella term. So, it could be everything from having public meetings for the public where the public is open and part of it. And the books

are open, to decisions are open to - everything being transparent and open. Open data is about machine readable data that's available to anybody to use.” This was further explored by Interviewee 11, who stated that open data is, “sharing government data online so anyone – which I mean by that is organisations, whether you're a profit, non-profit, researchers, the public, students, developers can help solve problems that affect Ontarians every day.” Each respondent in this category provided a cohesive definition of the term, but once again, open government data is expressed in conjunction to open data.

Respondents related to private businesses associated with open data initiatives in Anytown also provided concrete definitions of the term ‘open data’. Interviewee 13 described open data as, “...data that is released to the public in, you know, machine-readable form, that has no licence restrictions.” Interviewee 12 similarly stated that open data is data which is, “...free and open to use...” Evidently, individuals who utilize open data as a component of private business demonstrated a clear understanding of open data.

Finally, privacy experts were also consulted regarding definitional understandings of open data. Although this category of respondents was seldom referenced in previous sections, their affiliation with entities that ensure privacy and security encourages fluency in analyzing data of all types. This allowed these interviewees to speak knowledgeably about open data. Interviewee 15 expressed with enthusiasm:

“I'm a big fan of open data. I mean, our democratic societies are based on the ability of individuals to be able to hold governments accountable and you can't hold governments accountable if you don't know what they're doing. So we need transparency, we need openness and transparency, access to the information that government uses to make their decisions and the only qualifier is, that's not personal information.”

Each respondent in this category delivered a sound definition of open data, but once again, open government and open government data were often discussed alongside open data.

Overall, respondents expressed open data as data which is freely accessible by the general public. Through analysis, it was discovered that each category of respondents not affiliated with organizations which utilize open data were not well versed in the concept. As a result, respondents were only able to provide vague, and often flawed definitions of the term. On the other hand, respondents affiliated with organizations which utilize open data were naturally able to provide deeper, more cohesive definitions. Moreover, a pattern emerged where each category of respondents provided definitions of open government or government open data when asked to describe open data. Evidently, the term ‘open data’ is often amalgamated with understandings of ‘open government data’.

5.9 Open Data Benefits

Respondents were also encouraged to describe benefits of open data. The stated benefits of open data varied not only between categories of interviewees, but also between interviewees within each category. As such, it was most appropriate to devise an aggregated list of potential benefits of open data. Suggested benefits included: government transparency, innovation, government accountability, economic development, business development, citizen engagement, cost savings, and enhanced public services. Evidently, this list is quite vast, but upon further analysis, two specific open data benefits were frequently mentioned.

Firstly, *informed citizenry* was often raised as a benefit of releasing open data to the public. Interviewee 11 stated that, “the benefits of publishing open data includes improving accountability and transparency as a government, right, and ensuring Ontarians and the public or communities have access to relevant government data.” This was further elaborated upon by

Interviewee 8 who suggested that, “when you look into open data taking the difference of the information that Governments have and making it available, as a very basic starting point, gives us more information, which means we can be more educated and informed.” As shown, open data empowers citizens with government information, allowing for participatory citizenry.

A second frequently mentioned benefit of open data was open data’s *unintended benefits*. Although empirically vague, several respondents noted that the benefits of open are largely unknown. Interviewee 10 explained, “Well, I think sometimes we don’t know until it happens because again one of the things with open data is you don’t know how the data’s going to be used until you put it out there.” Interviewee 8 also noted that unintended benefits is a potential benefit of open data stating that, “there’s also really interesting things people can do with that information and different people will see that and know how to use that in different ways than the average person might, even looking at it as a day to day job in Government... I’m sure there are a millions of ways that it can used, that I haven’t even thought of yet. Yeah, absolutely, I mean, it’s a matter of what the data is, what’s made available and then how people can use it or what they see as potential.” Interviewee 6 expressed their enthusiasm for the future of open data and mentioned, “I do believe that they’ll end up opening up their data and they will benefit from, like, what other people develop.” Certainly, the benefits of open data are endless, as uses are left to the imagination. Evidently, open data can be used in whichever way the user pleases. Although ‘unintended benefits’ is not specific, its limitless and uncertain potential raises optimism for the future of open data initiatives.

5.10 Open Data Users

Next, respondents were asked to describe typical users of open data. As noted in Chapter 2, open data usage simply favours those who have IT and programming skills, statistical

competence or knowledge of government operations, to actually apply the data in a meaningful way. This question provided an opportunity for comparison between scholarly work and practical descriptions of open data users.

Only one public servant responsible for urban development in Anytown was consulted about open data users. Interviewee 2 explained, “It could be anybody. Individuals, businesses, organizations, researchers, it doesn’t really matter.” This respondent noted that open data is available to all without restriction.

Members of private businesses associated with smart city initiatives in Anytown provided various responses. Two respondents stated that businesses typically use open data. Interviewee 3 stated that companies, “use it to help them develop better services or better products”. Interviewee 4 similarly stated that, “...you’ll start to see businesses probably using it more and more actively in the next three to five years...” Interviewee 5 suggested that customers of certain utility providers utilize open data, but does not elaborate on how this data is utilized, and for what purpose. Finally, Interviewee 6 explained, “I think there’s different groups using it.” Interviewee 6 provided an example of how open data is not limited to one group of users. They explained that members of different sectors of a community are able engage with open data particularly through ‘hackathons’.

Smart city and open data experts noted that the general public can utilize open data. Interviewee 8 noted that although open data is available to all, it is still a relatively new tool which requires a “capacity to know how to work with and manipulate those data sets.” Although, open data is marketed as available to all, this respondent explained that there are limiting factors when approaching open data. This is an important point which will be discussed in a future section of this chapter.

Public servants responsible for open data initiatives provided two differing responses regarding open data users. Interviewee 11 explained that, “a lot of them are developers, right, because a lot of the open data format are sort of machine-readable, where they would have to program, take out information and then mash it up with other information, right.” Once again the business sector noted as a main user of open data. Interviewee 11 also stated that the general public can use open data for general interest such as searching for, “top baby names’ lists”, and other tasks which do not require advanced technical literacy. On the other hand, Interviewee 10 explained that users are relatively unknown. As stated, “...there's no requirement for users to tell us who they are and what they're using it for. We don't require that and that's part of the open data license. It's part of the approach that we share with others we've worked with in other municipalities in the province and things like that. When we've collaborated on best practices, that's part of open data is that we don't require them to sign anything or - they don't have to.” Interviewee 10 further explained that potential users may be, “...start-ups, we know that some not for profits, we know some of the engineering and planning firms...” Evidently, since users are not obligated to disclose who they are and how they use provided open data, exact users of open data are only speculative.

Finally, respondents related to private businesses associated with open data initiatives in Anytown suggested that businesses are typical users of open data. Interviewee 12 clarified, “The data really makes more benefits to businesses such as us – we're engineers, right, so it makes more benefits to us. Although it is open to everyone, I believe it is limited how much is open to everyone.” This respondent further explained that there is a process that one must undergo in order to obtain the appropriate data, and that specialized knowledge is required to actually make use of the data. While ‘business’ appears to be an obvious response since each of these

respondents are associated with companies that utilize open data on a daily basis, each respondent was also able to describe other potential users of open data. For instance, as explained by Interviewee 12, the general public may view data for personal interest. Interviewee 12 states that, “they could look up their house, they could look at their community information, they could understand what’s available out near them, and maybe they could look at aerial photographs that are historic – you know, fifty years old – they could see what their land was like before.”

As discovered, three distinct group of open data users emerged. They are: businesses, the general public, and unknown users. Various other potential users of open data were suggested by respondents, but were only briefly mentioned. Evidently, technical knowhow is a limiting factor to open data usage, and will be further explored below.

5.11 Anytown’s Open Data Initiatives

Next, respondents were asked to express their awareness of any open data initiatives in Anytown.

Public servants responsible for urban development in Anytown provided only vague descriptions of open data initiatives in the surrounding area. Interviewee 2 explained, “...the region and municipality of [Anytown] has done open data. I think they started that journey about three years ago. They have been able to release some data.” Interviewee 2 demonstrated their awareness of certain open data projects. Although the respondent explained the slow process of releasing open data, they never provided a concrete example of any relevant open data initiatives. Interviewee 1 acknowledged their lack of familiarity regarding open data initiatives in Anytown and stated, “I’m pretty thin on it.” Interviewee 1 also expressed the time-consuming process of releasing open data to the public, but was also unable to provide details on specific open data

initiatives in Anytown. Ultimately, each public servant responsible for urban development in Anytown expressed some vague knowledge of open data initiatives, and were unable to deliver concrete examples. Once again, this lack of clarity raises uncertainty over the expertise of individuals in organizations

Members of private businesses associated with smart city initiatives in Anytown expressed greater knowledge of open data initiatives within Anytown. Examples varied between respondents in this group. Interviewee 3 noted that a Taxpayer Advocate group utilizes open data. Interviewee 4 expressed their knowledge of Anytown's open data portal, Toronto's open data portal and Ontario's open data portal, and mentioned that each are capable of providing detailed transit information. This respondent stated that this transit information can be used "practically from a business point of view." Interviewee 4 also expressed that open data portals enable convenience to an end user looking to find municipal information quickly. Interviewee 6 expressed vast knowledge of open data projects in North America generally, and anticipates that similar applications of open data can be found in Anytown. They explained a particular example of an open data initiative in Boston where a citizen can report issues with roadways and road blockages by trees by sending a photograph to public workers who will then attend to the problem in an appropriate and timely fashion.

Experts in smart city and open data possessed sparse knowledge regarding open data initiatives in Anytown. Only one respondent offered an example of an open data initiative. They expressed knowledge of a public transit open data project, but stated that this project was in Toronto rather than in Anytown.

Public servants responsible for open data initiatives cited a variety of open data initiatives in the surrounding area. Interviewee 10 who is affiliated with Anytown's GIS division explained

that Anytown's goal is to ensure the release of open data to the public in order to generate initiatives. As stated, "So, if you look at the data that's available now, and we've just updated that release plan again, we're working with the departments again. And it goes out to 2018 of more data sets to release." Interviewee 10 also noted another ongoing open data initiative which utilizes openly available food safety inspection reports integrated into the restaurant reviewing app 'Yelp'. This was noted as a method of encouraging open data usage by a wider audience. More than this, Interviewee 10 noted that openly available transit data offers potential for various open data initiatives in Anytown. As explained, "...and in the same way we make our transit schedules, live feeds available in the GTFS standard, that's an open data standard, so that it can be embedded in Google maps. So, again it's about getting transit information out so that people have the information they need to use it, right?" It is evident that Interviewee 10 sees open data as a service to citizens, and expresses its potential for future applications.

Interviewee 11 expressed knowledge of geospatial initiatives which utilize open data. They described an initiative which, "actually uses about fifty datasets, so datasets such as building restrictions, regulatory data, and then it helps property developers and home buyers understand the property market opportunities, and regulations."

As demonstrated, each public servant was able to explain a variety of relevant ongoing open data initiatives in Anytown, both governmentally and privately led.

Finally, private businesses associated with open data initiatives in Anytown were asked to explain how open data is utilized as part of their services. Each respondent is affiliated with two separate mapping and property services, and utilizes geospatial open data which is available on government open data portals. Interviewee 12 explained how their business uses open data:

“It would mainly be in the GIS aspect of things, like I said, spatial data, and it would be, like I mentioned, number one would be their aerial photography and that would be used as a background in our drawings – we do a lot of design drawings, and our design drawings need to represent the real world situation, so we would use that as a background.... whether we take our water meter sewers and place it directly onto the aerial photographs from [Anytown], or vice versa, we take their data and their open source aerial photography and we stream it to our CADD programs, and it can pop it in the background. And we now have our data now superimposed onto their backgrounds.”

Interviewee 13 also explained how their business utilizes openly available geospatial data. This business provides a service which grants a user with essential information about specific properties. This respondent named other initiatives in the surrounding area, and noted, “...there’s a lot of start-ups in [Anytown] that are collecting different types of open data. So one where’s it’s like air quality start-up. So they’re trying to grab all the air quality readings in [Anytown] and Ontario area. There’s a start-up called I am sick, which is, I think, they’re trying to map out all the healthcare areas, like the doctor’s office and hospitals in that area.” Evidently, this respondent is well versed in open data and is able to speak about a multitude of open data initiatives in Anytown.

There are various existing open data initiatives in Anytown. Although they are not as expansive as expected, a number are gaining momentum. Respondents routinely expressed two specific examples of open data usage. Firstly, respondents often noted openly available transit information as an example of an open data initiative. A second, more frequently mentioned usage of open data was openly available geospatial information, which has spawned a variety of initiatives, projects and businesses. Similar to the progress of smart cities in Anytown, open data

initiatives are also in their early stages of development, and appear to be gaining momentum as individuals continue to utilize available data.

5.12 Open Data Challenges

It was evident that public servants responsible for urban development in Anytown had differing opinions regarding open data related challenges. Interviewee 1 explained, "...as government moves towards open data, I think they have a responsibility to engage the public about what it is, what they're proposing to do and what the risks are..." Evidently, Interviewee 1 felt that in order to promote open data usage, the public must be educated about it. "Most of the public will not participate in your discussion, but if 20 or 100 do, great, and at least make sure we make people aware." Thus, Interviewee 1 implies that government must be at the forefront of educating and encouraging public awareness of this tool. Conversely, Interviewee 2 believed that challenges are much more complex. They expressed that there are several barriers to open data distribution. For instance, Interviewee 2 explained that limited government resources pose a major hurdle in its distribution. "...it has been on our plan for the last five years, but we didn't really make a lot of headways because of other priorities and challenges in terms of resources..." Interviewee 2 also emphasized that open data has been included in a government plan, and that [Township within Anytown] first datasets will be released "sometime this year." Additionally, Interviewee 2 noted a time consuming process of ensuring quality of open data prior to its distribution for public consumption. Finally, they explained that privacy concerns related to sharing datasets between government entities and to the general public is also a major challenge to open data delivery. They described that there is a rigorous privacy review process prior to distribution of data, and is one of several factors which prevents municipality and township from sharing data freely between one other.

Business leaders in smart city development also noted several open data challenges.

Interviewee 3 explained ‘unintended negative consequences’ of certain open data datasets as a potential challenge to open data distribution. They expressed that although open data can provide several positive benefits, users may apply open data in a negative way. Interviewee 4 noted two potential open data challenges. Firstly, they explained that the data is not “clean”. This is to say, that the data is difficult to use and that, “...it takes a lot of work to get it to a point that’s usable...” This factor ultimately deters a wider audience from making use of the data.

Interviewee 4 also explained that education of open data usage to a wider audience is critical. They noted that, “we’re not taking enough time teaching so that people understand the benefits and bringing them along.” By educating a wider population about open data, its usage and application may be more widely adopted. Finally, Interviewee 6 discussed bureaucratic governmental processes as a potential hindrance to open data distribution. As previously mentioned, municipalities are not obligated to share datasets with their respective townships and vice versa. As a result, townships are wary of distributing too much data, or making too much progress in open data delivery. As stated, “...most of the municipalities or most of the cities and towns are very interested in what others are doing”, and are cautious to make progress. This is due to the fact that “They want to learn by the other people’s mistakes, but then also learn by their successes...” Evidently, political processes contribute to the slow progress of open data distribution.

Only one smart city expert was able to discuss open data challenges. They cited quality of data as a challenge to open data distribution. “I think that the assumption that the data set that you're working with are accurate...The data is only good if it is maintained and upheld. And I think that when data is released it's assumed that it's accurate.” They explained that open data

must maintain a specific standard of accuracy in order to be used by a broader audience. More than this, they explained that potential users must be educated about open data. As stated, "...the people don't know what to do with it and so inundating people with data can be overwhelming and it can turn people off...it's definitely a concern or potential setback for people that are embracing the open data as an approach." With more education on how to use open data, a broader audience can make use of available data. Finally, this respondent explained that privacy procedures may also hinder the distribution of open data.

Public servants related to open data initiatives similarly conveyed limited education of open data usage as a challenge to open data. Interviewee described the difficult process of explaining the concept open data to government personnel, and stated, "I think, because [name removed] and I took this over from someone else, they probably spent a whole year educating people, going to the groups, talking to them about what the plan is, what, you know, how we're going to get this up and running. So, by the time we got it in 2013, there was a whole plan already in place of what was expected to be released. But the education still needed to happen across the board." They expressed that educating peers is a strenuous, but necessary task. They explained, "...we have learned you don't do it once, you probably do it 50 times every meeting you have 'cause people change positions, there are new people coming in." Interviewee 10 also noted that businesses and the public must also be educated on open data and its benefits. They described that a major challenge is explaining that a benefit of open data is its unknowable outcomes. They explained, "And this idea of putting it [data] out for the public to use it and add value to it, this is new for them. So, like anything new it takes time to explain how it will work and what can happen and why we're trying to do this. So, it is very much culture change and education." Interviewee 11 similarly expressed the importance of educating a wider audience about open

data as a way to promote its usage. They clarified, “I think a lot of it is also by marketing it as well.” Interviewee 11 further explained that, “...in order for open data to be successful, you have to have open conversations to either tell people what open data is about, say to people that these open data are out there, and face the difficult questions that the public may have or may arise from doing that.” As demonstrated, each of these respondents believed that the success of open data usage is contingent on educating a wider audience on open data and how it can be used practically. Moreover, each respondent also mentioned privacy concerns as a challenge to open data delivery. Interviewee 10 noted, “We're not huge risk takers being government agencies. So, we had to make sure everyone is onboard of the data so a lot of it was vetted, are you sure there's no privacy impacts on releasing this? What is the risk to the organization of releasing this data? So, there was a lot of questions we had to answer before everyone felt comfortable of releasing.” Thus, progress of open data delivery is delayed since open data must go through a process to ensure citizen privacy.

Finally, members of private businesses associated with open data initiatives in Anytown also expressed educating the public on open data usage as a major challenge to open data delivery. Interviewee 13 explained in great detail:

“I think the biggest problem right now is that open data is released with no explanation of what those data points mean. So we look at a column, and then it might be just called like [BLD] underscore height. And I don't know if that refers to building height, or what type of building height, or how they got that information. So I think the number one issue is a lack of metadata, what we call – or just instructions on how to use the data... I mean, besides people having computer experience, you can have that, but if you don't understand what the data does, or how to use the data, because there's no instructions for that, I think that's the biggest problem.”

Interviewee 13 restates several challenges discussed by various other respondents. They noted that a lack of explanation on how to use data, dissuades potential users. This respondent also described a variety of other challenges of open data distribution and usage. They noted that local government is slow to execute open data initiatives. As stated, “I talked to [Township within Anytown] CIO, and he goes, ‘Oh, we have an open data plan on paper, and we have - it’s been delayed for two or three years, but we don’t have any plans to release any open data any time soon’.” Evidently, a lack of government interest and limited resources obstructs the progress of open data delivery. Interviewee 13 further explained that, “...the biggest problem is the cost, right now - that the municipalities currently think it’s a cost for them to maintain and release that data, and there’s no benefit for that.” Neither government nor businesses see an immediate return on a costly investment. This challenge has been previously discussed by Interviewee 10 who noted that open data is difficult to market since there is no immediate return on investment. Value is added after release of data which must previously be collected, filtered and arranged according to specific standards. Interviewee 13 further discussed investment in open data, and clarified, “I don’t think municipalities see that right now. I mean, they see it as a civil good, but no benefit in return. Like they’re not saving money, they’re not saving time, they’re not getting more money, right?” Thus, open data is not an immediate concern for government entities.

Each group of respondents expressed education of open data to a wider audience as an essential step to ensuring the success of open data. As it stands, open data is not easily accessible for the general population. With more information on how to manipulate datasets, respondents unanimously felt that usage would increase. Respondents also explained that educating government and business leaders about open data and its benefits as a challenge. Monetary return is a factor considered by both government and business alike. Since return on an investment on

open data is not guaranteed and is only possible after release of data, support for the distribution of open data is hindered. A final hurdle to the success of open data are privacy concerns when releasing data. As a result, rigorous review of data incurs costs, limits type of data distributed and ultimately delays the release of suitable data.

5.13 Open Data Accessibility

It quickly became apparent that accessibility of open data was a recurring issue, and educating citizens, businesses and government on open data and how to use it was commonly referenced as a major challenge. A divide was noted between those who can currently make use of open data and those who do not possess the specific technical knowledge needed to make use of open data. Therefore, open data is not as accessible to a wider audience as marketed.

When asked about the true nature of open data's accessibility, Interviewee 2 stated, "Yeah, the technical knowhow is like any data. The data means it's an electronic data I'm talking about. So if you cannot obviously manipulate or know how to use the data, you won't be able to use it. But in principle, anybody who's got the ability to read and manipulate electronic data should have access to it....I don't believe when we say everyone it's really an absolute everyone."

Interviewee 12 further expressed how technical knowledge is required to make use of open data. "...it's not fun and games, it's not something that someone will just pop up and say they can do." As demonstrated, open data is not a tool which can be easily utilized by all. One requires specific technical knowledge in order to read and manipulate provided data, and apply it in a meaningful way.

On the other hand, Interviewee 10 explained that Anytown is currently trying to make open data more accessible. They stated, "So, we are trying to not partner but getting contact with users or applications that users are always using." This is demonstrated by the formerly mentioned

initiative which integrates freely available food safety inspection reports within the restaurant reviewing app, Yelp. This serves as an example of how a divide in technical knowhow is currently being mended in order to allow for a wider adoption of open data.

Interviewee 8, did not feel that a digital divide in open data usage is a severe issue limiting potential users. They stated:

“I think that the expectation that everyone is using that open data or that everyone should be at that level would exacerbate the digital divide... I mean definitely it could be, if the expectation is that you need to be able to manipulate the data yourself, absolutely. But I think that expecting that it's all or nothing and everyone needs to be able to know how to do it or we won't use it, is a challenge in itself too. Because everyone comes in with different skill set levels of expertise and definitions.”

In this instance, Interviewee 8 felt that easy accessibility to open data is, in itself, a challenge and an unreasonable expectation. Although they acknowledged a gap in knowledge between users and non-users, they believed a usable end product supersedes equal accessibility. They explained, “The final product, that people can - products what all the people come up with when they use these data sets, are a little bit more interesting.”

Respondents acknowledged that there is indeed a digital divide related to open data usage. Open data evidently requires some technological and statistical competence, which are qualities not possessed by all. Despite this, initiatives which intend to bridge this gap are beginning to make progress, thus allowing for greater accessibility by a larger audience of users.

5.14 Open Data and the Smart City

Now that an exploration of interviewees' understandings of smart cities, open data and their respective components have been established, it is possible to analyze the relationship between

the two. This concluding analysis chapter expands upon whether interviewees believe if open can assist in the promotion of smarter urban planning, and inspects various rationales for accepting or denying open data as a promoter of smart city development.

13 of 15 respondents were able to provide comprehensive responses to the question, “Do you think that open data can help promote a smart city?” Respondents unanimously agreed that open data can indeed support the development of the smart city. Two main explanations emerged for this phenomenon. Firstly, four proponents of open data’s implementation in the smart city simply explained that data is a necessary requirement of the smart city. This explanation is iterative of a previous section of this thesis which expressed data as one of several component of the smart city. As previously articulated by Interviewee 12, “If you’re going to have a smart city, you need to have data.” Thus, open data, in this instance, is simply seen as an alternative form of data which can enable smart city development. Interviewee 3 further explained that open data is important to smart city development since, “...you can take all those databases and ties them together... So the software tools to connect all these different databases, standardize them, blend them...” Although these respondents did not elaborate on why this data is important to smart city development, they insinuate that open data fits into a broader spectrum of data, which ultimately promotes the development of a smarter urban landscape.

On the other hand, several respondents considered open data as a tool that can help foster problem solving applications and efficiency in the urban environment. A public servant responsible for smart city initiatives in Anytown believed that open data may assist in the development of the smart city in certain contexts. As stated by Interviewee 2, “...it depends on what the data is and what the ideas are that come out of the community in terms of how the data can be used...” Interviewee 14 similarly expressed that smart urban planning through open data

usage is contextual, and "...is potentially based on what the appropriate uses are of that information." Ultimately, these respondents believed that open data usage in promoting a smart city is contingent on its application by users. More than this, each respondent maintained a continual focus on the community in smart city development. Interviewee 2 expressed that open data, "does really open up the conversation and the collaboration between the community and the city." Likewise, Interviewee 14 explained that, "...we're all typically smarter collectively than we are individually, and open data is really designed to promote that kind of crowd sourcing and collective wisdom." This demonstrates a co-productive method of city building, a topic which will be further analyzed in the discussion section of this thesis.

The notion of co-productive city development was shared by Interviewee 10. When asked if open data can help promote a smart city, the respondent enthusiastically responded, "Absolutely!" They further explained the importance of open data in a smart urban landscape, and stated, "One of the benefits of open data, again it's empowering your community, your citizens, your residents, also your business community, also those innovators out there who do what they do to do things better." Once again, Interviewee 10 the importance of the community when stimulating smart urban development.

Finally, Interviewee 13 also expressed that open data can help promote a smart city. They stated, "I see open data as being able to streamline decision making for new types of urban development, by using, you know, data analytics to make better decisions." Evidently, Interviewee 13 views open data as a component which can encourage efficiency in urban planning and development.

5.15 Analysis Conclusion

As demonstrated, respondents universally expressed that open data can promote smart city development. Respondents also articulated that open data can be used to encourage efficiency in the urban environment, which is a commonly mentioned aspect of the smart city. Additionally, several respondents explained that open data can help foster participation and innovation by citizens, business and government who can engage in co-productive practices of city planning.

Chapter 6 Discussion

This chapter begins by comparing interviewee understandings of the smart city and open data in Chapters 5, with explanations found in contemporary scholarly literature and theory in Chapters 2 and 3. It then briefly examines challenges related to the distribution of open data, particularly in the realm of open data sharing procedures. This chapter concludes by considering the potential for a bottom-up approach to urban development, a phenomenon which I term ‘the open data smart city’, and suggests that open data can be considered a component of the smart city.

6.1 Smart City Definition

Interviewees were able to express a general understanding of the term smart city and its central components, with only slight variations between interviewee groups. Respondents typically described the smart city as an urban landscape which utilizes data collected by smart technology in order to enhance the efficiency of city services. Evidently respondents believed that the integration of technology in the urban environment is a core component of the smart city. Scholarly literature typically describes the smart city as a landscape in which software enabled technologies are integrated with urban infrastructure in order to enhance city processes (Kitchin 2014b:1; Harrison et al. 2010:1). As demonstrated, there are only minor discrepancies between respondents’ descriptions of the smart city, and descriptions found in scholarly literature. This is not surprising since respondents were strategically selected for their expertise in this field. Moreover, ideas of coded practices used to enhance city infrastructure, as discussed by interviewees and scholarly literature, relate directly to the theoretical concept of code/space.

Code/space offers a framework of analysis in understanding the implementation of coded practices in a physical landscape. Thus, code/space is the unification of the tangible and coded

worlds. Smart cities exaggerate this notion, since software is built into the urban environment and becomes normalized in everyday practices. This is affirmed by Graham who states, “With computerized systems now actually becoming the ‘ordinary’ sociotechnical world in many contemporary societies, code orchestrates a widening array of public, private and public-private spheres and mobility, logistics and service systems and spaces” (Graham 2005:562). This is further expressed by respondents who unanimously described the smart city as an urban landscape which incorporates technology and data into the urban infrastructure. For instance, Interviewee 13 explained that a smart city, “is a new way of urban development, integrating technology to increase efficiency.” Scholarly literature, and respondents alike clearly note that technology and data are essential to the architecture of a smart city. Software, in a smart city ultimately serves to enhance city processes and optimize efficiency. Respondents frequently described the importance of data in a smart city, which enables an understanding of city operations, and enhances decision making procedures. Thus, notions of code/space are demonstrated as technology and physical space are bound together in a smart urban environment.

Upon analyzing respondents’ descriptions of the smart city, it became apparent that on occasion the ‘intelligent city’, the ‘digital city’ and the integration of broadband internet in the urban environment were articulated. Each of these concepts and components are indicative of former iterations of the smart city, and arguably reflect notions of the digital sublime.

A former version of the smart city is noted by Interviewee 1 when discussing the smart city. As stated:

“Well, you know, we know that intelligent city has been used. I don’t know if that’s supposed to be synonymous or not. That’s the one I’m more familiar with, and in terms of intelligent city, I mean, I think of it more ... I mean, we’re in the early stages of it and broadband, I think, is really

a tool to an intelligent city...for me it's about this progression which appears to be a painfully slow progression, towards having an integration of information and data through technology talking to itself, and talking to us, and so the more we can start to rely on technology and data to inform us about traffic patterns or about, you know, having a smart grid or about, you know, traffic light coordination or you name it, and then obviously it links with other things like hospitals...”

Interviewee 1 demonstrated more familiarity with the ‘intelligent city’ rather than the ‘smart city’. They noted the importance of incorporating broadband, and information and communication technologies into the urban landscape in order to enhance urban infrastructure, which reflects scholarly descriptions of the intelligent city. As Komninos (2002) explains, the intelligent city sees the amalgamation of information and communication technologies in the urban environment, which not only augments the urban environment, but also enhances digital communication. Although there are minor variances between the intelligent city and the smart city, Interviewee 1 clearly indicated more familiarity with the intelligent city.

Upon discussing smart cities with Interviewee 2, they frequently alternated between the terms ‘smart city’ and ‘digital city’. For instance, they explain, “We are having for example right now having a discussion about a digital city etc. and we are planning to reach out to leaders, we are planning to reach out to the community as part of this conversation...” As demonstrated, Interviewee 2 mistakenly synonymizes the term ‘digital city’ with ‘smart city’.

Furthermore, when expressing various components of the smart city, Interviewee 2, as well as a majority of other respondents, heavily emphasized broadband internet as a core component of the smart city. Interestingly, this component is indicative of a digital city infrastructure. As noted in the literature review chapter, the digital city sees the incorporation of the internet in the urban

landscape in order to seamlessly share information between citizens, as well as enhance urban infrastructure (Ishida 2000).

In each of these instances, respondents either confused the digital city or intelligent city with the smart city, or emphasised central components of smart city precursors. Through examination, it is simple to understand this confusion, as there are only minor differences between each technologically enhanced urban landscape. As such, this phenomenon heavily reflects Mosco's idea of 'the digital sublime'.

To reiterate, the digital sublime is the idea that there is a "willful, historical amnesia about technology", especially when exploring information and communication technologies (Mosco 2004:117). Moreover, with each introduction of a new technology, comes a promise of a new age, and a solution to prominent global issues. This is relevant in smart city discourse, as there have been multiple variations of technologically enhanced urban landscapes. This has been noted in concepts such as wired cities and cyber cities, and demonstrated through the interview process with references to intelligent cities, digital cities and the incorporation of broadband in the urban landscape. Upon further analysis of each iteration of enhanced urban landscapes, it is apparent that there are only minor nuances that differentiate each. However, these minor nuances continually see a rebranding of the concept. Evidently, differences appear to be so minute such that respondents often interchange these terms. Yet, this does not negate the fact that there are repeated reintroductions of a similar concept with a variant title. In relation to the digital sublime, these new forms of a technologically enhanced urban landscapes are frequently marketed as a new way to surpasses the constraints of everyday life and enhance city services in order to achieve a sublime unachievable by previous versions.

Respondents' understandings of the smart city are quite similar to those provided by scholarly literature. Each emphasizes the importance of integrating technology in the urban environment in order to optimise city operations, and these understandings of the smart city also exaggerate notions of code/space and the digital sublime.

6.2 Open Data Definition

This section allows for a reflection of how respondents are informed about the term 'open data', and enables insight into respondents' comprehensions of the various intricate facets of the term. It also examines how certain understandings of the term open data may be perpetuated through bureaucratic forms of organization.

Respondents' understanding of the term open data was contingent on their respective profession or interaction with open data. Respondents with no affiliation or experience with open data were unable to provide a concrete definition of the concept. Consequently these definitions were often vague and inconsistent. More often than not, respondents typically substituted the term 'open data' for a more general description of the term 'data'. For instance, Interviewee 3 noted that various search engines and social media sites deliver open data. This phenomenon was also demonstrated by Interviewee 6 who explained that open data entails access to information about personal energy usage. I believe that two possible explanations exist for the substitution of the term 'data' for 'open data'. Firstly, respondents may have genuinely believed that open data and data are synonymous, and hence, provided a general summary of the term. This is a viable rationale since these terms seem quite similar. As discussed by Davies and Edwards (2012:119), data is encoded, structured information ranging from videos, documents and spreadsheets. Open data, on the other hand, maintains several of these attributes, but minor contextual characteristics differentiate data from open data (Davies and Edwards 2012:121). Thus, it is simple to

understand this confusion between each term. A second, more plausible, rationale for this confusion may be in relation to one's actual familiarity with 'open data'. In these instances, respondents' knowledge regarding open data appeared to be quite sparse. Rather than expressing a lack of knowledge with the term, respondents may have continued to deliver a definition to the best of their abilities. Perhaps respondents felt some form of embarrassment in their unawareness of the term, and clamoured to define open data rather than admitting their unfamiliarity with the term. In either case, a lack of tangible experience or interaction with open data is correlative with overall comprehensiveness of provided definitions of open data.

On the other hand, respondents who regularly utilize open data or are affiliated with government or organizations that interact with open data were able to provide consistent and more informed definitions of open data. Open data was often described as information which is publicly accessible. Interviewee 13, explained that open data is, "...data that is released to the public in, you know, machine-readable form that has no licence restrictions." This description bears a striking resemblance to scholarly definitions of open data. To reiterate, for data to qualify as open data, it must be downloadable, free and structured without previous processing (Lakomaa and Kallberg 2013:558). Moreover, users must be able to access open datasets without technical restrictions or limitations (Jetzek et al. 2013:102). Thus, respondents who interact with open data ultimately possess greater knowledge of its main components, and were able to provide cohesive, well informed descriptions of the term.

Another notable pattern demonstrated by public servants affiliated with open data initiatives was discussion of 'open government' and 'open government data' in accordance with open data. Rather than simply exploring a pure definition of 'open data', these related topics would also be raised. For example, when describing open data, Interviewee 10 explained that, "Open

government is more of an umbrella term. So, it could be everything from having public meetings for the public where the public is open and part of it. And the books are open, to decisions are open to - everything being transparent and open. Open data is about machine readable data that's available to anybody to use.” This pattern is further exemplified by Interviewee 2 who stated:

“Well the concept is really much broader than open data. I'm looking at open government. Open government means it's about being transparent to the public as an accountable entity who is here in existence to serve the community and the open data is just a subset and the open data concept is really whatever we collect from the public, to serve the public, should be available to the public in a way that is easy to use and in a format that people can manipulate and add value to it for their own interests and for the broader community interests.”

These descriptions are quite similar to various scholarly definitions of open government data. For instance, Ubaldi (2013) provides several main principles of open government. She explains that open government data is data which is released by government bodies and can be used freely by the public (Ubaldi 2013). Moreover, Worthy explains that open data enforces transparency, government accountability and promotes democratic participation (2015). Evidently, public servants seemed to be informed by government literature which explores open data in relation to open government. This phenomenon relates to Kallinikos' exploration of bureaucratic forms of organization. It is possible that a consistent understand of open data and its relation to open government data is linked to the bureaucratic structure adopted by Anytown's government. As described, bureaucracy establishes a form of standardization and regulation within an organization. Not only is this standardization evident in modes of operation, but it is also apparent in the perpetuation of consistent understandings of concepts pertinent to an organization (Kallinikos 2004:20). Therefore, bureaucracy may shape comprehensions of certain terms and

procedures within an organization, such as Anytown's government, ultimately enforcing the understanding that open data and open government data are unified concepts.

Comprehensive understandings and explanations of open data are correlated with a respondent's profession and affiliation with open data usage. Those who did not interact with open data were unable to provide a cohesive definition of the term, and often provided a general understanding of 'data'. On the other hand, respondents who frequently interacted with open data offered cohesive explanations of the term. Often, respondents not affiliated with government organizations, were able to provide a pure explanation of open data. This is to say that descriptions by non-government related respondents offered definitions which only discussed open data without exploring other related open data topics. On the other hand, public servants were able to offer comprehensive definitions of the term open data, but greater emphasis was typically placed on describing open government and open government data.

6.3 Open Data Sharing

Through the interviews, it was discovered that sharing of open data between government entities is not as free-flowing as initially assumed. This is to say that Anytown is not obligated to share open datasets with its respective townships unless they have undergone a rigorous privacy review process. This fact is also true in the reverse, where individual townships within Anytown are not obligated to share open datasets with Anytown unless they have undergone a formal privacy review process. In a professional government setting, this process is referred to as "impact assessment". This process is explained by Interviewee 10 who stated, "I know, it's confusing. It's hierarchies of government. But we don't govern the local municipalities any more than the province. And the province doesn't govern municipalities or regions either. It doesn't work that way." This was further discussed by Interviewee 14, a privacy expert, who explained,

“we basically have a process in place if there's any semblance of personal information in open data it doesn't get released. So, often the data that we're putting out right now is really tends to be stuff that is geo spatial or financial information, things like that.”

Thus, privacy protection is of utmost priority for government entities, and is thoroughly ensured prior to the disclosure of open datasets. Hence, separate government entities are unable to share open datasets until an impact assessment has been conducted. Interviewee 10 further clarified, “Anything that has personal information on it remains closed, and that's based on MFIPA, our privacy law that doesn't allow us to release information.” In light of this finding, I further investigated the *Municipal Freedom of Information and Protection of Privacy Act* (MFIPA). The act notes that its main purpose is “to protect the privacy of individuals with respect to personal information about themselves held by institutions and to provide individuals with a right of access to that information.”

With this information, topics regarding government data sharing procedures could be discussed and analyzed more critically with respondents. For instance, when discussing why datasets were not casually shared between government entities, Interviewee 2 explained, “Everybody is worried about making sure those privacy aspects are maintained.” Once again, privacy concerns are expressed as a major point of contention surrounding open data sharing. This concern was also expressed by Interviewee 6, who described an encounter they had with a public servant regarding *stringent* open data sharing policies. They stated:

“I can give you an example on open data and this was with a CIO sitting at the - this was a CIO for a city that they comment on. He was all for having open data, but he wanted to control just how much that information was exposed because one of his fears was that - and in looking at this, it seemed kind of strange. One of his fears was that if they just opened everything up and

someone came up with a really unique way of doing something, they might reflect poorly on his department.”

Each of these examples demonstrate legitimate fears held by government officials. Government officials must strike a balance between releasing enough data in order to serve the community, and releasing too much data, which may lead to privacy infringements (Lips 2010). With a plethora of available citizen information, it is important to consider the information imbalance between government and citizen, and the possible formation of a surveillance state (Lips 2010). As Murakami Wood et al. (2006) explain, surveillance occurs when there is routine attention paid to private details of citizens. This phenomenon is further explored by Kulk and van Loenen, who state that open data policies may impinge on individual’s rights and private information, since there is no absolute delineation between data which is personal and data which is public (Kulk and van Loenen 2012:196). Moreover, re-identification of anonymized data must also be considered. Data which is anonymized still holds the potential to be aggregated with a variety of other openly available datasets. This may subsequently lead to the re-identification of individuals (Kulk and van Loenen 2012:197). In light of these concerns, it is apparent that Anytown’s government officials are in the process of negotiating how much information can be released for public consumption, while ensuring the preservation of privacy. Although the speed at which datasets are delivered are hindered by impact assessment procedures, they serve an essential purpose in ensuring privacy.

6.4 Co-Productive City Planning

The co-productive method of city building involves government, businesses and citizens working together to develop a smart urban landscape using open data. Co-productive city planning could ultimately allow for a bottom-up or independent (‘indie’) approach to urban

development, in which the urban landscape is shaped by methods outside a conventional form of development. With co-productive city planning, citizens can truly be empowered in the democratic formation of their surrounding environment, thus fulfilling one of the promises of open data.

The notion of the 'indie' city became apparent in the preliminary research process of this thesis. While investigating the promises of open data, particularly open government data, a possible link between freely available open data, potential innovative applications of this data, and its possible impact on the urban landscape was observed. As previously discussed, since individuals are able to freely access a variety of datasets related to the urban environment without restriction, potential benefits to the urban environment are promising when applied in a meaningful way. This idea was further pursued during the interview process where respondents were asked if they felt that open data could assist in the promotion of a smart city. As expressed in Chapter 5, several respondents articulated that citizens may collectively become an asset in the development of the urban environment. Interviewee 10 described how open data holds the potential to encourage the co-production of an urban landscape, and stated, "One of the benefits of open data, again it's empowering your community, your citizens, your residents, also your business community, also those innovators out there who do what they do to do things better." Interviewee 6 further explained that citizens are able to view urban development data with "fresh eyes". The idea of co-productive city planning is iterative of points raised in STS literature regarding technical knowledge derived by 'non-experts'. As expressed by Bijker, one does not need to be an expert in order to contribute meaningfully to technical projects (Bijker 2001). Collectively, citizens, businesses and government can view tasks from new perspectives and think beyond the confines of technical expertise and traditional urban planning methods.

Jetzek et al. further express that government open data is, “a means to an end, not an end in itself” (2013:3). This is to say that open data is meant to be manipulated, and provides opportunities to be used in ways unimagined. This idea is further explored by Lathrop and Ruma who state, “Just as open source software allows users to change and contribute to the source code of their software, open government now means government where citizens not only have access to information, documents, and proceedings, but can also become participants in a meaningful way” (Lathrop and Ruma 2010). The nature of open data encourages more proactive forms of citizenry through participation and collaboration (Evans and Campos 2012:172). Thus, open data can possibly act as a catalyst for collaboration between citizens, business and government in developing the urban landscape, offering an alternate method of urban development.

6.5 Open Data as a Component of Smart Cities

Through preliminary research, data collection and data analysis, it became clear that open data fulfils several caveats which define a smart city. Desouza and Bhagwatwar explain that, “leveraging information and technologies is critical if we are to tackle the most complex urban challenges and enable effective governance of urban spaces” (2012:108). As such, this section explores how open data can be considered a component of the smart city. This section subsequently examines various open data initiatives which promote the development of a smart city within and beyond Anytown.

A smart city is a city which incorporates information and communication technologies and data into the urban environment in order to improve city efficiency, operations and quality of life (Harrison et al. 2010:1). When manipulated in a particular way, open data is able to satisfy several of these requirements. Since open data usage is unrestricted, there is no defined way in which the data can be used. Thus, there is no guarantee that users of open data will apply it in

ways which will improve city operations or promote efficiency in the urban environment. As a result, open data's place as a component of the smart city is contingent on its usage in a meaningful context which satisfies certain traits of the smart city.

Provided that open data is utilized in a way that fulfils certain requirements of a smart city, (primarily aspects of efficiency, data usage, and improvements to city operations) it is possible to consider open data as a complimentary component to the smart city. To explain, many open data portals release datasets regarding the urban landscape including: road networks, bike paths, notable addresses and street light information. Evidently, these datasets seem to encourage the manipulation of data in ways which may shape the urban landscape, and also verifies notions of code/space. As discussed in the theory section, code/space sees the physical environment and coded practices bound together. The intertwining of technology and data in the urban environment normalizes technology, making it a routine aspect of daily life (Kitchin and Dodge 2011). With open data, datafied knowledge about the urban environment is available for usage, and ultimately shapes interactions with various infrastructures.

There are several open data initiatives in Anytown which promote increased efficiency of city operations by marrying open data with smart applications. These examples ultimately embody notions of code/space. For instance, Interviewee 10 explained that openly available restaurant inspection reports are currently being integrated with the restaurant reviewing app 'Yelp'. This not only demonstrates an intuitive combination of open data and a readily available application, but it also links citizens to essential information about public spaces.

A second example, explores the usage of public transit schedule information. Interviewee 8 explained that through user collaboration, open data derived applications have the potential to coordinate and simplify people's routines. As explained, "They can look at things like when is

the busiest or slowest times, and when there is a backlog and that information can make it back to the transit authorities.” Evidently, individuals using public transit can be informed of the most efficient travel routes. Thus, an individual can interact with public transit physically, as well as through information technologies which provide data on pertinent travel information, once again demonstrating notions of code/space. In this context, open data is utilized to improve efficiency in the urban landscape. Not only can it be used to inform the rider of a more efficient transportation route, but it can also assist public transit officials in improving transit efficiency.

A final example of Anytown’s open data initiatives which promote the development of a smart urban environment, is the application “Map Your Property”. This application utilizes openly available spatial data, and presents it in an easy to use format. It provides users with essential data regarding environmental and property zoning information, which are crucial for urban developers. Evidently, this application utilizes open data in a novel way in order to expedite urban development.

Applications such as these are not limited to Anytown. They are applicable anywhere open datasets are available. For instance, Interviewee 6 described an open data based application which allow users to photograph potholes or road blockages due to fallen tree limbs, and direct them to city workers. They explained, “...the information that comes in to the work center allows them to be able to send out an appropriate team to fix the problem as opposed to sending somebody out, assess it and then them reschedule somebody to come out and do it.” Thus, this application attempts to increase efficiency in the urban environment. Finally, Kassen (2013) explores several open data initiatives in the Chicago area which benefit the urban environment. For instance, he describes “sweeparound.us”, an application which informs local residents of

scheduled street sweeping in the surrounding area. Users are able to enter their contact information and receive email or text notifications regarding scheduled maintenance.

As demonstrated, open data can be a valid smart city component if utilized in modes that serve urban infrastructure. Through example, it has been demonstrated that open data based applications can increase efficiency of city operations. It has also been demonstrated that open data's integration in a smart urban landscape perpetuate notions of code/space. In a smart urban landscape, efficiency of city operations are enhanced by software which is integrated within urban infrastructure, and operate in the background of urban life. Evidently, technology and data are a normalized experience in a smart urban landscape, as coded practices are integrated within the physical environment.

6.6 The Social Construction of Expertise

Although respondents were selected based on their positions as 'experts' in the field of smart city development and open data proliferation, through the interview process, it became apparent that some interviewees were not as knowledgeable about these topics as originally anticipated. This is to say, definitions and understandings of either smart cities or open data lacked various central components found in scholarly discussions of these topics. This was already alluded to through discussion of how respondents substituted the term smart city for terms such as the intelligent city or the digital city, naming of dated technological devices in the urban landscape, and exploration of other open data related topics such as open government and open government data.

Indeed, respondents demonstrated *general* familiarity with the terms, but upon probing respondents for deeper discussion of smart cities and open data, it became apparent that some respondents only had a surface understanding of each term. On occasion, some respondents

provided long winded responses, which never truly provided any depth. For instance Interviewee 2 states:

“Yeah, well that's interesting. So the big picture is really the urban centres will be where a lot of population clusters will continue to take place over the next decades. And the existing infrastructure and how we are building communities may not necessarily be sustainable to accommodate that population growth and urbanisation. Accordingly what cities need to do in order to build a smart infrastructure to allow them to manage, one is obviously to an instrument which is instrumentation automation. Accordingly collect information and make decisions that are based on facts and data to allow them to sustain services and accommodate that population growth and demand on existing infrastructure. So it's about instrumentation, it's about data collection, it's about intelligence. That will allow us to make smart decisions to continue to provide a service.”

Although this respondent describes some key components of the smart city, much of this response is cluttered with irrelevant material. This points to the notion that some individuals in expert positions are not quite ‘experts’ in their respective field, and only perpetuate knowledge as produced in their respective organization.

This is further confirmed by Interviewee 1 who states “Yeah, I mean, I know what you're trying to do. To a degree you're trying to test the level of knowledge of elective officials on these topics, and I'll admit to my limited level of knowledge.” This indicates that individuals who hold an expert position may feel that their level of expertise is not at an academic standing. It also suggests that the flow of knowledge is not moving in the correct direction. As discussed by Brown and Duguid (2001), although experts have knowledge that is perpetuated within their organizations, they do not possess the practical knowledge or expertise that is necessary for the

implementation of smart cities in a practical setting. As such, it is not enough that an individual has specialized knowledge. One must also consider various positions of practice within the community in order to consider how knowledge is received, generated, interpreted and circulated within organisations.

Chapter 7 Conclusion

7.1 Findings

This thesis has sought to understand how digital processes, open data and the physical world can be combined to develop a smart city in Anytown. An array of key informants and promoters of smart city and open data initiatives in Anytown were consulted in order to discover whether or not the proliferation of open data is a complimentary component to the development of a smart city.

Smart city development in Anytown is a complex process, requiring the appropriate vision, drive and tools to enable this phenomenon to come to fruition. Respondents not only explain that there are various technological components necessary for smart urban development, but they also noted that there must be a unified mindset and plan of action in order to effectively implement a smart city in Anytown. Although a variety of smart city initiatives exist in Anytown, smart city development is evidently in its infancy. Despite this, future prospects for smart city development is regarded with optimism, as key informants explained that Anytown can eventually become a smart urban landscape. Moreover, an overwhelming majority of respondents expressed that government leaders are the most influential actors in encouraging the development of a smart city.

Additionally, this thesis revealed that open data proliferation is also a complex process. It requires a strenuous, yet necessary “impact assessment” process in order to ensure that privacy is maintained. Additional challenges to open data proliferation include: the quality of released data, limited education on open data usage and a poor business model. This thesis also uncovered how open data is not truly accessible to all. Evidently, users require particular technical knowledge

and statistical competence in order to manipulate open datasets. Upon further investigation, certain initiatives seek to amend this fault by increasing accessibility of open data.

Moreover, this thesis discovered that open data can be a complimentary component of smart city development if used in ways which fulfil certain caveats of the smart city. Respondents universally expressed that open data can promote smart urban development if used in ways which improve city operations, as well as increase efficiency and quality of life in the urban environment.

Lastly, I found the need to reconceptualise the term ‘expert’ when analysing those in positions of power within smart city and open data initiative projects. Through analysis, it became apparent that these individuals lacked key knowledge of central components of smart city and open data, as they demonstrated only surface understandings of these concepts. There needs to be a certain degree of critical scepticism regarding the construction of the ‘expert’ and claims to expertise in the context of how knowledge to circulates within organizations, and future research might want to begin from this point.

7.2 The Actually Existing ‘Anytown’ Smart City

Each prior section has critically explored smart city and open data adoption, and has revealed much optimism regarding smart city implementation in Anytown. As such, it is necessary to critically examine this optimism, and apply ideas presented by Shelton et al. (2014) regarding the actual state of an existing smart city to the current progress of Anytown’s smart city development. Although various smart city initiatives were explored in the analysis chapter of this thesis, it is apparent that the state of smart city development in Anytown does not accurately reflect notions of smart city development as portrayed in promotional smart city literature. Presently, smart city initiatives in Anytown do not wholly tend to issues such as electrical and

water consumption, waste management, and other city services that smart city proponents boast as practical benefits of smart city development. Instead, smart city initiatives in Anytown are quite rudimentary, as they are typically focused on improving transit efficiency, gradually incorporating smart technologies into the urban landscape and adopting a broadband network.

Evidently, smart cities Anytown are failing to keep pace with smart cities as presented in relevant literature, and in other parts of the world.

Interviewees typically expressed superficial understandings of smart city adoption in Anytown. Although socio-political relations were discussed by a few interviewees, there was a lack of in-depth consideration towards social-spatial relations in regards to smart city implementation. Often, there was an “uncritical, ahistorical and aspatial understanding of data” (Shelton et al. 2014:10), as interviewees typically discussed the importance of technology and data integration in the urban environment. Yet, in these instances, frequently mentioned technologies necessary for smart city development were dated. This was explicitly demonstrated through discussions of integrating a broadband network in Anytown. As previously explained, broadband internet is a component of a previous iteration of the smart city, demonstrating how Anytown occupies a lower position on a smart city continuum.

Moreover, smart cities in Anytown lag behind other practical applications of smart city initiatives seen in places such as Brazil, South Korea, Denmark and the United States (Naphade et al. 2011:1). In fact, based on research, this case study is in its infancy of smart city adoption, in terms of understanding the smart city as existing on a continuum of smartness. Anytown falls lower on this continuum since, although this locale demonstrates various smart city initiatives, significant developments have yet to come to fruition. This fact was affirmed by Interviewee 1 who noted that smart city initiatives in Anytown are in their “very early stages when you

compare it to some of the European cities that are quite advanced in this area”. Therefore, smart city development in Anytown does not mirror the ideal smart city as presented in promotional smart city literature.

Smart city frameworks, as presented in promotional smart city literature, may not be as easily implemented in a practical sense. As it currently stands, Anytown is a ways off from achieving the technologically sublime vision of the smart city. This supports the findings of previous research conducted in various other locales in Southern Ontario which explored the difficulties associated with the implementation of smart infrastructure. Through research gathered for this thesis, it is evident that only a few components labeled as ‘smart city technologies’ are currently embedded in the urban environment. Although smart city advocates in Anytown are attempting to encourage initiatives that appear ‘smart’, as a means to achieving smart city status, they often overlook how these initiatives will benefit the community, and how these initiatives compare to the ideal version of the smart city as defined in academic literature.

7.3 Future Considerations

What is the future for smart city initiatives in Canada, and how can open data be more widely used as a tool for smart city development? There are two potential methods to expedite the progress of both smart city and open data initiatives.

Firstly, investment in open data is imperative, not only for the perpetuation of open data initiatives, but also for the perpetuation of smart city projects. While examining open data initiatives in Anytown, it was evident that its progress is still in its infancy. Currently, resources allocated to open data proliferation are limited. As a result, the distribution of open datasets for general usage is hindered. To explain, the creation of open datasets require individuals to collect data, filter and arrange data, ensure privacy, upload the datasets on an easily accessible platform

and maintain the data. This is a lengthy process, requiring funding for necessary labour and resources. By investing in open data, potential initiatives using this data can come to fruition. Although the exact benefits and outcomes of open data are unknown, by providing an expansive database of open datasets, users are left with the materials necessary to generate beneficial applications and services.

Additionally, distributors of open data should incentivize the usage of available datasets. As explained by Kassen, financial incentives are offered to users who develop independent open data driven initiatives in the Chicago area (Kassen 2013:510). This incentive could be applied in a Canadian context in order to encourage increased usage of open data.

As affirmed by key interviewees throughout this research, open data initiatives can assist in the promotion of a smarter urban landscape. Thus, by investing in and incentivizing the usage of open data, the creation of smart city applications can be inadvertently expedited.

Secondly, education concerning open data and smart cities must be made more broadly available to everyday citizens and public servants. Respondents made frequent mention that knowledge regarding these topics is minimal, and that in order for either smart cities or open data to succeed, their purpose and benefits must be explained. As stated by Interviewee 4, "...we're not taking enough time teaching so that people understand the benefits and bringing them along, versus just saying: You should do it. And I think that's one of the issues; I think there needs to be a lot more teaching and training." These topics are simply not explored or understood enough by the general population. Without a full grasp of smart cities and open data, progress is hindered. Thus, it is unlikely that a transformation from a current urban landscape to smart urban landscape can occur if citizens and government are not well informed.

Finally, in order to progress towards a smart city, citizens must be informed on how to utilize open data. As mentioned previously, in order to manipulate data in a meaningful way, technical knowledge is required. Through proper educational tools such as online tutorials or video guides that demonstrate how to utilize open data, open data can become increasingly accessible to broader audience.

Based on these findings, it is possible to conclude that Anytown occupies a lower position on the smart city continuum, as defined by terms in academic literature. Despite this, it is apparent that Anytown is gradually progressing towards achieving a higher position on the smart city continuum. With careful consideration of provided suggestions, and by utilizing open data as a tool for smart city progress, Anytown could move towards fully adopting a smart city.

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Appendix A: Coding Table

1	2	3	4	5
Academics SC	Benefits	Aggregate	Analytics	Accessibility
Accessibility OD	Bridge Gap	Analytics	Automation	Authority
Cameras	Broadband	Business	Benefits	Benefits
Citizens SC	Challenges	Citizens	Broadband	Business
Data Collection SC	Citizens *	Collaboration	Business Model	Business Model
Economic SC	Collaboration * SC	Community	Citizen Engagment	Challenges
Government SC	Communication * SC	Consent	Community	Citizens
Hackathons	Community	Control	Convenience	Comfort
Heath	Cost of Tech	Corruption	Culture	Conservative Gov
Improvements SC	Data Usage	Data Collection	Dumb	Cost
Innovation	Digital Signit	Demographics	Economic	Culture
Leadership	Displacement	Efficiency	Educate	Data Delivery
Opportunity	Economics SC	Ethics	Efficiency	Difficulty
Politics	Educate	Geospatial	Feedback	Educate*
Privacy	Efficiency SC	GIS	Gov influence	Efficiency
Security SC	Evolution	Government	Health	Format
Services SC	Fredericton	Health	Messy Data	GIS
Smart Buildings	Health	Identifiable	Money	Hierarchy
Social Support	ICF	Misuse	Network	Improvements
Surveillance	Infrastructure	Personal Info	[Town A]	Internal Groups
Toronto	IT	Privacy	Policy	Mapping
Traffic	Leadership	Private	Resistance	Mediators
Transportation SC	Management SC	Public	Security	Needs
Urban Planning	Meanigful Data	Risk	Sensors	Ontario
Violations	Mindset	Social	Smart Building	Open Government
	[Town A]	Threat	Smart Communities	Opportunities
	ORION	Transparency	Surveillance	Permission
	OTN	Transportation	Sustainability	Plan
	Privacy	Trust	Tech Advantage	Policy
	Productive	Vision	Telco	Progress
	Progress		Threat	Purchase Data
	Strategy		Transportation	Resistance
	Toronto		Vision	Restriction
	Transparency		Waste Disposal	Review Process

	Transportation		Wi-Fi	Risk
	Trust			Sharing
	Video			Spatial
	Violations			Transporation
	Vision			Unintended Consequences
				Users
				Value Added
				Vision
				Waste
				Water

6	7	8	9	10
Ambitious	Academic	Accessibility	Agreement	Accessibility
Analytics	Accessibility	Aggregate	Broadband	Algorithms
App	Accuracy	Benefits	Bussiness	Beaurocracy
Broadband	Aggregate	Business Model	Citizen	Benefit
Business	Anonymize	Digital Divide	Collaboration	Business
Business Model	Availability	Evolution	Democracy	Communication
Collaboration	Benefit	GIS	Economic	Cost
Communication	Challenges	Messy Data	Educate	Development
Customer	Connected	Optimistic	Heath	Digital
Economic	Context	Policy	Infrastructure	Dislocation
Educate	Control	Private Info	Innovation	Distribution Model
Efficiency	Digital Divide	Security	Intelligent City	Durham Region
Energy	Educate	Sharing	Leadership	Efficiency
Goals	Efficiency	Spatial Data	Mindset	Energy
Growth	Gov Privacy	Threat	[Town A]	Infrastructure
Hacking	Initiatives	Transportation	Privacy	Marketers
Infrastructure	Innovation		Progress	Reliable Information
Internet	Interest		Quality of Life	Sensors
Leader	Mapping		Smart Grid	Sustainability
Management	Meta-Data		Traffic	Transportation
[Town B]	Non-Profit		Transparency	Urban Regeneration
[Town A]	Open Media		Transportation	Urban Resilience
Ontario Energy Board	Personal		Vision	Waste
Revenue	Privacy			
Services	Public Interest			
Sharing	Risk			
Slow Progress	Surveillance			
Smart Grid	Toronto			
Sustainability	Transportation			
Transportation	Trust			
Vision				

11	12	13	14	15
Abuse	Actionable Information	Accountability	Broadband	Accessibility
Accountability	Agenda	Aggregate	Challenges	Aggregate
Big Data	Analytics	Apps	Citizens	Benefit
Causality	Automation	Benefits	Community	Bridge Gap
Consent	Benefits	Citizen Consultation	Conversation	Business Model
Consequences	Big Brother	Citizens	Economic	Buzzword
Control	Broadband	Collaboration	Economic Development	Challenges
Deidentify	Censorship	Communication	Funding	Citizen
Democracy	Challenges	Data Sharing	Inclusive	Citizen Benefits
Ease	Chicago	Developers	Information Technology	Citizens Hinder
Educate	Citizens	Educate	Infrastructure	Collaboration
EU	City Planner	Effective	Initiatives	Community
Freedom	Communication	Government	Instrumentation	Cost
Health	Convenience	Government Process	Leader	Decision Making
Implications	Digitization	Health	Population Growth	Difficulty
Investigations	Economic	Innovation	Smart Decisions	Economic
Law	Educate	Inventory	Smart Infrastructure	Educate
Massive	Efficiency	Mapping	Transportation	Government
Open	Energy	New Movement	Vision	Green Rooftop
Personal Information	Environment	OD Directive		Influence
PHIPA	Hackathons	Ontario Trillium Foundation		Initiatives
Practices	Health	Open by Default		Jargon
Privacy by Design	IBM	Pillars		Leaders
Protection	Informed Decisions	Policy		Mapping
Purpose	Innovation	Privacy		[Town B]
Relationship	Leadership	Problems		CIO
Resolutions	LED	Public Service		Privacy
Risk	Lighting	Research		Slow

Secrecy	Malicious	Strategy		Smart Buildings
Suggestions	Metering	Transparency		Startup
Transparency	Mindset	Urban Development		Technology
Unauthorized Access	Municipalities	Yelp		Transportation
Urgent	Network			Urban Planner
US	ORION			
Violations	Personal Information			
	Policy			
	Population Growth			
	Resolutions			
	Security			
	Sensors			
	Sharing			
	Smart Buildings			
	Smart Data*			
	Solution			
	Strategies			
	Strength			
	Traffic Control			
	Transportation			
	Video			
	Vision			

Appendix B: Qualitative Interview Guide

Good morning/afternoon/evening,

I would like to thank you for your time and your participation in this interview. The goal of my research is to understand the processes of smart urban planning, the promotion of open data and open data initiatives as well as concerns about privacy and security of big data in open data initiatives. I would like to make clear that you may skip questions you do not wish to answer or stop the interview at any time.

First, I would like to start with some basic questions about yourself. (Preliminary questioning, in order to gather the nature of the individual's involvement or familiarity with smart cities.)

1. Can you describe to me what your company is and what they do?
2. Can you explain what your company does in relation to Smart City Development/Open Data usage or initiatives
3. What is your current occupation/position?
 - a. Explain your role (probe: What do you do?/What does that mean?/What do you do everyday?)
4. Have you always been interested in city policy/development and management/coding/urban spaces? Why?
5. What drew you to the realm of urban development?
6. What drew you to the realm of open data and its usage?

Next, I would like to ask about smart city development and its implications on society.

7. To your understanding, what is a Smart City?
 - a. What do you believe are the necessary components for city to be a 'smart city'? (What is required for a city to be a 'smart city'?)
8. In your opinion, why is smart city development important (if at all)?
 - a. What does it have to offer citizens in an urban environment (if applicable)?
 - b. Can you expand on this description?
9. What do you think about the term "Smart City"? (Is it just a buzzword?)
 - a. If so, then what would you call this integration of technology in city planning?
10. Does [Anytown] fit any of the characteristics of smart cities that you have just described to me?
 - a. Do you think [Anytown] is a smart city?
 - b. If not, does it show traces of becoming a smart city?/ "Do you think it is going in that direction"
11. Are you aware of any Smart City developments in [Anytown]?
12. How has [Anytown] changed or evolved in the past 10 years? (Urban landscape)
 - a. How has Anytown changed or evolved in the past 5 years?
13. How, to your knowledge, has technology been integrated into [Anytown]? (This may include: increased amount of televisions, increased CCTVs, Wi-fi, etc.)
14. What cities do you think are the leaders in smart city development?
15. Who, in your opinion, has the most influence over smart city implementation?
 - a. Citizens?
 - b. Marketers?

- c. Policy Makers?
- 16. Do you think Smart City development will it impact your daily life?
 - a. Do you think it will it impact your career in any way?

I would also like to discuss policy decisions when it comes to the development of the Smart City

- 17. What factors do you think contribute to the adoption of smart city practices?
 - a. Citizen opinion/ What marketers are promoting/ optimism?
 - b. Prompt-feasibility/ease of use/cost/privacy concerns/brand
- 18. To your knowledge, how are policy decisions regarding smart city development decided upon?
 - a. What is the process of decision making?
 - b. **Is privacy a topic of consideration?**

I would also like to ask about open data and its implications.

- 19. To your understanding, what is open data?
 - a. Where do you gather your understanding about open data?
- 20. Can you explain how you think open data impacts your daily life?
- 21. To whom do you think this open data available to?
 - a. Can regular citizens access open data?
 - b. Can the government access open data?
 - c. Can corporations access open data?
- 22. Who are the actual users of Open Data?
 - a. Citizens/Marketers/Businesses/Government?
 - b. Why?
- 23. Are you aware of any Open Data initiatives in [Anytown]?
- 24. Can open data help shape the urban environment?
 - a. How so?
 - b. Can open data help inform smart city development?
- 25. Do you think that Open Data can help promote a smarter city?

Privacy and Open Data

- 26. What do you think privacy means?
 - a. Where did you gather your understanding of privacy?
- 27. Do you think that Government and Businesses are protecting privacy?
 - a. How?/How not?
- 28. Is there a privacy policy put in place to protect Open Data?
 - a. Is this policy adequate?
 - b. What are its limitations?
- 29. Should we/citizens feel concerned about open data collection? Explain.
- 30. How do you think privacy can be affected by open data?
 - a. How?/How not?
 - b. What, if anything, are you worried about concerning the publishing of open data?
- 31. In your opinion can open data collection violate individual rights and freedoms?
 - a. How so?

32. Because of privacy concerns, some datasets remain closed.
 - a. Can you explain what kind of datasets these are?
 - b. Why these particular datasets?
 - c. Does this have an effect on transparency?

Finally, I would like to ask about big data and its implications.

33. To your understanding, what is Big Data?
34. Can you explain how you think Big Data impacts your daily life?
35. To whom do you think this Big Data available to?
 - a. Can regular citizens access Big Data?
 - b. Can the government access Big Data?
 - c. Can corporations access Big Data?
36. Do you think that Government and Businesses are protecting privacy?
 - a. How?/How not?
37. Is there a privacy policy put in place to protect Big Data?
 - a. Is this policy adequate?
 - b. What are its limitations?
38. Should we/citizens feel concerned about Big Data collection? Explain.
39. In your opinion can Big Data collection violate individual rights and freedoms?
40. Is there anything that I have missed that you would like to add?

I would like to thank you once again for your time and participation in this interview and the information you have provided me with for my research.

Appendix C: Confidentiality Agreement

Name: _____

I acknowledge that Queen's University at Kingston (hereinafter called "Queen's") has in its possession, and with the authority to disclose, in confidence, certain information ("Confidential Information") relating to the Ubicity research project (the "Project") being conducted by Professor David Murakami Wood (the "Researcher") in the field of Sociology. Confidential Information includes, without limitation, computer programs, discoveries, inventions, techniques, documents, data and information concerning the study or other research programs of Researcher or his/her affiliates, and of information with respect to Researcher's patients or staff.

The Confidential Information will be given to me in order to perform duties as researcher. In consideration of working on the Project, I agree that I will keep in confidence and trust all Confidential Information and will not directly or indirectly use the Confidential Information, nor disclose any Confidential Information to any person or entity, except in the course of performing duties assigned with respect to the studies. I agree that I shall be free to use information that:

- a) is explicitly approved by the Researcher for use in theses, academic publications and scientific conference presentations; or
- b) is known to me prior to the receipt of the said Confidential Information from Queen's as evidenced by written documentation; or
- c) lawfully is or becomes public knowledge through no default of this Agreement; or
- d) is provided to me by any third party with a bona fide right to do so; or
- e) is approved for release by written permission of the Vice Principal (Research) of Queen's University

Upon the termination of the Project, I undertake to return all Confidential Information pertaining thereto which has been provided by Queen's and all copies thereof or to destroy the same at the option of Queen's.

This agreement is to be effective upon the date of signing, and shall be interpreted and construed in accordance with laws of the Province of Ontario, Canada.

By: _____

Dated at _____ this _____ day of _____, 2016.

Witness: _____

Please retain a copy of this agreement for your records and provide one to the Researcher.

Appendix D: Letter of Information

The Adoption of a Smart City Design in [Anytown] through Open Data Initiatives (Tentative Title)

<Full participant and organizational address>

<Date>

Dear <insert title and name here>

This letter is being sent to ask for an hour of your valuable time to participate in a major international research study on Smart Cities being conducted by Vincenzo Alaimo, under the supervision of Professor David Murakami Wood in the Department of Sociology at Queen's University in Kingston, Ontario, Canada.

What is this study about? The research examines the current state-of-the art and future of smart city initiatives in three countries, Canada, the UK and the USA, particularly in relation to issue around security and surveillance. Full details can be found at www.ubicity.ca. More specifically, this particular study seeks to investigate the adoption of a smart city design in [Anytown] through governmentally and non-governmentally led open data initiatives.

Why am I being asked for an interview? < Individuals involved in open data and smart city initiatives in [Anytown], and/or suppliers of software and hardware solutions for [Anytown] initiatives, and/or those more broadly involved in open data and smart city initiatives at the municipal and provincial level.>

How will the interview be conducted? The interview itself would take no more than one hour, and would be conducted by Vincenzo Alaimo. The interview would ideally be in person at a time and place convenient to you during this period. It would be greatly appreciated if you would answer all material as frankly as possible. Unless you specifically request otherwise, the interview will be confidential (your name will not be used); and you can further request all or part of the interview to be 'off the record' (the information will be unattributed and will not be associated with your organization). You may choose to skip any questions you feel uncomfortable answering. As well, you may withdraw from the interview at any time.

What will happen to my responses? With your permission, the interview will be recorded in digital audio format. This will be transcribed, the files encrypted, password protected and stored only at Queen's University. Only the research team will have access to this data. Quotations from, paraphrases of, and information derived from the interview may be published in non-academic summaries of research, in academic journals or presented at scientific conferences, but any such presentations will fully respect all agreements on confidentiality and/or non-attribution. Note, if you choose to take part in this interview, please be informed that there is a risk of being identified based on your position or title. You may also withdraw your consent, change the way in which you have agreed you wish to be identified, or alter the way in which any particular statement can be attributed to you, at any time until the completion of the analysis of the data (June 2016). We will provide you a summary of the research relating to [Anytown], and on request, would also be happy to provide you with copies of the full research report or individual published research articles.

What if I have concerns? The research team has identified no serious risks associated with the study. However, if you have any questions about study participation, please contact the Uicity team leader, Professor David Murakami Wood dmw@queensu.ca / 1-613-533-6000 ext. 74490 or Uicity research assistant, Vincenzo Alaimo 12va4@queensu.ca [REDACTED]. Any ethical concerns about the study may be directed to the Chair of the General Research Ethics Board at chair.GREB@queensu.ca or 613-533-6081.

This study has been granted clearance according to the recommended principles of Canadian ethics guidelines, and Queen's University policies."

Your participation in this research study is greatly appreciated.

Yours Sincerely,
Vincenzo Alaimo

Appendix E: Consent Form

Name (please print clearly): _____

Organization (please print clearly): _____

1. I have read the Letter of Information and have had any questions answered to my satisfaction.
2. I understand that I will be interviewed for the Ubicity research study, and that the interview will be recorded.
3. I understand that the interview will be confidential unless I specify otherwise.
4. I understand that I may choose to skip any questions I feel uncomfortable answering, and may withdraw from the interview at any time.
5. I understand that I can give notice that I am speaking off-the-record at any time during the interview, for all or part of the interview, and that this means that for the period covered, nothing I say will be attributed to my organization.
6. I understand that every effort will be made to maintain the security of the data, and respect for the conditions of the interview now and in the future, and that only members of the Ubicity research team will have access to these records. I recognize that quotations from, paraphrases of, and information derived from be published in non-academic research summaries, professional journals or presented at scientific conferences, but any such presentations will fully respect all agreements on confidentiality and/or non-attribution. Note, if you choose to take part in this interview, please be informed that there is a risk of being identified based on your position or title.
7. I understand that I will receive a copy of the research summary, and can request copies of the full report and any academic article produced from the research.
8. I understand that I may withdraw my consent, change the way in which I have agreed I wish to be identified, or alter the way in which any particular statement can be attributed to me, at any time until the completion of the analysis of the data (June 2016), by contacting the Ubicity research team leader, Professor David Murakami Wood at, dmw@queensu.ca / 1-613-533-6000 ext. 74490
9. I am aware that if I have any questions, concerns, or complaints, I may contact the Ubicity team leader, Professor David Murakami Wood dmw@queensu.ca / 1-613-533-6000 ext. 74490 or Ubicity research assistant, Vincenzo Alaimo 12va4@queensu.ca [REDACTED]; or the Chair of the General Research Ethics Board (533-6081) at Queen's University. Any ethical concerns about the study may be directed to the Chair of the General Research Ethics Board at chair.GREB@queensu.ca or 613-533-6081.

I have read the above statements and freely consent to participate in this research:

Signature: _____ Date: _____

I agree to have this interview recorded:

Signature: _____ Date: _____