The Acquisition and Implementation of Risk Technologies by Canadian Police Services

by

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The above committee determined that the thesis is acceptable in form and content and that a satisfactory knowledge of the field covered by the thesis was demonstrated by the candidate during an oral examination. A signed copy of the Certificate of Approval is available from the School of Graduate and Postdoctoral Studies.

ABSTRACT

Most Canadian police services have rapidly acquired and implemented a range of technological advancements in recent years. This rapid adoption of technologies has left a significant gap in our empirical and theoretical understanding of how police make decisions about which technologies to acquire. While existing research has focused on technology's impact at the organizational level (e.g., post-implementation evaluations), the macro-level contexts that shape technological acquisition by the police is undertheorized and underexamined. The current study examines the acquisition and implementation of risk technologies (i.e., all technologies operationally used by police services to collect data in mass volumes for the purpose of immediate or future risk assessment) by Canadian municipal/regional police services through a tri-phased methodological approach, including: 1) a national survey, 2) semi-structured interviews with police personnel implicated in technological decision-making, and 3) a content analysis of 71 police services' formal strategic plans. Findings revealed a stark disconnect between formal and informal technology acquisition processes within services, alongside a lengthy list of economic, institutional, and societal influences on said decision-making. Second, results highlight a shifting role of police in the era of evidence-based policing (EBP) and rapid technological advancement towards that of knowledge workers who fulfill ever-evolving demands for information *and* consumers of private sector technologies. Results are then used to substantiate a call for accountability through collaborative decision-making, formal strategic planning, and external research partnerships.

Keywords: risk technology; policing; technology; acquisition; surveillance capitalism

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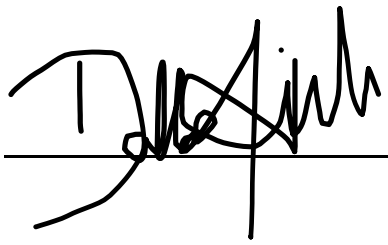

Dallas Hill

STATEMENT OF CONTRIBUTIONS

I hereby certify that I am the sole author of this thesis and that no part of this thesis has been published or submitted for publication. I have used standard referencing practices to acknowledge ideas, research techniques, or other materials that belong to others. Furthermore, I hereby certify that I am the sole source of the creative works and/or inventive knowledge described in this thesis.

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LIST OF ABBREVIATIONS AND SYMBOLS

Term	Acronym
Artificial Intelligence	**AI**
Automatic License Plate Reader(s)	**ALPR**
Body Worn Camera(s)	**BWC**
Canadian Association of Chiefs of Police	**CACP**
Canadian Society of Evidence-Based Policing	**Can-SEBP**
Computer-Aided Dispatch	**CAD**
Diffusion of Innovation	**DOI**
Digital Evidence Management System(s)	**DEMS**
Facial Recognition Technology	**FRT**
Geographic Information System	**GIS**
Information Communication and Technology Committee	**ICTC**
Information and Privacy Commission of Ontario	**IPC**
Information Technology	**IT**
Kitchen Table Talks	**KTT**
Mobile Data Terminal	**MDT**
Next Generation 9-1-1	**NG (9-1-1)**
Non-Disclosure Agreement(s)	**NDA**
Ontario Police Memorial Foundation (OPMF)	**OPMF**
Ontario Police Technology Information Co-operative	**OPTIC**
Ontario Provincial Police	**OPP**
Police Accountability Community Teams	**PACT**
Privacy Impact Assessment	**PIA**
Policing the Risk Society	**PRS**

Police Regional Information Data Entry	**PRIDE**
Randomized Control Trials	**RCT**
Real-Time Operations Centre	**RTOC**
Records Management System(s)	**RMS**
Research Ethics Board	**REB**
Risk Technolog(y/ies)	**RT**
Snowball Sampling/Response-Driven Sampling	**SS/RDS**
Surveillance Capitalism	**SC**
Toronto Police Service Board	**TPSB**
Trunk Mobile Radios	**TMR**
Unmanned Ariel Vehicle(s)	**UAV**
Virtual Desktop Infrastructure	**VDI**

CHAPTER 1: INTRODUCTION

The rapid growth of technology across the globe has significantly changed the way we collect, analyze, and interpret information. Currently, hyper-connectivity allows for the continuous collection of individuals' personal information through their use of personal digital technologies as well as their technological interactions within virtual and physical public spaces (e.g., video surveillance systems) (Lupton & Michael, 2017). According to Lupton and Michael (2017), individuals' interactions with new and existing digital technologies create fluid collections of information. The analysis and interpretation of these data assemblages for unstated and pre-set purposes are commonly referred to as dataveillance (Lupton & Michael, 2017; van Dijck, 2013; 2014). Although dataveillance can occur at the personal or interpersonal level, more frequently, data assemblages are used by external third-party actors for commercial, research, and law enforcement purposes (Lupton & Michael, 2017; Zuboff, 2015; 2019; van Dijck, 2013; 2014). These external actors predominantly include employers, advertising and insurance companies, educational and government institutions, and police services (Joh, 2016; Zuboff, 2015; 2019).

The allocation of data assemblages to these third-party external actors has significant implications for how we interpret the world that we live in. Accordingly, it has become nearly impossible to avoid being monitored by some form of digital technology. Personal digital technologies, for instance, often collect and sell users' personal information beyond their use of an application (e.g., Facebook, Twitter, Instagram) in exchange for free services (van Dijck, 2014; Zuboff, 2015). Further, predictive algorithms created through these streams of personal data are commonly used in many social and economic spheres to assess an individual's level of risk. Specifically, these algorithms calculate scores that ultimately determine whether an

individual should have access to goods and services, or if they demonstrate the possibility of engaging in criminal activity (e.g., terrorism, cybercrime) (Lupton & Michael, 2017).

With digital risk assessments of the public increasingly becoming a hot commodity for many public and private institutions (e.g., insurance companies, border security, and credit companies), the demand for information has also increased at an exponential rate, with police services being one of the key producers (Ericson & Haggerty, 1997). To accommodate these knowledge requests more effectively and efficiently, police services are progressively acquiring and using their own risk-based technologies in the field, equipped with the ability to collect, analyze, interpret, and manage large quantities of personal data (Joh, 2016). The following figure conceptualizes the cyclical process of police knowledge work.

Figure 1:1 Cyclical Process of Police Knowledge Work

Previous definitions of risk technologies (RT) conceptualize the term as tools equipped with the capabilities to drive human decision-making in the realm of risk assessment (Hannem et al., 2019). Broadening this definition to the scope of this dissertation, *all* digital technologies

operationally used by police services to collect data in mass volumes for the purpose of immediate or future risk assessment will be referred to as RT. Further, digital technologies will refer to electronic devices that create, store, and manage data. It is also important to note that the concept of risk exists on a spectrum and is not confined to one extreme or the other. Correspondingly, various digital technologies have differing levels of risk-related data collection and management. The purpose of this dissertation is to provide a better understanding of how RTs are adopted and implemented in an operational setting (e.g., solutions to crime, replacement of traditional investigative tactics, front-line usage). Although digital data collection via RT is not a new approach for police services, the technological advancements, and the hurried adoptions of RT hold the potential to change many aspects of traditional policing.

The traditional methods used by police to collect information to predict or identify current or future crimes require substantial time and resources (e.g., foot patrol, manually writing notes, visiting multiple locations for witness statements, discretionary decision-making) and have been heavily criticized for bias and discrimination against minority populations. Due to these constraints, traditional methods have become insufficient at managing increasing knowledge/information requests from the police regarding risk (Ericson & Haggerty, 1997). Further, the substantial increase in *external* demands for risk-related information (e.g., insurance companies, financial institutions, health, and welfare agencies) has forced police to quickly adapt their organizational operations to maintain the flow of information. By exercising time and resources into traditional means (e.g., investigating one suspect at a time), the police tend to miss opportunities that could be made possible with the assistance of RT. For example, the traditional method for police officers to conduct checks on license plates requires a police officer to enter the license plate number of a vehicle they have identified as suspicious into a mobile data

terminal (MDT) to learn the status of said vehicle. Using this traditional method, an officer can check an average of 150 vehicles throughout their shift (Manson, 2006 as cited in Ozer, 2016). In contrast, automatic license plate readers (ALPRs) allow for the automated scanning of up to 3,600 vehicles in the same time frame (Ozer, 2016). However, the successful acquisition and implementation of RT by police services can be limited by several factors including but not limited to the culture of the organization, budgets, training, lack of empirical evidence of effectiveness, questions about ethical uses, public acceptance, and legislation (Goel et al., 2017; Rogers & Scally, 2018; Lum et al., 2017). Many of the issues that arise with RT have yet to be examined in the literature or be addressed by any form of government legislation, regulations, or policy. Therefore, police personnel are left with minimal guidance and standards while making decisions on which RT to acquire and implement in their services to achieve their organizational and strategic missions.

1.1 Statement of the Problem

As the acquisition and implementation of RT continues to be one of the top priorities for Canadian police services, large portions of annual budgets are increasingly allocated to technologically improving organizational efficiency and effectiveness (Lum et al., 2017). For instance, in 2018, one of the largest cost drivers for Canadian police services was digital technology and supporting software (Statistics Canada, 2018). At a total cost of $664 million, some of the most expensive costs included: two-way radios ($193.0 million); software, applications, and computer systems ($146.7 million); telecommunication devices ($85.4 million); and computers and hardware ($77.7 million) (Statistics Canada, 2018).

Since the collection of Statistics Canada's most recent data in 2018, the money allocated to technological advancement seems to have continued to increase. For example, for the 2023

fiscal year, York Regional Police Service has allotted $8.7 million to various RT and accompanying software (i.e., hardware/software, digital evidence management, "connected officers" – smart mobile devices given to neighbourhood officers to increase connectivity to data, software, and citizens, infrastructure, people systems, and business intelligence) (York Regional Police, 2022). However, recent research has suggested that despite these large allocations of police operational budgets to technological advancement, various RT that have been introduced to police services have failed to demonstrate a measurable increase in operational efficiency or effectiveness (Benedict, 2022; Hedberg et al., 2017; Hood, 2020; Lum et al., 2017; Newell & Greidanus, 2018). This lack of empirically demonstrated evidence for the effectiveness and efficiency of RT used by police services makes it difficult to determine the true impact of the acquisition and implementation of RT on policing institutions (Lupton & Michael, 2017; Sanders & Hannem, 2012).

The disconnect between the increasing adoption of RT and the lack of empirical evidence of their efficiency and effectiveness has raised a host of concerns surrounding organizational decision-making processes by Canadian police services. Namely, concerns have been raised by social science and legal scholars, civil liberties organizations, privacy and ethics commissions, and the general public about the lack of ethical guidelines and the invasions of personal privacy that accompany the use of RT by police services, as well as the implications they hold for social justice and civil rights (Gates, 2002; Hood, 2020; Joh, 2014; 2016a; 2016b; 2017; Lupton & Michael, 2017; Patton et al., 2017; Piccorelli & Elias, 2018; Saulnier & Thompson, 2016). One of the most recent examples is the covert use of Clearview AI by several Canadian police services. Clearview AI is a social media scraping software that has collected billions of public images to build a registered image search tool for police surveillance purposes (Aguilar, 2020).

Unknowingly to the individuals whose information has been collected, this search tool can identify individuals in various contexts and link it back to online sources revealing their names, where they live, the sorts of activities they participate in, and who they know. Without guidelines and best practices for proper acquisition and implementation, emerging RT like Clearview AI run the possibility of being used in an unethical manner. Further, many of these RT are created and sold by private sector companies who do not necessarily abide by the same ethical standards and moral codes that police services are publicly held to, thus creating a sizeable discrepancy between design and appropriate use.

Scholars have also pointed out that economic and social exclusion could be exacerbated by the management, storage, and use of data by government and corporate entities (Joh, 2014; 2016a; 2016b; 2017; Lupton & Michael, 2017; Zuboff, 2015; 2019). Others have highlighted the involvement of various private sector technology corporations in the creation of a "digital divide", which stems from the commercialization of personal information for financial gains that benefit powerful institutions and organizations (e.g., Amazon, Google, Facebook) while actively excluding others from access (boyd & Crawford, 2012; Zuboff, 2015; 2019). Correspondingly, these powerful institutions have control in multiple realms of the economy, including policing. What is at issue here is not simply an embrace of emerging technologies by police services, but rather how these private sector technology companies exercise an undue influence that can guide, shape, and limit the actions of the police in ways that remain largely undocumented.

1.2 Significance of the Current Study

This doctoral research will examine the acquisition and implementation of RT by Canadian municipal/regional police services. Considering the previously mentioned concerns highlighted in the literature, this research focuses specifically on the influences on the decision-making

stages related to the acquisition and implementation of RT. Additionally, this research challenges the current literature on organizational theoretical constructs and technology acquisition and implementation by applying theory derived from Ericson and Haggerty's (1997) *Policing the Risk Society* (PRS) and Zuboff's (2015; 2019) *Surveillance Capitalism* (SC) to the problem at hand. By applying these theoretical frameworks, the proposed research illuminates the potential macro-level factors at play in police services' technological decision-making. Merging these two theoretical approaches will not only highlight the economic and political influences at play but will also delve into the role of police in society and why they choose to acquire and implement RT that are created, sold, and managed by private sector companies. The specific research questions guiding my dissertation research are: 1) How do police make decisions about which risk technologies to acquire?; 2) What role does the private sector play in the acquisition and implementation of risk technologies by Canadian police services?; 3) What are the impacts of acquiring and implementing risk technologies on police personnel?; and, 4) How can police services best acquire and implement new risk technologies to meet their organizational and strategic missions while safeguarding rights and avoiding unethical uses?

This research is significant for several reasons. First, this research provides a unique empirical and theoretical understanding of how municipal/regional police services decide to acquire RT. Second, it adds a Canadian context to the current literature that is dominated by US and UK perspectives. Third, this research extends the existing literature, which primarily involves technical evaluations of effectiveness and efficiency at the micro- and meso-level, by adding to existing macro-level understandings of Canadian municipal/regional police services' technological decision-making. Lastly, this research suggests there is an opportunity for collaborative research to take place between academics, police personnel, and possibly private

sector companies, to help police better meet their missions in an increasingly complex societal context. Ultimately, this research can help police personnel navigate the increasing involvement of privately-owned RT being used throughout Canadian municipal/regional police services while being mindful of the possible undue influences on decision-making.

In what follows, Chapter Two examines existing organizational theoretical approaches to technology acquisition and implementation by police services (i.e., Cohen, March, & Olsen, 1972; Cyert & March, 1963; DiMaggio and Powell 1983; Rogers, 1962, followed by a discussion of the shortcomings of utilizing organizational theorizing to understand the full picture of decision-making about RT by police services. Correspondingly, the necessity for additional macro-level theorizing to explore the acquisition and implementation of RT will be presented. Next, PRS (Ericson & Haggerty, 1997) and SC (Zuboff, 2015; 2019) are discussed as the theoretical frameworks that guide this dissertation and will also be used as a critique of the existing organizational theories of technology acquisition and implementation. Next, I present a literature review on the effectiveness and efficiency of RT in policing, the impacts of mass data collection on policing, and corporate involvement in police decision-making. Following this, I address the gaps in the literature as well as present how the current study addresses these gaps. Overall, Chapter Two summarizes the current understanding of technological decision-making by police, including the collection, storage, and management of data.

Chapter Three presents the methodology used in the dissertation. It discusses the procedures and measures used to collect data for this project, as well as the rationale for choosing a tri-phased approach to explore the previously mentioned research questions. Correspondingly, how the data was analyzed is then discussed. Next, the location and context of

the research and the explanation and justification for the sample used in this study are presented. Last, the ethical considerations for carrying out this research are outlined.

Chapter Four presents the results of the national survey, semi-structured interviews, and content analysis. First, I will present the findings from the quantitative survey responses of 27 municipal police service personnel who identified as instrumental in technological decision-making. I will also demonstrate how the findings were triangulated with the corresponding phases of the research to gain a deeper understanding of the topic at hand. Then, I will present the key themes from 11 semi-structured interviews with various Canadian police personnel. Last, I will present the thematic findings of the content analysis of 71 publicly accessible strategic plans of municipal, provincial, and federal Canadian police services.

Chapter Five provides an in-depth discussion of the findings presented in Chapter Four. First, results will be used to highlight the apparent disconnect between formal and informal technology acquisition processes within services and the subsequent impacts associated with circumventing formal processes despite their existence. Second, results will be discussed in relation to the shifting role of policing in the era of EBP and rapid technological advancement. In doing so, I will identify police as knowledge workers for third-party companies *and* as consumers of the products these companies provide. Third, results will be used to substantiate a call for accountability surrounding police decision-making. This subsection will not provide concrete recommendations but will open the door to potential avenues of what accountability could look like through collaborative decision-making and strategic planning. Then, I will discuss the importance of research in technological decision-making. Specifically, I will elaborate on how we can bring research to the forefront of decision-making and the role it can play in policing spaces. To conclude the chapter and the entirety of this dissertation, the

limitations of the project will be identified. Namely, 1) the limited previous research on the topic, 2) the small unrepresentative samples, and 3) the onset of the COVID-19 pandemic. Last, future directions for research will then be discussed followed by a brief overview of the project and my concluding thoughts.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

Technology use is central to the history of modern policing (O'Connor & Shon, 2019). In recent years, however, the police have acquired, implemented, used, and experimented with a wide range of technologies at an exacerbated rate. This ongoing technological experimentation includes but is not limited to facial recognition technology (FRT) (Hill et al., 2022), ALPR technology (Merola et al., 2019), big data and machine learning (Brayne, 2017), drones and robots (Davis, 2019), and Artificial Intelligence (AI) (Berk, 2021). As Hannem et al. (2019) note, these technologies should be considered RT in the hands of the police as they are "tools that mediate and shape human decision-making with respect to risk and threat" (p. 19). These RT are not merely neutral technologies that purport to enhance public safety but instead encapsulate a complex mix of enhanced surveillance techniques, attempts to predict crime before it occurs, and efforts to measure risks that are often unmeasurable.

At the center of many of these RT is digital data (O'Connor et al., 2022). Digital data is collected via RT for immediate but also (unknown) potential future uses (Hannem et al., 2019). The use of RT by police has raised a variety of concerns, particularly around data use and collection. For example, the accuracy of FRT has been called into question due to a lack of quality in the data used to train the algorithms, thus leading to potential bias (Nesterova, 2020). Similarly, it remains unclear how the algorithms used to predict crime via machine learning arrive at their decisions. With this understanding essentially black boxed, sometimes because of companies' proprietary claims to this information, questions remain as to how much previously collected biased and poor-quality data influenced the future predictions of where and on who the police should focus their attention (Hälterlein, 2021). Given this, research on existing RT within police services has shown mixed results concerning their overall effectiveness, efficiency, and

fairness (Haskins & Chapman, 2018; Jennings et al., 2015; Koper et al., 2015; Ozer, 2016; White, 2014). Further, these technologies are also often acquired and used without accompanying regulation and oversight (Joh, 2017).

There is plenty of empirical research and theorizing surrounding the uses and impacts of RT by police services. However, there is limited research and theorizing surrounding the acquisition of RT. Of the current research on police acquisition of RT, most theorizing exists at the organizational level. However, few researchers have examined the larger macro-level context in which technological acquisition and implementation play out (Bayerl et al., 2013). As Bayerl et al. (2013) argue, the "view of 'technologies in organizations' needs to be broadened into a wider view on 'technologies in organisations in their macro-context'" (pp. 804 – 805). The goal of this chapter is to present a theoretical framework for understanding the macro-level theoretical context in which police acquire and implement RT.

In doing so, I first provide a comprehensive overview of organizational-level theoretical explanations of technological decision-making by police services and discuss previous empirical works surrounding the acquisition and implementation of RT (i.e., Cohen, March, & Olsen, 1972; Cyert & March, 1963; DiMaggio & Powell 1983; Rogers, 1962), followed by a discussion of their shortcomings. Next, PRS (Ericson & Haggerty, 1997) and SC (Zuboff, 2019) are used as the theoretical framework in this dissertation to illustrate the importance of expanding macro-level theorizing for understanding decision-making on RT by police. The organizational shift from traditional/reactive policing methodologies to data-driven policing will then be discussed to illuminate the increasing acquisition of RT and data collection methods by police services. This discussion will emphasize the discrepancies in the literature regarding concerns with the acquisition and the integration of RT within police services, situate the research within the

existing policing literature, and help illustrate the importance of this study. Ultimately, this chapter contributes to a wider understanding of data collection, storage, and management via supporting RT in police services.

2.2 Risk Technologies and Organizational Theorizing

This section begins with an examination of three organizational theories that have been or could be used to explain police acquisition of technologies. While I acknowledge that various organizational theories have been undertaken to explore the structure and operations of policing (e.g., contingency theory [Lawrence and Lorsch 1967)]), I have chosen four vastly different models to exemplify the breadth of organizational theorizing in both technological decision-making and policing scholarship. These theories include the diffusion of innovations (DOI) model (Rogers, 1962; 2003), the behavioural theory of the firm (Cyert & March, 1963), the garbage can model of organizational choice (Cohen et al., 1972), and institutional isomorphism (DiMaggio & Powell, 1983). These four organizational theories are some of the more frequently cited in the literature when police decisions surrounding technology adoption and implementation are examined. Each of these theories will be discussed separately before discussing the shortcomings of organizational approaches more broadly. By discussing the advantages and limitations of these approaches, the need for additional macro-level theorizing that can address the potential economic, environmental, institutional, political, and societal factors involved in police services' technological decision-making will be illuminated. Correspondingly, a case will be made for combining key elements of Ericson and Haggerty's (1997) PRS and Zuboff's (2019) SC to provide a macro-level theoretical context for understanding police adoption of RT. In combining key elements of these theories, previously

ignored macro-level impacts on police decision-making and the potentially problematic relationship between the private and public sectors will become clear.

2.2.1 Diffusion of Innovations Model.

One of the dominant theoretical perspectives for understanding the process of technology acquisition and implementation within organizations is the DOI model (Rogers, 1962; Hendrix et al., 2019; Pasha, 2019; Weisburd et al., 2003). In policing, scholars have tethered the DOI model to the examination of body-worn cameras (BWCs) (White & Malm, 2020), ALPRs (Willis et al., 2018), COMPSTAT/crime mapping (Weisburd & Lum, 2005; Weisburd et al., 2003), conducted energy weapons (White, 2014), and information communication technology acquisition (Skogan & Hartnett, 2005). The origins of this model are centred in the discipline of communications and explain how an innovation (an idea or product) is communicated over time through a specific social system or organization (Rogers, 2003). The final step of the model is the subsequent adoption of the diffused innovation (e.g., purchasing a new product, or acquiring new behaviour). More recently, DOI theory has been specifically tethered to the adoption of technologies by organizations (Rogers, 2003). The defining properties of the DOI model acknowledge the hierarchical characteristics of organizational decision-making and suggest that successful persuasion to adopt an innovation (e.g., technology) is dependent on the relative advantage of the technology over the product it is replacing, the compatibility with the values and needs of the adopters, the complexity of the innovation, the testability of the innovation prior to commitment, and the observability of tangible results (Rogers, 1962; 2003). However, the processes of the model are not simultaneous or linear, as they can be influenced by various organizational factors leading to differing outcomes.

In the instance where a decision is made to acquire an innovation, adopters of the innovation are categorized into five mutually exclusive classifications including innovators, early adopters, early majority, late majority, and laggards based on their level of innovativeness (Rogers, 1962; 2003). Innovators play a significant role in the diffusion process because they are the individuals who are the first to try an innovation. Rogers (2003) characterizes innovators by their venturesomeness on account of their impulsivity. Correspondingly, innovators typically have control of substantial financial resources and can rebound from inevitable unsuccessful adoptions of innovations. Early adopters on the other hand are highly respected by their local social systems and are regarded as the central point of reference when considering the adoption of an innovation. Furthermore, early adopters are often discrete and successful with their adoption of new products. On the other hand, the adoption of an innovation by the early majority is a relatively long process. In comparison, the late majority are often skeptical of change and will only choose to adopt an innovation following the early majority. Lastly, laggards refer to those who are conservative, skeptical of change, and difficult to persuade. Consequently, laggards rely on empirical evidence and pressure from other categories of adopters to acquire an innovation (Rogers, 1962; 2003).

By focusing specifically on the decision-making process, DOI theorizing provides an understanding of the rate at which police organizations might adopt new technologies and the various stages of said adoption. Social media adoption and use by the police offers an illustrative example of DOI theorizing. Police were initially reluctant to adopt social media except for the initial few organizations who could be classified as innovators or early adopters (e.g., Royal Canadian Mounted Police and X [formerly known as Twitter])]). After these early stages, social media use by the police substantially expanded (early majority, late majority) with all but a few, typically smaller scale, police services (laggards) not having some form of social media presence

(Dekker et al., 2020; Walsh & O'Connor, 2019). Police services reflecting on their approach to technology acquisition and implementation (i.e., are they innovators, laggards, or somewhere in between) would benefit from understanding where, as an organization, they fall on this spectrum. This could also be reframed as how willing police services are to take a risk on trying out new technologies that might succeed but could also fail in unknown and potentially damaging ways.

2.2.2 The Behavioural Theory of the Firm.

A second theory that is drawn upon to explain police acquisition and implementation of RT is the behavioural theory of the firm (Hendrix et al., 2019). Empirically, this rational organizational perspective has been used to examine the role of randomized control trials in police decision-making (Bedford & Neyroud, 2021) and COMPSTAT/crime mapping adoption (Willis et al., 2007). Originated by Cyert and March (1963), this theory concentrates on explaining the key factors contributing to the decision-making of large-scale commercial organizations focused solely on short-term goals. The behavioural theory of the firm would consider police organizations to be rational actors that would only acquire technologies that they could use to meet their mission and goals (Hendrix et al., 2019). For example, if a police service was looking to integrate hot spots policing into their organizational model, it would make sense that they subsequently adopt a Geographic Information System (GIS) software to direct front-line officers on patrol (Piza & O'Hara, 2014).

This theoretical perspective also recognizes that organizations have multiple goals and multi-decision coalitions in which management, workers, stakeholders, consumers, and suppliers have their own sets of goals and demands. For instance, the goals of (technology) suppliers include high profits and monopolization. While the goals of consumers (police) include low purchase prices and good quality products. Thus, the goals of the organization are dependent on the various

demands of members within the coalition. Demands are created through several avenues including the availability of information, past achievements, aspirations, expectations, and the achievements demonstrated by other groups (e.g., other police services). For various reasons, the individuals within the coalition bring the selected demands to leadership who decide which requests help the organization reach their overarching goals and mission (Cyert & March, 1963).

The behavioural theory of the firm offers valuable insight into how organizational decision-making by police services is impacted by limited/available resources within a context of potentially unlimited/multi-faceted demands. That is, organizations have a limited number of resources to invest in strategic goals and the varying demands presented by different members compete for the resources of the firm (Cyert & March, 1963). By acknowledging the resource component of decision-making, it becomes clear that not all demands that are presented to police leadership will be considered and not all goals will be met satisfactorily. Therefore, despite the perceived efficacy of RT, police services may not acquire and implement them in their organizations partially due to limited resources. Consequently, the decision to acquire and implement RT is not a linear process.

2.2.3 The Garbage Can Model of Organizational Choice.

A third theory that is drawn upon to explain police acquisition and implementation of RT at the organizational level is the garbage can model of organizational choice. Rather than being grounded in rational choice, this model is rooted more in entropy (Hendrix et al., 2019). That is, it is argued that complex organizations often do not rely on strategic goals and their missions to make decisions (Cohen et al., 1972). Instead, the decision-making processes are equivalent to:

> A garbage can into which various kinds of problems and solutions are dumped by participants as they are generated. The mix of garbage in a single can depends on the mix of cans available, on the labels attached to the alternative cans, on what garbage is currently

being produced, and on the speed with which the garbage is collected and removed from the scene (p. 2).

These types of organizations, also referred to as 'organized anarchies,' are characterized by their ad hoc decision-making around RT rather than it being linked to meeting the strategic goals of the organizations (Cohen et al., 1972; Hendrix et al., 2019). For example, in Canada, several members of police services recently accepted a free trial from Clearview AI to use their controversial facial recognition software (Browne, 2020; Hill et al., 2022). This technology appears to have been used by officers without any oversight, for unknown purposes, and without the knowledge of the public. Additionally, police service leadership were often unaware that divisions of their service were testing out the software as well as using the software in active investigations. In other words, there was no established link made between the technology's use and the police services' goals and missions.

The garbage can model of organizational choice clarifies the unique structural and cultural elements that go into the acquisition and implementation of RT by complex organizations like police services. That is, there are sometimes no clear directives or formal processes for acquiring RT (e.g., trial and error are used to determine technological usefulness). Also, RT can be acquired and used as solutions in search of problems to solve (Cohen et al., 1972). As Strom (2017) found, technology acquisition by police services in the United States was often unstructured and independent of the short and long-term goals of the organizations. Similarly, Weisburd and Neyroud (2011) describe technology decision-making by police as a 'black box' that is often done without demonstrations of effectiveness or efficiency. By moving away from a rational choice perspective, this theory furthers our understanding of how police services can quickly acquire and implement RT (e.g., body-worn cameras [BWCs], FRT) without being guided by a rational plan.

It also helps to illustrate that there are internal and external influences on police decision-making that go beyond the immediate goals of any police service.

2.2.4 Institutional Isomorphism.

Finally, institutional isomorphism is a framework that has been used to understand the institutional pressures that contribute to organizational decision-making. In policing, this model has been tied to how police services acquire innovative practices (e.g., community policing practices, homeland security practices, communication strategies) (Giblin & Burruss, 2009; Burruss et al., 2010; King, 2000; Roberts & Roberts, 2007, Morabito, 2008, Willis & Mastrofski, 2011). Originally coined by DiMaggio and Powell (1983), institutional isomorphism is focused on the tendency for organizations with similar working environments to move towards a state of homogenization. The process of homogenization is attributed to three potential facets 1) mimetic, 2) normative, and 3) coercive. Mimetic influence occurs when an organization moves towards homogeneity by mimicking an organization that is structurally similar. For example, police services frequently rely on one another for insights regarding the adoption of technology. The experiences of the initial adopter of the technology tend to shape how the technology is carried out by other services (e.g., chosen vendor, requested technical capabilities). Normative influences on decision-making are internal pressures that have since been divided into two separate categories – professionalization (e.g., professional associations, conferences) and publications (e.g., government reports) (Giblin & Burruss, 2009). Collectively, mimetic and normative influences reflect *institutional pressures* to the organization (Giblin & Burruss, 2009). Last, coercive influences are pressures on decision-making that exist external to the organization (e.g., government funding). The acknowledgement of external coercive influences on initial

decision-making process could, theoretically, provide a more holistic understanding of why police decide to adopt innovations (e.g., technology).

2.3 Shortcomings of Organizational Theorizing for Police Decision-Making

Both the DOI model and behavioural theory of the firm discussed above describe a logic to police decision-making around RT. While these organizational theories are enticing for explaining RT adoption and use by police services because of the logical/rational decision-making procedures they present, there are limitations to framing RT decision-making by police services in this way. First, decision-making around RT is not always rational/logical and linked to the strategic goals of police services. For instance, Hendrix et al. (2019) found that decisions to adopt and implement technology within police services occurred independently of their organizational strategies and goals. Second, the focus on internal decision-making oversimplifies the complexities of police services which are fluid and ever-changing organizations made up of multitudes of different actors (e.g., officers working with limited supervision and high levels of discretion) and external factors (e.g., politics, interest groups) that might lead to less than well thought out decision-making about RT (Sheptycki, 2019). Consequently, these theories do not account for instances where goals are not distinctly outlined or when change happens at a rapid pace (e.g., when calls for accountability prompted the adoption of BWCs). The alternative theory offered, the garbage can model of organizational choice, is one grounded in chaos. It describes RT acquisition and implementation by police services as less about active and planned decision-making and more about happenstance (Strom, 2017). Unfortunately, this tells us little about how RT are acquired (Hendrix et al., 2019). While this theory also hints at external factors (e.g., cosmopolitan networks, institutional pressure to keep up with modernization) influencing how RT come to be acquired and implemented by police services, these are not fully explored.

Organizational-level theories have only begun to articulate the complexity inherent in police acquisition and implementation of RT. Questions remain as to how different types of RT, the level of risk associated with the RT, and police services' performances impact their decision-making around RT (Hendrix et al., 2019). For example, it has been found that poor performance may encourage police services to adopt riskier technologies earlier than police services that are performing well at achieving their mission in hopes that the product will improve overall performance (Pasha, 2019), but more research explicitly examining RT acquisition is needed. Thus far, the reliance on meso-level organizational theorizing to explain the acquisition and implementation of RT by police services has focused mainly on the structural and cultural elements influencing decision-making within police services. For the most part, this has neglected the macro-level influences (e.g., private sector, politics, economics, social movements) that can play a crucial role in technological decision-making. Unlike the previously mentioned models, institutional isomorphism provides a broader lens that acknowledges both internal and external forces contributing to organizational decision-making. While this has valuably contributed to our understanding of police innovations (e.g., Willis & Mastrofski, 2011), the external coercive pressures continue to exist in the realm of public sector actors. This focus inadvertently neglects potential private sector influence on idea formation and decision-making. Additionally, this model places the organization at the epicenter of the issue rather than the potential macro-level forces at play. Existing literature on private sector influence suggests that these forces are fundamentally shaping the world around them, including police organizations.

Taken together, organizational theorizing has left a limited interpretation of how police make decisions about technology. For example, the potential influence of private technology corporations (e.g., marketing, vendor-consumer relationships) remains largely absent from the

wider discussion of potential influences on the acquisition and implementation of RT within police services. According to Greene (2014), "we seem to have moved the discussion to considerations of aggregate police effects, hot spots, evidence-based, and the like, measuring selectively chosen impacts of police interventions (most at the meso-level) …such an approach…ignores what new environments the police face in the twenty-first century (macro-level) and their likely impact on the police" (p.221). Additionally, O'Connor and Shon (2019) suggest that the lack of macro-level theorizing has left police in a position to be governed by external institutions with no clear operational directives. With empirical evidence to suggest that police services do not consider organizational goals during their decisions to adopt RT (Hendrix et al., 2019; Strom, 2017), the scope of the analysis must be broadened to examine the larger societal context that shapes police services' acquisition and implementation of RT. Ultimately, this would help provide a more holistic view of the issue.

2.4 Macro-Level Theorizing and Policing

To provide a more comprehensive theoretical picture of police acquisition and implementation of RT, this section draws on Ericson and Haggerty's (1997) work on PRS and Zuboff's (2019) work on SC. In this section, I demonstrate the relevance of PRS and SC to explaining police services' technological decision-making beyond, or as an accompaniment to, organizational-level theorizing. First, each theoretical work will be discussed separately to clarify their perspectives. Ericson and Haggerty's work has been influential in policing by providing a modern illustration of police work as predominantly knowledge work that facilitates relationships between the private and public sectors. Additionally, Zuboff's work illustrates the concerns that accompany the consumption of private technology, including how systems of power (i.e., private technology corporations) use information as a tool to control and shape the experiences of their

consumers (in this case the police, which in turn affects how RT impact the public). After each perspective is discussed, key concepts will be merged from each theoretical perspective to elucidate the macro-level influences on police decision-making about RT.

2.4.1 Policing the Risk Society.

According to Beck (1992), as a society we are increasingly concerned with risks (e.g., environmental, economic) and our ability to mitigate them. As such, information has become invaluable to our society in order to predict, communicate, and prevent risk. When applying this framework to policing, Ericson and Haggerty (1997) assert that police are no longer considered to be self-governed, rather, they are 'other-governed' by demands for risk-based information that are external to the organization. For example, insurance companies shape the data that police need to collect in traffic patrol to evaluate their clientele (Ericson & Haggerty, 1997; O'Connor & Shon, 2019). According to this theorizing, police are continuously faced with the competing demands of external institutions (e.g., social services, health care, technology companies) that influence the rules, technological design, data collected, and RT that are acquired and implemented (O'Connor & Shon, 2019).

Contrary to what is commonly illustrated by mass media, police spend relatively little time "fighting crime" (Ericson & Haggerty, 1997). Alternatively, police work is characterized as knowledge work through the collection of information and the assessment of risk (Chan, 2001; Ericson & Haggerty, 1997; Manning, 1992). The underlying framework of PRS rests on the argument that increased information about risk leads to a more secure world. Respectively, police work is measured in terms of risk and how those risks can be managed more effectively and efficiently.

Recently, the proliferation of RT throughout police services has transformed police knowledge work by creating new opportunities to collect, manage, and regulate information (Brayne, 2017; Ericson & Haggerty, 1997; O'Connor & Shon, 2019). These new opportunities to collect data have shifted police practices away from traditional reactive policing strategies towards data-driven approaches (e.g., evidence-based policing). Data-driven police practices position information at the forefront of strategic and tactical decision-making (Burcher & Whelan, 2018). Correspondingly, data-driven strategies are proactively focused on establishing a pre-crime society that values risk prevention over and above reactive means of addressing crime (Zedner, 2007). Further, when crimes do occur, they are likely investigated with the help of RT (e.g., BWCs). The shift in police practices towards data-driven approaches, coupled with increasing external requests for information, has led to the adoption of a uni-directional approach to the intelligence cycle that is dysfunctional for the fluidity of police organizations (Sheptycki, 2013). This management guided approach to intelligence results in the compulsion to collect as much information as possible even if that information might not be initially relevant (Ericson & Haggerty, 1997; Manning, 1992; Sheptycki, 2013).

PRS extends beyond previous organizational attempts to understand police decision-making, as it acknowledges police initiatives as driven by both internal and external demands for information. These influences ultimately impact police decisions to acquire and implement RT that collect the necessary information to satisfy these increasing demands (Terpstra et al., 2019). Although police typically decide to adopt RT in hopes of increased organizational effectiveness and efficiency, most of the efforts by police services to incorporate RT are directed by the demands of external institutions (Ericson & Haggerty, 1997; Manning, 2001). Private sector insurance companies are illustrative of an external entity that demands information about risk from the

police. For example, PRS suggests that, while responding to automobile accidents, the main priority of police work is to collect data concerning risk management for insurance companies (e.g., responsible parties, demographic information, incident report). This information demanded by insurance companies allows them to recalculate a driver's risk score to maintain balance through the redistribution of risks. Correspondingly, external requests for information have demonstrated a profound impact on how the police think and act as an organization (Gates, 2019; Joh, 2017; Rogers & Scally, 2018).

Additionally, PRS extends current organizational theorizing by acknowledging the inequalities in society surrounding the ownership and control of information via RT (Ericson & Haggerty, 1997; Ferguson, 2017; Joh, 2017). With decreasing control over knowledge production initiatives, police services are often unaware of where the knowledge they produce ends up, let alone how external and powerful industries (e.g., private technology corporations) exploit the collected information (Ericson & Haggerty, 1997). As the demands for risk knowledge from external institutions continue to rise, new questions also emerge surrounding the collection, storage, management, and accessibility of information by police services. Specifically, private technology corporations are increasingly involved in police knowledge work through the supply of RT that can collect, store, and manage large volumes of information (Ericson & Haggerty, 1997; Joh, 2017). As I attempt to illustrate below, combined with SC theorizing, PRS can help to theorize the influence (e.g., marketing tactics) of private technology corporations (e.g., Clearview AI) on police decisions to acquire and implement new technologies.

2.4.2 Surveillance Capitalism.

SC is a macro-level economic theory frequently used to explain the negative impacts private sector technology corporations can have on society stemming from their ownership of the

means of learning and the control of information (Zuboff, 2015; 2019). Zuboff (2019) operationalizes SC as:

> A new economic order that claims human experience as free raw material for hidden commercial practices of extraction, prediction, and sales; a parasitic economic logic in which the production of goods and services is subordinated to a new global architecture of behavioral modification; a rogue mutation of capitalism marked by concentrations of wealth, knowledge, and power unprecedented in human history; the foundational framework of a surveillance economy; as significant a threat to human nature in the twenty-first century as industrial capitalism was to the natural world in the nineteenth and twentieth; the origin of a new instrumentarian power that asserts dominance over society and presents startling challenges to market democracy; a movement that aims to impose a new collective order based on total certainty; and an expropriation of critical human rights that is best understood as a coup from above: an overthrow of the people's sovereignty (p. VII).

According to this definition, economic ends are intrinsic to technological development (Zuboff, 2019). To achieve these economic ends, surveillance capitalists utilize a convergence of freedom and knowledge to control the market (Zuboff, 2019). Therefore, an individual's information is taken and sold to fund the freedom and knowledge of surveillance capitalists while simultaneously oppressing the individual who offered their information for access to various RT. For example, Facebook requires users to agree to a lengthy list of terms and conditions prior to using their platform for social engagement. These terms and conditions include the extraction of user data that can be shared with third-party companies to personalize advertisements and content.

Consequently, users are sacrificing their personal information to access the benefits of the platform, while Facebook profits from the collection of said knowledge.

This theorizing raises potential ethical concerns regarding the relationship between police services and RT companies and the corporate control of information. Presumably, before acquiring and implementing RT, police services must also agree, like users of almost any technology, to a lengthy list of terms and conditions. Although little is currently known about what has been agreed to in these contracts. Given this, it is often unclear exactly who owns the data collected by and stored in RT (e.g., digital evidence platforms) and how/if this data is being used beyond immediate police use. We do know that surveillance capitalists focus on the collection of information for behaviour modification purposes through the sale of emerging digital technologies. Therefore, regardless of criminal involvement, the historical location information of countless individuals is collected through police RT and may exist in several databases where it can be aggregated and sold to make decisions about consumption habits, health, and creditworthiness (Brayne, 2017; Joh, 2017).

The complete societal transformation by way of SC has paved the way for a social system without boundaries surrounding privacy and security (Zuboff, 2015; 2019). The potential impacts of RT integrating into the public sector have only begun to be addressed in the literature. For instance, Robinson (2019) and Zuboff (2015) both express concern regarding the influence of private sector finances on public sector activities, such as the growing collaborations between government authorities and private technology corporations for surveillance purposes. As previously mentioned, the consumer-vendor relationship poses greater concern when the product itself plays a significant role in the collection, management, analysis, and storage of information by public police services (Joh 2017). However, the literature surrounding the influence of private

technology companies on public sector decision-making has circled the broad impacts of SC as a whole and has not been applied fully to the area of policing.

2.5 Information, Power, and Policing

Drawing on PRS and SC theorizing, this section outlines a macro-level theoretical understanding of police services' acquisition and implementation of RT. Collectively, insights from PRS and SC provide a more robust understanding of how external economic, environmental, institutional, political, and societal influences could impact organizational decision-making in the public sector. Individually, SC and its defining properties do not present a direct link to how the police make decisions regarding which RT to acquire and implement. However, when combined with PRS theorizing, police can be examined as the primary consumers of a niche market of RT designed and produced by private technology corporations to collect mass volumes of information used to surveil, classify, and categorize populations into risk profiles. Correspondingly, it is imperative to examine how external factors are specifically impacting the technological decisions of police.

Scholars have often noted the techno-social implications of RT and their accompanying data capabilities (Aradau & Blanke, 2017; Gates, 2019; Joh, 2014; Joh, 2016b; O'Leary, 2015). As Aradau and Blanke (2017) point out, "big data has revitalized the promise of prediction across social, political, and economic worlds" (p. 374). Specifically, technological advancements have paved the way for an entirely new industry with information as the central commodity. Before the surge of digital technology, information was manually collected, stored, analyzed, and interpreted at the discretion of the individual. Even further, the sheer quantity of collected information was discretional by the level of importance of the task at hand. There has since been a shift in the foundation of information gathering and analytics towards a "collect all mantra",

where data is collected through extraction and capture by digital technologies (Crampton, 2015). As previously demonstrated, police have assumed this "collect all mantra" through the rapid acquisition and implementation of RT. The capabilities of emerging RT create new ways to collect, analyze, disseminate, and automate information.

In specific reference to modern police knowledge work, the increasing external demands for information have resulted in the collection of substantial amounts of data via RT for intelligence-led purposes (Fan, 2018; Joh, 2017). As Ericson and Haggerty (1997) point out, RT acquisition and data collection have become a perpetuating cycle, as the introduction of more efficient RT fuels external demands for more information. For example, while ALPR data may not be deemed valuable or informative by police agencies, once the data is aggregated into massive databases for future analysis, it becomes highly useful to secondary private companies (e.g., insurance brokers) (Dryer & Stroud, 2015). As it seems, the introduction of intelligence-led decision-making in policing has exacerbated the possibilities of what can be done with the vast amount of information that is collected by RT.

As a result of this rapid expansion of information capabilities, RT and their data capabilities are often portrayed in the literature as tools of power and a threat to individual privacy, civil liberties, and freedoms (Richards & King, 2013; Fan, 2018). Recently, concerns have been raised surrounding the ethical implications of data collection, storage, and management of police data via RT (Baird, 2018; Brayne, Levy, & Newell, 2018; Fan, 2018; Joh, 2014; Joh, 2016a). Namely, data costs, retention, accessibility, and ownership (Baird, 2018; Brayne et al., 2018; Fan, 2018; Joh, 2014; 2016a; McNeal, 2015). The following section will examine these ethical concerns using a PRS and SC framework. To clarify, I use PRS to demonstrate police work as increasingly driven by external demands for information while using

SC to highlight the ethical concerns of meeting these increasing demands for information using RT supplied by private sector companies.

2.6 Police Data Collection, Storage, and Management

Police officers as "crime fighters" is a widely held view by the public and mass media. Realistically, however, police personnel are predominantly categorized as knowledge workers who collect primary data in response to knowledge requests from their institutions as well as external parties (Ericson & Haggerty, 1997). To elaborate, knowledge work in policing involves collecting information about risk (e.g., crime-related administrative reporting), largely for internal organizational purposes (e.g., crime analysis), but also for external institutions who rely on the police for information to manage the risk profiles of their clients. Correspondingly, information technology (IT) and MDTs quickly became large players in the territory of police work by the late 1990s (Chan, 2001; Meehan, 1998). As Chan (2001) discovered, the average police officer spends approximately half of their eight-hour shift completing administrative tasks (e.g., investigative reporting of events). It seems that information is of the utmost importance for the success of policing and achieving institutional goals. Although risk assessment continues to be a core component of police knowledge work, the supporting technologies that collect and analyze risk information have changed (Ericson & Haggerty, 1997; Joh, 2014). Presently, we see that police are increasingly investing in the potential of big data systems and their supporting RT in hopes of further increasing workplace effectiveness and efficiency (Fan, 2018). Therefore, the following section will show that the regulation of RT acquisition and implementation by police services is paramount.

The shift from traditional reactive policing towards technologically advanced proactive policing has come with its benefits (Strom, 2017). According to Joh (2016b), there are three

major benefits of incorporating data and RT into policing. Firstly, data-driven policing can diminish the often-criticized variation in the use of discretion. Historically, discretion has played a large role in police work, whether it is deciding what constitutes suspicious behaviour or deciding which neighbourhoods to patrol. Limiting such a high level of discretion may lead to a more impartial allocation of police service efforts and reduce the negative effects that have been demonstrated by police discretion in the past (Ericson & Haggerty, 1997; Goel et al., 2017; Joh, 2016b). Secondly, RT can offer alternatives to traditional investigative tools that have been the targets of criticism in the past. For instance, Joh (2016b) suggests that RT can eliminate police services' reliance on informants and dangerous undercover operations. Lastly, RT have been highlighted for their potential to increase the accountability of police personnel (Chan, 2003; Goldsmith, 2010; Fan, 2018; Joh, 2016b). For example, the information collected by emerging RT is capable of examination by a neutral third party in cases of police misconduct (e.g., early intervention systems for officer behaviour). Taken together, incorporating RT into police work has the potential to be beneficial in various ways. However, these benefits are coupled with a long list of concerns regarding data costs, retention policies, accessibility, and ownership (Baird, 2018; Brayne et al., 2018; Fan, 2018; Joh, 2014; 2016a; 2016b). The following section will discuss each of these data concerns in relation to the acquisition and implementation of RT.

2.6.1 Hidden costs and data retention.

One notable concern raised by scholars surrounds the storage and management of data by police services and private technology corporations (Brayne et al., 2018; Fan, 2018; McNeal, 2015; Rogers & Scally, 2017). Alongside the introduction of emerging RT, police services were presented with the ability to record mass amounts of data instantaneously. Most notably, BWCs allow police personnel to record all of their daily work, including any interactions with the

public. As a result, mid-sized police services are likely to record approximately 5-7 terabytes of data per month (Fan, 2018; Joh, 2016a). Once this volume of data is created there are several unresolved discrepancies that exist surrounding the process of storing and managing the information. Namely, where and how long the data is stored, the associated costs, retention procedures and the ownership/control of the data (Brayne et al., 2018; Fan, 2018; White, 2014).

The major manufacturers of emerging RT (e.g., Axon) typically offer cloud-based digital evidence management system (DEMS) solutions to police services at an annual subscription cost (White, 2014). Although a department may choose to store the data themselves, the current storage technologies that police use are not adequately equipped to handle such large quantities of visual data and supplementary information (Fan, 2018). Additionally, departments that have decided to store the data internally have found that they need to dedicate additional staff members to manage the sheer amount of BWC footage being collected (Fan, 2018). In hopes of greater efficiency, several Canadian police services have opted to store their data through Axon's Evidence.com, a cloud-based DEMS that can store police data recorded through supporting technologies. Specifically, Evidence.com claims to have:

> …reimagined evidence management and sharing. Files can now be shared directly… to meet the fast-changing needs of police forces. Officers can easily upload digital evidence to create, store, catalogue, search and share case files with third parties. This replaces DVDs, costly data centres and slow workflows with streamlined, infinitely scalable and lower-cost evidence management. ("Axon Evidence.com", n.d.)

These claims discussed by Axon lead the consumer to believe that DEMS are more effective and efficient than traditional policing methods in terms of data access, sharing, and cost, however, recent evidence has demonstrated that DEMS can have severe financial and organizational

impacts on police services (e.g., unanticipated costs, restricted retention subscriptions) (Brayne et al., 2018; Fan, 2018; Hung, Babin, & Coberly, 2016; Strom, 2017; White, 2014).

Currently, there are only a handful of police services that can afford to use emerging RT and their cloud-based DEMS. In 2018, at the municipal/regional level, there were 141 stand-alone police services and 36 First Nations self-administered services in Canada (Statistics Canada, 2018). Of the nation's municipal/regional police services, there are large variations in the number of sworn officers as well as the size of their annual operating budgets. For instance, the Toronto Police Service is the largest municipal police service in Canada with over 5500 sworn officers and an operating budget of $1.076 billion (Toronto Police Service, 2020). On the other hand, there are municipal/regional services with as little as 15 sworn officers and subsequently much smaller annual operating budgets. As a result, the acquisition and implementation of DEMS and supporting RT have not been consistent across Canadian municipal/regional police services.

For municipal/regional police services that decide to invest in DEMS, scholars tend to agree that the decision to migrate to a new department-wide system has demonstrated to be much more expensive than originally anticipated (Brayne et al., 2018; Fan, 2018; Strom, 2017; White, 2014). As evidenced by Strom (2017) in his examination of US police services, agencies often reported that high initial costs of DEMS were perceived as unreasonable. Additionally, costly DEMS and supporting equipment prevented agencies from purchasing the necessary number of units (e.g., BWCs, ALPRs) for their department. Of the agencies that had the budget to use these RT, there were several reports of hidden costs during or after the initial purchase. For example, the fine print of Axon's Evidence.com price plan states that police services must subscribe to a minimum of a five-year contract to receive the optimal services of the software, which includes

unlimited storage (Axon, n.d.). Although these services promise to increase efficiency and effectiveness, the demands of police services are constantly changing. These services are now obligated to these unexpected additional costs despite any economic or technological changes throughout the next five years. The unplanned costs of DEMS and supporting technologies can have significant impacts on the budget of a police service, which might subsequently impact the overall success of the technology's use. Despite the impact of costs, the concerns surrounding the acquisition and the use of RT are not limited to this area of inquiry.

The variation in DEMS costs and policies has also sparked a dialogue concerning the discretion involved in data storage and management decisions by police services and private technology corporations (Hung et al., 2016). For instance, according to Axon's Officer Safety Plan, to obtain unlimited data storage, police services must choose from a selection of plans starting at $ 99 USD per user per month. Subscribing to a plan any lower than Axon's Officer Safety Plan results in severe restrictions on data storage and security, therefore exacerbating the issue of discretion surrounding data retention, as services are forced to either restrict how much data they collect or to delete data that is already stored in the cloud. Further, in an examination of US police services' BWC policies, only 56% of agencies retain evidentiary data based on archival rules for the crime (Fan, 2018). The remaining 46% of police services retained data based on a variety of reasons, including the number of years (i.e., 1-3 years after case conclusion), case conclusion, a statute of limitations, or there were no specified policies in place. The wide range of discretionary power that is placed on private technology companies and police services raises a host of ethical and privacy concerns surrounding the decisions of when to record information (Newell & Greidanus, 2018) and which information is to be kept or discarded.

2.6.2 Data accessibility and ownership.

With increasing external demands for information occupying a substantial portion of police operations (Ericson & Haggety, 1997), there is a need for effective data management and storage (Joh, 2017). Ideally, effective data management and storage would ensure the security of confidential information, the prevention of lost/misused data, and authorized accessibility. However, managing the sheer quantity of data while maintaining privacy, reliability, security, and accessibility concerns are some of the biggest challenges for police services (Pearce, 2010). For instance, in a recent audit of Los Angeles police services' ALPR use, three out of four agencies who used a cloud storage vendor to hold their data lacked contract guarantees that the vendor could appropriately protect the data (Howle, 2020). These challenges are further complicated by the fact that private corporations frequently own the rights to the DEMS and supporting technologies utilized by police services (Brayne et al., 2018; Joh, 2017).

According to Brayne et al. (2018), the data collection and storage of sensitive data by private technology corporations and police services run the risk of mass distribution after an individual has interacted with RT (Moses, 2023). For instance, in sensitive cases, such as domestic violence responses by police services that are required to wear BWCs, survivors run the risk of identification following a data breach/hack if that data was recorded and held by RT (Newell & Greidanus, 2018). Similarly, Dryer and Stroud (2015) highlight the issue of the secondary use of police data via RT. Specifically, the simultaneous increase in public and private sector databases alongside the increased use of ALPRs by police services raises data accessibility concerns as license plate information is frequently retained and stored regardless of whether a hit is present. Consequently, irrespective of their involvement in criminal activity, the historical location information of countless individuals may reside in several databases that can be aggregated and sold to make decisions about our consumption habits, health, and

creditworthiness (Brayne, 2017; Joh, 2016b). Ultimately, the quick adoption of data-driven policing and supporting RT by police services has resulted in very few guidelines regarding data ownership and accessibility (boyd & Crawford, 2012; Joh, 2017).

The previously mentioned findings have left openings for private corporations to control the storage and management of data over and above police services. Recently, contracts between private technology corporations and police organizations have given private technology corporations the ownership rights to all data that is collected and stored using their technology. For instance, ShotSpotter (an acoustic gunshot location device) demands ownership over all the information collected by police organizations that use their technology. Subsequently, when police wish to share this information with other government organizations, there is the possibility that they will be unable to, or there will be a fee associated (Tashea, 2016). According to Joh (2017), this has left police organizations confused as to what information they own and what degree of control they have over said information. Even further, restrictions on the accessibility of data have been presented after contracts between private technology vendors and police organizations have terminated (Joh, 2017). Most notably, there have been reports of vendors returning data to police services in encrypted forms without proper decoding materials after the completion of contractual obligations (e.g., Alden, 2017). Collectively, these concerns point to the potential influence of private technology corporations on police services through the acquisition and implementation of RT.

2.7 Police as Knowledge Workers *and* Consumers

First and foremost, police are publicly viewed as the enforcement and surveillance arm of the state who help to regulate society and manage risk (Ericson & Haggerty, 1997). As such, police services are assumed to be the ones in control of their surveillance, data, and investigative

tools. However, police services are increasingly becoming consumers of RT that are "created, sold, and controlled by private companies" (Joh, 2017, p. 101). These technological solutions are often developed by private sector companies who have the initial goal of selling a product to a police service as a consumer rather than supplying an appropriate solution to the police, leaving the potential for several ethical issues to arise that have not been considered in the context of public safety (Johnson et al., 2020). As such, when categorized as knowledge workers *and* consumers, it is suggested that police services will likely buy into the latest technology that promises to efficiently manage risk and reduce uncertainty (Ericson & Haggerty, 1997). As Joh (2016) explains, "... police departments are just another group of customers" (p. 38). By connecting the identity of police as knowledge workers and consumers to the foundations of SC, we shift the focus towards understanding how police make decisions to acquire and implement various types of RT. In doing so, the primary point of interest becomes the increasing institutional control that can play into decision-making processes, specifically the overall influence of private technology corporations. Explicitly, aggressive marketing tactics (Dencik et al., 2018; Hood, 2020; Sanders & Sheptycki, 2017), market secrecy (Aguilar, 2020; Goodfield, 2020; Joh, 2017; Sanders et al., 2015), and limited access to information (Tashea, 2016; Joh, 2017) have been highlighted as influencing police decision-making processes.

As consumers, police services have become influenced by private sector marketing. As it stands, few scholars have noted the influence of aggressive marketing tactics used by private technology corporations on police services' decision-making (Dencik et al., 2018; Hood, 2020; Joh, 2017; Sanders & Sheptycki, 2017). For instance, Axon has quickly become the primary surveillance data generation, storage, and management choice of Canadian and American police services. According to their homepage, "… more than 17,000 law enforcement agencies in over

100 countries around the world are a part of the Axon network" (Axon, n.d.). Within many of these contracts between police services and private surveillance corporations, police services can obtain the marketed product at a discounted rate on the condition that they take part in future marketing by providing testimonials and referrals to other agencies (Sanders & Sheptycki, 2017). Additionally, scholars have uncovered instances of the private sector pressuring police services to sign no-bid contracts when purchasing their products and services, thus establishing their monopolized presence in the industry (Joh, 2017). Even further, police services that invest in the technology can agree to host visiting agencies from other institutions to demonstrate the "efficiency" of the technology. These marketing tactics can also take the form of joint press conferences between private corporations and police services, web marketing, trade shows, conferences, and speaking engagements (Sanders & Sheptycki, 2017). Collectively, these tactics and engagements are often used by corporations as evidence that their technology is efficient and effective for police usage, ultimately muddling the line between strategic marketing and empirical case studies (Sanders & Sheptycki, 2017). Therefore, regardless of the quality, necessity, effectiveness, and efficiency of RT, market dominance by a handful of private technology corporations can easily persuade police services to continue with their products and services to avoid competitive bidding (Joh, 2017).

Concerningly, market secrecy has been identified as a contributing factor to the undue influence of the private sector on police services. More specifically, as a layer of protection for their products, non-disclosure agreements (NDAs) are becoming increasingly common in the purchase of private RT by police services. Police services signing NDAs presented by private corporations are problematic for myriad reasons. Largely, the use of new and potentially intrusive surveillance technologies can be kept secret from the public and excluded from any

judicial authorization. Most notably, the undisclosed use of Stingrays[1] by police organizations throughout the US has been identified as a violation of privacy rights and deemed comparable to a search without a warrant (Joh, 2017). Similarly, a handful of Canadian police services have recently been criticized for their undisclosed use of Clearview AI, a facial recognition software that references to source data scraped from the internet and social media without consent (Aguilar, 2020; Goodfield, 2020). The undisclosed use of Clearview AI's software application was largely attributed to the free trial that they offered to police services. Ultimately, this form of consumerism and layer of secrecy contradicts the amassed standards of transparency and accountability expected of the police and can subsequently result in significant harm to police imagery and public trust (Joh, 2017; Sanders et al., 2015).

boyd and Crawford (2012) identify six major ethical implications to consider in the discussion of the commercialization of data and RT by private technology corporations: the definition of knowledge, claims of objectivity and accuracy, quantity over quality, the meaning of big data, the ethics of accessibility, and limited access. To elaborate, decisions are made by the consumers of information with the assumption that the information is objectively and accurately collected, however, this may not be the case. For instance, there is the possibility of algorithmic error and subsequent inaccurate data interpretation by consumers (e.g., see Eubanks, 2018). It has also been suggested that even with a seemingly objective prediction software, the cultural and structural barriers that saturate police services run the risk of using RT in a disruptive manner to legitimize racism and discriminatory practices (Ferguson, 2017; Sanders & Hannem, 2012). For instance, following the introduction of PredPol in the US, police agencies heavily shifted their attention to computer-generated "hot spots" that identify where crime is

[1] Stingrays are referred to as "cell site simulators, a surveillance technology that tricks nearby cell phones into providing data by behaving as a fake mobile cell tower" (Joh, 2016, p. 38).

likely to occur, and therefore where officers are instructed to prioritize their attention while patrolling (Sanders & Sheptycki, 2017). Although this software has shown reductions in crime rates throughout the targeted areas, place-based predictive systems can further perpetuate the marginalization of labelled neighbourhoods (Ferguson, 2017; Sanders & Hannem, 2012). To elaborate, the data that is collected from the real world is filled with systemic oppression and racial disparities. Therefore, when these disparities are not acknowledged in the construction of RT, they will only further perpetuate this oppression (Ferguson, 2017; Hood, 2020).

Additionally, limited access to information has undoubtedly created a social divide between the big data-rich and the big data-poor (boyd & Crawford, 2012; O'Leary, 2015; O'Neil, 2016; Robinson, 2019). Consequently, private social media and technology corporations have absorbed the rights to privacy, and therefore, can decide whom they sell their product to. It is possible that private technology corporations are not concerned about the possibility for technology to be disruptive to police services, rather it is likely that corporations are searching to sell their product in their self-interest regardless of the ethical implications of its usage in the long term (Joh, 2017). In other words, the social division that could follow the increasing mix of public funds in private finances has the potential to oppress those who do not have the means to access their data. These potentially harmful practices exercised by private corporations have raised important questions that need to be answered.

2.8 Policing and Risk Technologies: Effectiveness and Efficiency

The increasing focus on data and RT by Canadian police services suggests a strong belief that technology holds the potential to improve police services effectively and efficiently (Chan & Bennett Moses, 2016; Koper et al., 2014). For this dissertation, effectiveness and efficiency refer to the ability of RT to fulfill the intended goals and activities outlined by police services.

Although emerging RT have undoubtedly shown great promise in their capabilities for police services (Goel et al., 2017; Goldsmith, 2010; Fan, 2018; Joh, 2016a; Strom, 2017), it remains unclear whether they have made police more effective and efficient. Contemporary literature has shown mixed results in the examination of existing RT within police services and their overall effectiveness and efficiency in police work (Koper et al., 2015; Ozer, 2016). Nevertheless, police are increasingly pressured by external demands for information from the private sector, government institutions, and the public to incorporate RT. In what follows, I will present the empirical evidence concerning the effectiveness and efficiency of recently acquired RT. The following RT are exemplars to demonstrate instances of RT acquisition with limited prior empirical evidence, including but not limited to BWCs, ALPRs, and FRT.

2.8.1 Body-worn cameras.

Originally, BWCs were advertised by private technology companies to police services for their ability to capture any interactions that take place between suspects, victims, witnesses, and officers (Hedberg et al., 2017). Additionally, the video recordings collected by BWCs promised to help officers document statements, behaviours, and general observations during response calls. These RT tools differ from existing forms of visual surveillance (e.g., dash cams, CCTV) as they often come equipped with big data capabilities in the form of trained datasets, live facial recognition, AI features, and cloud-based uploading to DEMS. Recently, BWCs have taken on an alternative role as an "objective" surveillance tool, assumed to increase the accountability of front-line officers in the use of force responses while simultaneously reducing citizen complaints (White, 2014). Following recent tragic and highly publicized events, such as the shooting of unarmed 18-year-old Michael Brown in Ferguson, Missouri, the public demand for officer accountability and BWC adoption by police agencies significantly increased (Jennings et al.,

2015). In response to these increasing public demands for information, several North American police services have swiftly acquired and used BWCs (Hedberg et al., 2017). The empirical evidence regarding the effectiveness and efficiency of BWCs in reducing the use of force responses and citizen complaints is limited (Haskins & Chapman, 2018; Hedberg et al., 2017; White, 2014). Further, little is known about whether BWCs increase the accountability, transparency, and legitimacy of the police demanded by the public (Sousa et al., 2017; White, 2014).

While limited, the results from recent studies on the effectiveness of BWCs across North American police services have been mixed (Ariel et al., 2015; Jennings et al., 2015; Pang & Pavlou, 2016). For instance, the use of BWCs by the Orlando Police Department effectively reduced response-to-resistance incidents by 53.4% and serious external complaints by 65.4% in a randomized trial (Jennings et al., 2015). Similarly, BWCs have been found to civilize the behaviours of on-duty officers and the public, as the number of complaints significantly reduced for officers who were wearing BWCs compared to those who were not (Ariel et al., 2015). In contrast, Pang and Pavlou (2016) found that police-involved shootings and civilian deaths by police significantly increased by 3.64% from the use of BWCs. Scholars agree that the mixed results demonstrated by BWCs are largely attributable to their rapid acquisition and implementation with limited prior empirical evidence (Hedberg et al., 2017; Rogers & Scally, 2017; White, 2014). Collectively, it seems that more research is necessary to capture a holistic understanding of how the use of BWCs impacts the effectiveness and efficiency of police services.

Although there are empirically demonstrated reductions in the use of force responses and civilian complaints against officers, the effectiveness of BWCs outside of these randomized

experimental trials seems dependent on the compliance of on-duty officers to activate their cameras during response calls (Ariel et al., 2016; Hedberg et al., 2017; Newell & Greidanus, 2018). According to Hedberg et al. (2017), BWC activation among on-duty officers is limited, as cameras were activated in a mere 32% of incidents during their analysis. Additionally, officers were more likely to activate their BWC in some incidents than others. For instance, BWCs were activated during 47% of domestic violence responses; 39% of violent offences; 26.5% of property offences; and 6.5% of traffic violations. Similarly, Ariel et al. (2016) found the effectiveness of BWCs to be dependent on the level of discretion that on-duty officers have regarding camera activation. Specifically, when police discretion was used during response calls, the reported use of force significantly increased. Although the direct causal relationship cannot be determined, Ariel et al. (2016) speculate that activating a BWC during a tense response call may serve to increase the aggression of the suspect, and thus the responding officer. As demonstrated, these reported instances of low compliance rates by on-duty officers can diminish the potential effectiveness and efficiency of BWCs and further erode public trust.

2.8.2 Automatic license plate readers.

Although invented in 1976, police services across North America are only recently acquiring and using ALPR technologies to increase the effectiveness and efficiency of their knowledge work by expanding their collection of data and expediting the time-consuming process of manually cross-referencing vehicle license plates with lists of stolen vehicles (Dryer & Stroud, 2015; Roberts & Casanova, 2012). ALPRs function by automatically capturing images of vehicular license plates, converting the captured images into alpha-numeric characters, comparing the license plates to several private and public sector databases, and alerting the on-duty officer if the vehicle is stolen or involved in criminal activity (Dryer & Stroud, 2015;

Roberts & Casanova, 2012). ALPR systems are also used as a tool for mass surveillance to capture information regarding the location of vehicles at specific times and dates (IPC, 2017). This series of functions by ALPRs happens in mere seconds and can often capture up to 1,800 reads per minute (Dryer & Stroud, 2015). With such rapid and vast data collection, analysis, and interpretation, scholars have raised concerns surrounding the efficiency and effectiveness of ALPR use by police services.

Few North American police services have sought to discover whether ALPR use was indeed improving their effectiveness and efficiency of motor vehicle theft detection. For instance, the Vallejo Police Department partnered with BetaGov to conduct a randomized control trial that provided limited empirical evidence showing that ALPR technologies effectively identify stolen cars and linked individuals to motor vehicle theft crimes (BetaGov, 2017). Although cars equipped with ALPRs identified more stolen vehicles and wanted suspects than the control group, the result was not statistically significant considering the number of hits. Ultimately, this trial demonstrated the limited efficiency of ALPR technologies, and could only conclude that there is a potential for on-duty officers to locate more stolen cars using ALPRs.

Misreads can limit the effectiveness and efficiency of ALPR technologies, where the technology incorrectly flags a vehicle's license plate as stolen or involved in criminal activity. For instance, the Vallejo Police Department data showed 35 - 37 percent of "hits" labelled as misreads for both mobile and fixed ALPRs (BetaGov, 2017). According to Dryer and Stroud (2015), there have been numerous reports of persons being wrongly accused and apprehended by police services due to a misread by ALPR technology. In their analysis of ALPR use by the Ontario Provincial Police (OPP), the Information and Privacy Commissioner of Ontario ([IPC], 2017) found the potential for ALPR systems to capture and extract inaccurate vehicle license

plate information (e.g., mud-covering a license plate causing a misread). Dryer and Stroud (2015) further this discussion by pointing to the lack of national standards regarding the design and manufacture of license plates as one of the reasons for ALPR misreads. Additionally, while the system may capture and extract the correct license plate number, the issuing province may be incorrect (IPC, 2017). Taken together, it seems that the effectiveness and efficiency of ALPRs warrants further academic attention.

2.8.3 Facial recognition software.

FRT has presented itself to be one of, if not the most, controversial RT to be adopted and used by the police on an international scale. In its most basic form, FRT numerically sorts the biometrics of the face and creates a digital identity for the individual who was captured by the technology for the purpose of suggesting or verifying an existing identity (Galterio et al., 2018; Gates, 2006; Mann & Smith, 2017). While these biometric technologies are routinely used in other aspects of public safety (e.g., border control), they are a relatively new and severely underregulated tool for police (Hill et al., 2022). Police use of FRT typically matches biometric information against existing police databases (e.g., mugshots) to identify a list of potential suspects. The perceived benefits of this technology presented to and by the police to advocate for their adoption and use include 1) locating potential high-risk individuals (e.g., terrorists, missing/trafficked persons, and sexually exploited children) (Carter, 2018; Galterio et al., 2018; Hamann & Smith, 2019; Klum et al., 2014; Nesterova, 2020); and 2) improving the effectiveness and efficiency of investigative efforts (Kotsoglou & Oswald, 2020). Despite these perceived benefits, FRT has been heavily criticized regarding the genuine efficiency and effectiveness of the technology in practice.

The increased interest and swift adoption of FRT by policing organizations do not coincide with the technology's ability to demonstrate operational effectiveness or efficiency in policing duties. Specifically, the accuracy rates of FRT are frequently called into question and tend to be less accurate than other available RT (Garvie et al., 2016). To elaborate, the accuracy of the technology tends to be dependent on several factors (e.g., lighting, photo quality, thresholds, physical qualities of the individual, and training sets) (Arigbabu et al., 2015; Dessimoz & Champod, 2016; Hood 2020). It has also been established that FRT, especially when used in real-time, is less accurate in identifying individuals who belong to minority groups due to a lack of diversity in algorithmic training sets implemented by the vendor (Grother et al., 2019). As a result, scholars such as Benedict (2022) have argued that an identification via FRT is not sufficient to establish probable cause. These potentially inaccurate conclusions drawn by the algorithmic design of FRT raise significant concerns about the potential bias and discrimination at the hands of the police.

2.8.4 Limitations to the effectiveness and efficiency of risk technologies.

Scholars agree that the impacts of RT on police effectiveness and efficiency can be limited by several factors (Chan, 2001; Ioimo & Aronson, 2004; Koper et al., 2014; Lum et al., 2017; Koper et al., 2015; Strom, 2017). These factors include but are not limited to the degree and timing of planning for technology implementation, unexpected costs, the capacity of personnel, management attitudes and practices, agency culture, communication, buy-in, and the current government and community climate (Chan, 2001; Koper et al., 2014; Lum et al., 2017; Strom, 2017). As exemplified in their examination of four US police agencies, Koper et al. (2014) found traditional/reactive police culture and limited technological training to be key factors in the demise of successful technological implementation, therefore hindering the

potential effectiveness and efficiency of products. Consequently, many of the aforementioned factors can lead to technology resistance and disuse, forcing agencies to abandon costly equipment and resort to more traditional/reactive methods of police work (Ericson & Haggerty, 1997; Meehan, 1998; Strom, 2017). Given such mixed empirical results concerning the adoption of RT in the literature, the question remains as to why police services are increasingly investing in them.

2.9 Gaps in the Literature and Current Inquiry

As evidenced in the literature review, the rapid growth of data collection by police has raised new questions regarding the use of private sector technologies for policing purposes. However, very little is known about how police services decide to invest in, acquire, and use these technologies in the first place, especially within the Canadian context. Correspondingly, empirical evaluations of RT are scarce. Existing impact evaluations of RT in policing are often from digital technologies introduced during the late 1990s IT wave and fail to account for emerging RT and big data. On a similar note, although technological change continues to be a persistent force in policing, there has been relatively little research on the impacts of technology in policing beyond technical, efficiency, or process evaluations (Koper et al., 2014). Without an in-depth analysis of these technological changes, it remains unclear how risk-based algorithms embedded in many of these technologies identify individuals and subsequently place them into categories of risk that can have a substantial influence on their future as Canadian citizens (Eubanks, 2018; Ferguson, 2017; Joh, 2016; Miller, 2019). A limited understanding of the socio-technical implications of RT on police organizations and their use on the public ultimately limits the effectiveness of technology acquisition and implementation in the future. As such, factors beyond the technology itself, such as the influence of peers and the involvement of external

influences in technology investment decisions, must be considered to accommodate the unique and complex structure of police services (Lindsay, Jackson, & Cooke, 2014).

Although there has been a call for the examination of factors influencing the decision-making of police services (Lindsay et al., 2014), the influence of private technology corporations on the public sector is wildly unacknowledged (Hood, 2020). From a theoretical standpoint, most of the research on technology acquisition and implementation by police is grounded in organizational perspectives that may not apply to the unique nature of police services (Hendrix et al., 2019; Strom, 2017). Similarly, macro-level theories that identify the undue influence of private surveillance technology corporations lightly scratch the surface of the potential detriment of blurring the lines between the private and public sectors, specifically regarding police services (Zuboff, 2015; Zuboff, 2019). By disregarding the contributing macro-level factors on police decision-making, the adoption of emerging RT by police organizations cannot be fully understood.

This research attempts to examine the acquisition and implementation of RT by Canadian police services. In hopes of addressing the gaps in the literature, this research will specifically examine the decision-making processes behind the acquisition of data-driven RT by municipal/regional police services across Canada. This research will also seek to challenge the current organizational theoretical constructs surrounding technology acquisition by utilizing Ericson and Haggerty's (1997) PRS and Zuboff's (2015; 2019) SC theorizing. Therefore, following the theoretical framework outlined above, this research will extend beyond the current technology and policing literature by thoroughly examining the relationship between private technology corporations and police services in Canada.

Specifically, the research questions guiding my dissertation research are: 1) How do police make decisions about which risk technologies to acquire?; 2) What role does the private sector play in the acquisition and implementation of risk technologies by Canadian police services?; 3) What are the impacts of acquiring and implementing risk technologies on police personnel?; and, 4) How can police services best acquire and implement new risk technologies to meet their organizational and strategic missions while safeguarding rights and avoiding unethical uses? In the next chapter, I discuss the methods used to answer these research questions.

CHAPTER 3: METHODOLOGY

3.1 Introduction

This chapter focuses on the methods used to collect data for this dissertation. Firstly, the procedures, sampling, and analysis are discussed for the three phases of the study, as well as the rationale for choosing a tri-phased approach to answer the overarching research questions. Phase 1 included a mixed-methods survey that was sent to municipal/regional police services across Canada. Phase 2 involved semi-structured interviews with police administrators who were identified as instrumental in technological decision-making in their police service. Phase 3 included a content analysis of Canadian police services' publicly accessible strategic plans. Finally, the ethical considerations for carrying out this research are outlined.

3.2 Data Collection: Procedures, Sampling, and Analysis

The methodological approaches taken in this dissertation are anchored in PRS (Ericson & Haggerty, 1979) and SC frameworks (Zuboff, 2015; 2019). PRS helps to illuminate the role of police as predominantly knowledge workers *and* consumers with increasing external demands for information. SC compliments PRS by illuminating the macro-level influences on police services' technological decision-making. To elaborate, SC complements PRS theorizing by recognizing the complexities that accompany the increasing external demands for information (e.g., the consumer-vendor relationships between private technology corporations and police services). Although the current study is guided by these two theoretical approaches, the methodological approaches in this dissertation are predominantly exploratory. The current study is considered primarily exploratory because there has been limited research on the initial processes of acquisition, including who is considered a "technological decision-maker", and I am

using participants' understandings to help elucidate this issue (Creswell, 2014; Creswell & Creswell, 2018; Morse, 1991).

The dissertation entails three interconnected mixed-methods phases. Arguably, mixed-method designs provide deeper insight into the problem or question at hand when compared to the exclusive use of only one quantitative or qualitative method (Creswell, 2014; Creswell & Creswell, 2018). Additionally, to enhance macro-level research on the police, there has been a specific call for more mixed-method research (Greene, 2014; Goode & Lumsden, 2018). Therefore, by incorporating a mixed-method design, a more holistic understanding can be gathered from the data. Accordingly, I utilized a quantitative survey, qualitative semi-structured interviews (Phase 2) and a content analysis (Phase 3). Together, these three phases helped to obtain a more holistic account of police decision-making on RT than any one method alone (Creswell, 2014). Overall, and as discussed in the subsequent section, the tri-phased approach used in this dissertation focused on garnering a better understanding of the acquisition and implementation of RT by Canadian police services. Consequently, through the triangulation of data sources, the corresponding limitations and biases associated with any one methodology when used independently should be minimized (Creswell, 2014; Creswell & Creswell, 2018). In what follows, the tri-phased approach to the current research is described beginning with the nationwide survey, followed by the semi-structured interviews, and subsequent content analysis of organizational strategic plans.

3.2.1 Phase 1.

The first phase of this research is a mixed-method survey created using Qualtrics© software. According to Creswell and Creswell (2018), "a survey design provides a quantitative description of trends, attitudes, and opinions of a population… by studying a sample of that population" (p. 207). Accordingly, a survey was chosen for this phase of the current study for its

established reputability in the social sciences as a relatively systematic and empirical approach (Creswell & Creswell, 2018; Marsden & Wright, 2010). Further, self-report surveys are both efficient and inexpensive, as they can be mass-administered to several participants at one time (Paulhus & Vazire, 2007). Therefore, a mixed-method survey was chosen over and above other methodologies to collect both open-ended and closed-ended responses pertaining to the acquisition and implementation of RT by municipal/regional police services across Canada. Overall, the national survey provided an opportunity to explore the state of RT acquisition and implementation practices by Canadian police services. The survey was utilized as a means of obtaining a baseline understanding of the topic, as limited previous literature exists.

Phase 1 of this dissertation entailed a 15-minute survey (see Appendix A) which was administered to municipal/regional police services across Canada via email correspondence. The email invite was sent to police leaders serving the 141 stand-alone municipal/regional police services and 36 First Nations self-administered services across Canada. Additionally, the invitation to participate was sent out via social media (i.e., X [formerly known as Twitter]) and was included in the Canadian Society of Evidence-Based Policing (Can-SEBP) newsletter (Appendix F). The justification for such a wide administration of the survey was to gain a thorough understanding of how RT is currently acquired and used across Canadian municipal and regional police services. The invitation to participate in the survey included an official letter addressed to the police leader detailing the process of the current study, a link to the survey for review to answer any initial concerns, and a pre-drafted email including an explanation of the current study as well as the necessary information concerning confidentiality, anonymity, and right to refuse/stop participation (see Appendix B). If the police service agreed to participate, the pre-drafted email was sent to all employees who were involved with the acquisition of RT (i.e., civilian employees and sworn-in

officers). Police employees who agreed to participate began the survey by clicking the embedded link, which led to an online version of the survey hosted by Qualtrics©. The survey began on July 26, 2021, and closed on December 1, 2021. Two follow-up emails were sent out after the initial start date of the survey (i.e., August 30, 2021, and September 27, 2021). Although these dates coincide with the subsequent phases (i.e., semi-structured interviews and content analysis), preliminary findings were continuously examined and used in structuring the interview guide and thematic analyses.

The main objective of this survey was to understand how police services made decisions about which RT to acquire and implement to identify the impacts of adopting RT on police personnel in the Canadian context. The survey explored the perceptions of sworn police personnel from various ranks (e.g., front-line officers, Chiefs, management, and executives) who had experience with the acquisition, use, and impacts of RT on the success of policing activities. The administered survey adopted a previously used measure of police perceptions of technology acquisition and implementation in the US (i.e., Strom, 2017) with moderate modifications to acknowledge the technological and cultural differences between American and Canadian policing organizations[2]. The results of this survey served as a starting point for understanding how police make decisions about what RT to invest time and resources into. Additionally, the results of this survey were used to substantiate findings across the separate phases of the project.

The survey was divided into three sections: demographic information, recent experiences acquiring and using RT, and current/future plans for the acquisition of RT. The first section of the survey included demographic information about respondents' age, gender, race/ethnicity, size of

[2] Two sections will be used from the original survey administered by Strom (2017) - one concerning recent technology implementation and the other concerning current and future plans for technology acquisition. Unmanned arial vehicles, facial recognition technology, and digital evidence management systems were added to reflect emerging Canadian policing technologies.

police service, and location (e.g., West, East, Central). The second section of the survey asked participants to indicate their most recent experience acquiring and using RT, whether it be a new form of technology or an upgrade to a previously existing system. The list of RT provided by Strom (2017) was modified to include the following RT that have been recently introduced into Canadian policing: unmanned arial vehicles (UAV), FRT, and DEMS. Following this, participants were prompted to identify any issues concerning the acquisition and implementation of the selected RT (e.g., officer resistance, vendor support, cost). Apart from a few open-ended questions pertaining to decision-making and RT acquisition, the questions in this section used a Likert-scale design (e.g., A2: How long ago was that purchase made? 1: within the past year, 2: more than one year, less than 2 years, 3: more than 2 years, less than 5 years, 4: more than 5 years). The third section of the survey was designed to prompt information about the previously outlined RT that a respondent's police service had acquired or planned to acquire over the next five years. Specifically, this section asked about the importance of each RT for the outlined goals and strategies of the respondent's police service. Respondents who indicated their service as using listed RT in the past two years were prompted to rank the level of importance of the technology for the success of the related policing activity on a 3-point Likert-scale (i.e., 1 = not at all important, 2 = somewhat important, 3 = very important). To conclude the survey, respondents were asked a series of open-ended questions to collect any additional RT and corresponding information that may have been missed by the survey.

Statistical analysis software (i.e., SPSS) was used to analyze the quantitative data collected during this phase of the study. This software was used to generate descriptive statistics and to contextualize potential relationships in the data as further discussed in Chapter 4. As previously

mentioned, the data analyzed from the survey was used to triangulate the results from the subsequent phases of the study.

3.2.2 Phase 2.

This phase of the study entailed conducting semi-structured interviews with police personnel. Semi-structured interviews are a form of qualitative interviewing that can obtain extensive descriptions of participants' experiences about a specific research topic (Brinkmann, 2013; Denzin & Lincoln, 2005; Kvale, 2007; Kvale & Brinkmann, 2014). Further, semi-structured interviews create the opportunity for a mutually accomplished story, as the interviewer and interviewee co-construct the narrative (Adams, 2015; Fontana & Frey, 2005; Gubrium & Holstein, 2001). Therefore, semi-structured in-depth interviews were chosen for this phase of the dissertation over and above other methodologies in hopes of gathering a rich understanding of the experiences of participants with the adoption and implementation of RT. Overall, the semi-structured interviews provided an opportunity to learn about the inner workings of police services' technological decision-making. I was able to delve into the processes of RT acquisition while also gaining a deeper understanding of the various influences that contribute to a service's decision to adopt RT – such as the influence of vendors and marketing. Through conversations with participants, I was able to learn about their experiences with a range of technologies that may not have been considered in the national survey.

Phase 2 of this dissertation involved conducting semi-structured interviews with Canadian police personnel who have identified themselves as instrumental in making decisions about technology at their police services. These interviews were conducted with police personnel from municipal, provincial, and federal services to broaden the scope of the research and gather rich data on an underexplored topic. The semi-structured interviews ranged from 16 minutes and 38

seconds to 56 minutes and 49 seconds in length (M = 38:09) and were exclusively conducted virtually via Google Meet. The context for choosing this methodology was dependent on the COVID-19 pandemic national restrictions. Work-from-home mandates ignited the use of virtual conference platforms by several organizations (including police services) therefore, they served as a viable solution to limited in-person research. Following the scheduling of the interview, an email was sent to all participants with the confirmed date/time and a link to the digital consent form for them to read over prior to the research. They were also told to reach out if they had any questions or concerns with the material. As recommended by Creswell (2014), after confirming that the participant digitally sign the consent form, I explained the purpose of the study, the amount of time needed to complete the interview, the plans for the results of the research, and any ethical concerns. By informing participants of this information before the interview started, it helped reassure them of their rights and voluntary participation. For each semi-structured interview completed, a $10 donation was given to the Ontario Police Memorial Foundation (OPMF). These interviews were recorded using an audio-recording device and transcribed for analysis.

Participants in this phase of the study included executive members, civilian employees, and sworn officers who have been involved in the acquisition and/or implementation of RT (see Table 4.4). Participants were recruited using two techniques. Primarily, participants were recruited through expressed interest at the end of the quantitative survey in Phase 1. Specifically, participants were asked at the end of the survey if they would be interested in being contacted for an interview and were provided with a text box to leave their preferred method of contact. Notably, the contact information of the interested participants was not connected to their survey responses. I began sending the recruitment email to interested parties on September 21, 2021, requesting a scheduled date/time for the interview. Secondly, this phase of the research also

utilized snowball sampling/response-driven sampling (SS/RDS). Introduced by Coleman (1958-1959) and Goodman (1961), SS/RDS is a sampling method for hard-to-reach populations, meaning they are either too difficult or too expensive to obtain using traditional sampling methods (e.g., random sampling). In using this sampling method, this phase of the study began with a purposeful sample given that it is not possible to obtain a random sample from the population of interest (Goodman, 2011) through the recruitment of individuals who signed up from the survey. Purposeful sampling is commonly used in qualitative research in search of the most information-rich cases to maximize minimal resources (Palinkas et al., 2015; Patton, 2022). The process of purposeful sampling involves the selection of participants who are considered experts in the research topic of interest (Creswell & Plano Clark, 2011). The initial purposeful sample served as the first wave of participants, then the individuals who were referred by the first wave of participants served as the second wave, and so on. (Goodman, 2011; Heckathorn, 1997; 2011). The interviews began on September 23, 2021 and concluded on December 10, 2021.

The semi-structured interview questions are provided in Appendix H. These interviews were intended to expand on the questions posed and the results received throughout Phase 1. At the beginning of the interviews, questions targeted participants' work experience, their perceptions of technology acquisition and implementation in their service, and the role they play in technological decision-making. These questions highlighted a previously unexamined perspective of police personnel and their understanding of how decisions were made regarding RT. The next set of questions addressed the participants' experiences acquiring and implementing RT, seeking to examine the benefits and limitations of various types of RT. These questions delved deeper into the potential issues of RT meeting the institutional goals of policing

in terms of effectiveness and efficiency, ultimately highlighting the impacts of the acquisition and implementation of RT on police personnel. Finally, participants were asked about their perspectives on how police can best meet their technological goals. As the primary consumers of RT, these questions helped provide a much-needed voice for police personnel.

Qualitative data collected from the semi-structured interviews during Phase 2 were coded inductively. The qualitative data was analyzed for recurring themes using NVivo software to determine how the themes fit into the broader theoretical understanding of the topic (Creswell, 2014). Once the recurring themes were identified and categorized in NVivo, they were sorted using the theoretical constructs of PRS and SC. Although the analysis of the semi-structured interviews was guided by PRS and SC, the research was not bound by these constructs. As previously mentioned, there has been little written about RT acquisition, therefore, the analysis of participants' experiences was done in an exploratory manner to build a holistic understanding of the findings (Creswell, 2014; Creswell & Creswell, 2018; Morse, 1991).

When using this approach to data analysis, I began immediately following the first bit of data collection in order to guide subsequent interviews (Creswell, 2014). Therefore, data collected using the semi-structured interviews were examined several times using qualitative analysis software (i.e., NVivo). Following the systematic process of coding qualitative data, open and axial coding was used as the preliminary data analysis methods for all qualitative data. Open coding is an interpretive process where the data is analyzed for major similarities and differences across events/actions/interactions, while also being put into conceptual labels (Creswell, 2014; Corbin & Strauss, 1990). From this process, axial coding emerges where the data is repeatedly compared against each other to further develop categories and subcategories working towards one core phenomenon surrounded by related categories (Corbin & Strauss, 1990). According to

Charmaz (2005; 2017), this approach to qualitative data analysis can facilitate the examination of social life at multiple levels of analysis, therefore illuminating previously invisible processes. Using this approach, I was able to identify patterns and emerging themes in the data, while emphasizing the dominant influences on police decision-making surrounding the acquisition and implementation of RT. From this point, quotes were chosen from each dominant code to illustrate themes found in the data. This was achieved by selecting the most exemplary quote of a particular theme.

3.2.3 Phase 3.

As discussed in the literature, police services have been found to make decisions about technology independently of their organizational strategies and goals (Hendrix et al., 2019; Strom, 2017). To explore this further, the third phase of this dissertation involved a content analysis of the 71 publicly accessible strategic plans from police services at the municipal, provincial, and federal levels. This content analysis was conducted from October to December of 2021 and focused exclusively on the identification of technological decision-makers and police services' organizational direction in relation to technological goals and solutions. The decision to conduct the content analysis alongside the semi-structured interviews was done to identify potential avenues for the recruitment of police personnel who were instrumental in technological decision-making at their service. Additionally, I examined whether technological goals and solutions related to the responses provided by participants in the quantitative survey in Phase 1 and the semi-structured interviews in Phase 2. By framing the content analysis this way, I was able to triangulate results and have more confidence in the findings. Triangulating the results of the survey, semi-structured interviews, and content analysis was achieved by individually coding for dominant themes in NVivo then comparing themes across methodologies for commonalities.

While I acknowledge that publicly accessible strategic plans are likely heavily sanitized from the realistic operations of police services, it is imperative to understand the level of transparency that exists for technological decision-making in these spaces. Strategic plans are a useful tool for police services to communicate intended directives and to provide necessary transparency on policing operations, therefore, it was important to understand how these processes are currently being carried out.

The strategic plans of Canadian police services were collected from the official website of each service (where available). To do so, I visited the website of each Canadian police service and manually scanned for their strategic plan. Once the strategic plan was identified through the scan of the website, they were downloaded and stored in a folder on Google Drive. Although this did result in collecting some dated strategic plans (see Table 4.4), particularly from smaller police services that do not frequently update their websites, it was the most consistent and reliable method across services. Police services that did not have a website were excluded from this analysis. As with the data from Phase 2, the collected strategic plans were analyzed using NVivo. Thematic coding was used to ascertain three common themes: 1) Technological Goals; 2) Technological Solutions to Goals; and 3) Designated IT Plan. These coding categories served as a starting point for the content analysis and allowed for a second round of inductive coding to identify commonalities between the previous methodologies. For example, I was able to compare how technological solutions were perceived across the surveys, semi-structured interviews, and content analysis.

3.3 Ethical Considerations

Research has demonstrated that there are specific ethical challenges to consider when conducting research with police populations (Davies, 2016; Engel & Whalen, 2010; Goode &

Lumsden, 2018; Greene, 2014; Herbert, 2001; Spano, 2005). Correspondingly, it was essential to follow the specific guidelines presented in the literature while also adhering to the necessary parameters of the Research Ethics Board (REB) at Ontario Tech University. This study was reviewed by the Ontario Tech University REB (#16344) on June 7, 2021. These ethical principles were maintained during the research process by providing participants with clarity, confidentiality, and anonymity (Creswell, 2014). Additionally, on the part of the researcher, acknowledging power imbalances and areas of bias can increase trust and respect with participants while simultaneously minimizing risk (Creswell, 2014; Hatch, 2002). Lastly, reflexivity about one's ethical position as a researcher can help challenge underlying assumptions and give insight into how one's experiences impact how their research is conducted and analyzed (Creswell, 2014; Ibrahim & Edgley, 2015; Weis & Fine, 2000). In what follows, a discussion of the above-mentioned ethical considerations is presented.

3.3.1 Consent & the Disclosure of Information.

Informed consent is an integral part of Phase 1 and 2 of the current study. As such, all participants were presented with a consent form at the beginning of the survey in Phase 1 and prior to the semi-structured interviews in Phase 2 (Appendix B; Appendix C). Consent forms were not necessary for Phase 3 as the documents analyzed were publicly available. In line with the recommendations by Creswell (2014), the consent forms outlined the right of participants to voluntarily withdraw from the study at any time; the purpose and procedures of the study; the known risks associated with participation; the expected benefits of the study; the protection of confidentiality and anonymity of the participants and; a check of consent (i.e., during online survey research) or a signature from both the researcher and the participant (i.e., during semi-structured interviews). Participants were reminded that they do not need to feel coerced into

participating and they can choose to leave the discussion at any point. Additionally, participants were reminded that they do not need to answer any questions they do not feel comfortable with, and their responses would not impact their employment. Participants were also notified that the $10 donation to OPMF would be given regardless of whether they finished the interview or not, therefore eliminating the possibility of coercive impacts associated with contingently compensating participants in social science research (Fisher & Anushko, 2008). Additionally, given that the donation is for $10.00, it is not a significant amount of money for the participants to feel obligated to contribute to the research.

3.3.2 Confidentiality & Anonymity.

As previously mentioned, confidentiality and anonymity are core components provided to participants during the research process. According to the Tri-Council Policy Statement (TCPS2, 2018):

> The ethical duty of confidentiality refers to the obligation of an individual or organization to safeguard entrusted information. The ethical duty of confidentiality includes obligations to protect information from unauthorized access, use, disclosure, modification, loss or theft. Fulfilling the ethical duty of confidentiality is essential to the trust relationship between researcher and participant, and to the integrity of the research project. (p. 58)

Given the nature of policing and the public imagery associated with the job, there are several measures that needed to be taken in order to ensure the preservation of confidentiality and anonymity. Notably, the initial data from Phase 1 was entirely anonymous. Phase 2 involved collecting participants' email addresses (for recruitment and scheduling) and audio recordings. The email addresses were kept in the folder created for the study on the Ontario Tech G-Suite

and the file was password protected. Audio recordings were transcribed into a PDF text format that redacted any identifiable information (e.g., names, locations). Prior to the destruction of the audio recordings, they were placed into a password-protected folder on an external hard drive. Therefore, the mp3 files could only be accessed properly by downloading and entering a password on the device where they have been downloaded. Once transcriptions were created, individually password protected, and stored in the folder created for the study on the Ontario Tech G-Suite, the audio recordings were destroyed so no identifiable information remained (see Appendix G).

3.3.3 Power Relations.

Although not applicable to the survey and content analysis, all researchers conducting qualitative interviews must acknowledge potential power imbalances and actively mitigate the risks involved (Kvale & Brinkmann, 2014). Oftentimes, power imbalances stem from researchers interviewing vulnerable populations (Creswell, 2014; Hatch, 2002) – where researchers must be cognizant of their influence during an interview that could silence or harm the participant. However, although rarely discussed, the possibility exists for participants to hold an authoritative position over the researcher during an interview. For instance, when conducting research within police services, power imbalances could arise from the authoritative power that the police dominantly hold in society to begin with. For instance, Herbert (2001) discusses one such experience conducting research in police precincts and the difficulties that can arise from power imbalances between academics and police officers (i.e., limited trust, suspicion, teasing). To mitigate the assumed power imbalances between myself and the police, I attempted to build rapport that fosters trust and reputability through networking and establishing myself in the field,

while also safeguarding confidentiality and anonymity throughout the entire research process (Herbert, 2001).

Additionally, scholars have found that police services often demonstrate a genuine interest in academic-practitioner research partnerships to inform and enhance policing (Engel & Whalen, 2010; Goode & Lumsden, 2018). However, the previously common approach to police research by academics involved the tendency to write about the police rather than with the police, subsequently failing to acknowledge their perspectives and disempowering them from knowledge production (Marks et al., 2010). A transactional approach to research involves give-and-take, trade-offs, and compromise, including a bargain over outcomes that benefit both the researcher and organization members who are participants in the research (Cunliffe & Alcadipani, 2016). Although contingent on several organizational factors (e.g., priorities of the organization, culture, communication, and hierarchies), a transactional approach to research can cultivate an opportunity to bridge the gap between practitioners and academics. According to Engel and Whalen (2010), police-academic partnerships can enhance the impact of research, research quality, and accessibility. Additionally, academic-practitioner partnerships can serve as a catalyst for critical thought within the profession and increase the likelihood of the dissemination of research to inform policy (Goode & Lumsden, 2018). My dissertation embraces this transactional approach to research by providing interested police services with a report of the findings and practical implications.

3.3.4 Bias & Reflexivity.

Eliminating all bias in research is not possible, however, good qualitative research involves the researcher actively situating themselves in their own writings by acknowledging how their cultural and social position influence the interpretation of their work (Richardson,

1994; Creswell & Creswell, 2018). According to Creswell (2014), this process is referred to as reflexivity, "in which the writer is conscious of the biases, values, and experiences that he or she brings to qualitative research study" (p. 216). As a white female academic, I acknowledge that my experiences will shape how my research is conducted and interpreted. According to Davies (2016), by conducting research with the police I am considered an "outsider-outsider", as I have had no previous affiliation with the police. This position as the "outsider-outsider" can limit my credibility in the field and present additional barriers to developing trust and legitimacy with participants. To mitigate these influences, I followed the recommendation of Spano (2005) of incorporating a semi-structured field journal to increase researcher reflexivity. The field notes were used to contextualize information collected during the semi-structured interviews. Specifically, the contextual information was used to substantiate my interpretation of the common themes that emerged in the data.

3.4 The Benefits of the Current Study

By obtaining informed consent, ensuring confidentiality and anonymity, mitigating assumed power imbalances, and reducing potential areas of bias, the benefits of this study greatly exceed any risks associated with the proposed methodologies of this study. The benefits of this study include but are not limited to 1) an empirical examination of how Canadian police services decide to acquire and implement RT, 2) the addition of a Canadian context to the existing literature, 3) an understanding of the impacts of RT beyond technical, efficiency, or process evaluations, 4) the addition of a macro-level understanding of decision-making in police services, and 5) the opportunity for a transactional approach to research where academics and practitioners can benefit. Overall, this research is important because it helps to fill a gap in our

knowledge about the increasing use of RT by police services and the influences on their decision-making.

3.5 Conclusion

This chapter provided the methodological approaches and methods used for this dissertation. Through the use of these techniques, this dissertation answers the following research questions: 1) How do police make decisions about which risk technologies to acquire?; 2) What role does the private sector play in the acquisition and implementation of risk technologies by Canadian police services?; 3) What are the impacts of acquiring and implementing risk technologies on police personnel?; and, 4) How can police services best acquire and implement new risk technologies to meet their organizational and strategic missions while safeguarding rights and avoiding unethical uses? As discussed throughout this chapter, the current study incorporated a tri-phased, mixed-method approach. In the next chapter, I discuss the survey results, rich data obtained from participants through the interviews on the processes involved in acquiring and implementing RT in Canadian police services, and how/if RT are integrated into police services' strategic plans. With that, the results of this study help to inform future decision-making processes regarding RT.

CHAPTER 4: RESULTS

4.1 Introduction

In this chapter, I summarize the research findings derived from the three phases of the dissertation including the quantitative survey responses from 27 municipal police service personnel who identified as instrumental in technological decision-making, 11 semi-structured interviews with various Canadian police personnel, and the content analysis of 71 publicly accessible strategic plans of municipal, provincial, and federal Canadian police services. It is important to note that each phase was intended to be triangulated with one another to provide a holistic interpretation of technological decision-making. The results from each of these phases will be discussed in detail. Demographic information was included where possible, however, most of this information was redacted to protect the anonymity of both the participants and their organizations.

4.2 Phase One: Survey

4.2.1 Response rates.

The quantitative survey from Phase 1 of the research study was distributed to all Canadian police services with publicly accessible email addresses or websites with general inquiry pages (88.23%; n = 105). Follow-up reminders to complete the survey were sent out twice over the course of 4 months (July 2021 - October 2021). A total of 27 participants filled out the survey (response rate = 25.71%). However, the completion rate of the survey was low with an average of 63.63 percent. The participants who completed less than 100 percent of the survey still clicked through the survey however, they did not answer all of the questions. Therefore, the responses of the 27 participants were included in the analysis where applicable. While the number of participants is low, it is common and acceptable in police research settings

(Nix et al., 2019). Ultimately, the intentions behind selecting a survey was to begin to piece together an understanding of technological decision-making by police services in Canada rather than to generalize the findings to all Canadian police services.

4.2.2 Demographic information.

Demographically, participants' ages ranged from 42 - 57 years old (M = 48.5; SD = 3.95) with 37.04 percent identifying as male (n = 10), 3.70 percent as female (n = 1), and 11.11 percent (n = 3) as "prefer not to answer". Additionally, respondents were predominantly Caucasian (40.74%; n = 12) while the remaining participants preferred not to answer (7.41%; n = 2) or did not respond (48.15%; n = 13). The occupations of participants varied greatly, including the following positions: Deputy Chief (28.57%; n = 4); IT Director/Management (14.29%; n = 2); Superintendent (14.29%; n = 2); Staff Sergeant (14.29%; n = 2); Constable (14.29%; n = 2); Senior Leader (7.14%; n = 1); and Chief of Police (7.14%; n = 1). The demographics of the responding Canadian police services are summarized in Table 1 below.

Table 4:1 Canadian Police Service Demographics

Demographics	**Count**	**Percentage (%)**
Region of Canada		
Atlantic (NL, PEI, NS, NB)	1	3.70
Central (ON, QC)	8	29.63
Prairie (AB, SK, MB)	4	14.81
Northern (YT, NT, NU)	-	-
West Coast (BC)	1	3.70
Region of Service		
Rural region	4	14.81
Suburban region	2	7.41

Urban region	8	29.63
Service Size by Number of Sworn Officers		
Under 10	-	-
10 – 50	5	15.52
51 – 100	-	-
101 – 150	-	-
151 – 200	-	-
201 – 250	2	7.41
Over 250	7	25.93

4.2.3 Technology acquisition, use, and decision-making.

Participants were asked about their previous, current, and future plans to acquire and implement RT. When asked to select the type of technology that was most recently acquired and used in their service, BWCs were the most selected technology (36.84%; n = 7), followed by DEMS (15.79%; n = 3), dash cameras (15.79%; n = 3), other (i.e., e-ticket and business continuity) (10.53%; n = 2), crime mapping (GIS) software (5.26%; n = 1), UAVs (5.26%; n = 1), rapid DNA instruments (5.26%; n =1), and none of the above (5.26%; n = 1). In terms of timing, 77.78% (n = 14) of responding services acquired and used the selected RT within the past year, while the remaining services had used the technology anywhere between one- and five years (22.22%; n = 4).

Multiple actors from different departments and levels of management were involved in the decision-making process to acquire these technologies across most services. Participants' technological decision-making often included an IT director/technical expert, the Chief or Deputy Chief, command staff, and a departmental task force. At a handful of services, respondents noted only one or two decision-making entities (e.g., a departmental task force,

command staff, or the Chief/Deputy Chief) were responsible for decisions relating to their most recent technological acquisition.

Participants were also asked how they made the decision to acquire the make and model of their most recent RT. Often, multiple factors went into the decision-making process with one of 15 responding services selecting seven out of nine possible contributing factors; one service selecting four factors; five services selecting three and two factors; and three services selecting one factor. Overwhelmingly, consulting with other members of a different department within their police service was the most common factor involved in police services' technological decision-making (66.67%; n = 10) followed by conducting a scan of practice (e.g., an informal poll of other services' practices) (46.67%; n = 7); the product was specified by a grant or other external funding source (33.33%; n = 5); other (i.e., IT department recommended the product, proof of concept, a provincial level joint initiative, requirements were determined internally and research conducted to assess viable vendor solutions, and developed and ran a pilot to test competing technologies) (33.33%; n = 5); publications or website of government or professional association (26.67%; n = 4); vendor websites (26.67%; n = 4); approached by a vendor (13.33%; n = 2); and vendor exhibit at a conference (13.33%; n = 2). The use of trade magazines was not selected by any of the participating police services as a factor in their most recent technological decision-making endeavors.

The survey also documented participants' experiences with their most recent RT post-acquisition. This section of the survey aimed to gather the expectations and subsequent realities of the performance, cost, support, training, resistance, and preparation for the technology. In doing so, areas of concern can be identified that could be addressed in the earlier stages of decision-making prior to purchase. Most respondents indicated that the acquired technology

performed about as expected (66.67%; n = 12). The remaining participants stated that their acquired technology either somewhat exceeded (16.67%; n = 3) or greatly succeeded expectations (16.67%; n = 3). While most services reported that purchasing costs were about as expected (68.75%; n = 11), other services aligned with existing research (i.e., Chan, 2001; Koper et al., 2014; Lum et al., 2017; Strom, 2017), indicating that costs either somewhat (25%; n = 4) or greatly (6.25%; n =1) exceeded expectations. Previous research has highlighted the importance of discerning between purchasing costs and costs of implementation, as services often encounter unexpected costs (e.g., subscription fees, repairs, training) during different phases of the adoption process (Strom, 2017). As such, services were asked about their expectations in relation to implementation costs. In line with previous research, most services indicated that the implementation costs of the technology somewhat exceeded expectations (53.33%; n = 8).

To better understand police services' technological implementation, I asked a series of yes/no questions regarding whether certain issues were encountered implementing RT, followed by whether the issue was minor or major in nature. Before delving into these findings in more detail, it is important to note that services reported multiple issues beyond those asked in the survey, including a lack of dedicated IT support, organizational expectations being above the functional capabilities of the technology, poor equipment support, poor leadership, COVID-19 restrictions preventing on-site technical support, wireless/cloud storage technology issues, strict timelines, lack of cohesion from the project team, inadequate staff to manage and provide training, and downstream impacts to business operations and stakeholders. These additional issues with RT acquisition and implementation were collected through the open-ended question "Did you experience any other difficulties implementing this technology? If so, what were

they?". Services were also more likely to report multiple issues with the implementation of the technology rather than one isolated issue. This finding points to a potential domino effect of issues that arise at the individual and organizational levels without the proper foundations for adoption in place.

To identify issues with support, participants were asked "in implementing this technology, did your service experience any problems with poor vendor support?". Only one service indicated a minor issue with poor vendor support upon implementing their BWCs. Next, I asked, "in implementing this technology, did your service experience any problems with poor management support?". One service indicated a major issue with management support upon implementing BWCs.

In terms of training, participants were asked "in implementing this technology, did your service experience any problems with inadequate training of technical staff?". Three services indicated a minor issue with adequate training of technical staff in the use of technology, including BWCs (n = 2) and dash cameras (n = 1). Next, participants were asked, "in implementing this technology, did your service experience any problems with inadequate training of end users?". Five services indicated an issue with the adequate training of end users in the use of technology, including BWCs (n = 2), business continuity (n = 1), dash cameras (n = 1), and DEMS (n = 1), two of which highlighted the issue as major.

To understand police services' experiences with technological resistance post-implementation, I asked "in implementing this technology, did your service experience any problems with resistance from end users?". Results demonstrated that seven services experienced minor issues with end-user resistance to technology, including DEMS (42.86%; n = 3), BWCs (28.57%; n = 2), dash cameras (14.29%; n = 1), and e-ticketing (14.29%; n = 1). Resistance was

also raised on a broader spectrum by asking, “in implementing this technology, did your service experience any problems with staff resistance?”. Six services indicated a minor issue with overall staff resistance to technology, including DEMS (50%; n = 3), BWCs (16.67%; n = 1), dash cameras (16.67%; n = 1), and business continuity (16.67%; n = 1).

Last, I gathered perceptions of preparedness for the implementation of the technology. Participants were asked, “in implementing this technology, did your service experience any problems with a lack of preparation?”. Six services experienced issues with preparation for the implementation of their technology, including BWCs (n = 3), dash cameras (n = 1), e-ticketing (n = 1), and business continuity (n = 1). Half of these respondents indicated that they experienced major issues with their service’s level of preparation.

Overall, results from the survey highlight BWCs, DEMS, and dash cameras as dominant RT being adopted in the field of policing. The decision-making processes surrounding the adoption and implementation of these RT were generally influenced by consulting with a different department within their service and gathering information from other services that have experience with the product. While most services reported that their most recent technology adoption met their general expectations, participants also reported additional costs as an unexpected accompaniment. Identified issues surrounding the use of their selected technology were both technical and organizational in nature. Often, participants made note of issues surrounding training, preparation, and end-user resistance to their use of BWCs and DEMS. To explore whether the experiences with their most recent technology purchase translated to additional RT in their service, participants were asked about their experiences and satisfaction with 17 additional RT.

4.2.4 Experiences and satisfaction with additional risk technologies.

I was also interested in gathering a list of services' additional experiences with RT and their corresponding satisfaction levels. These questions served as a starting point for the subsequent semi-structured interviews discussed below. Participants were asked about their experiences with 17 common RT. This list was compiled using the outline provided by Strom (2017) with the removal of data mining tools, search and data sharing across silos, and software to discover connections as the scope of the current study involves RT with data collection capabilities. I included the addition of UAVs, FRT, and DEMS to match the proposed definition of RT as well as to complement the existing landscape of Canadian policing. Results for this section are presented in Tables 2 and 3 below.

Table 4:2 Use of Additional Risk Technologies by Services in Past Two Years

Risk Technology Type	**Yes (%)**	**No (%)**
Crime mapping/Geographic information system (GIS) software	15 (88.23)	2 (11.77)
Predictive analytics software	5 (35.71)	9 (64.29)
Investigation case management software	10 (71.43)	4 (28.57)
Software to track cell phones and exploit cell phone data	10 (71.43)	4 (28.57)
Regional/national information sharing	7 (50)	7 (50)
Automatic License Plate Readers	12 (75)	4 (25)
Acoustic gunshot detection	-	16 (100)
Rapid DNA instruments	3 (21.43)	11 (78.57)
Mobile biometric devices	5 (38.46)	8 (61.54)
Closed-circuit television (CCTV) and video content analysis (VCA)	9 (69.23)	4 (30.77)
Gun/contraband detection	-	13 (100)
Early intervention systems concerning officer behaviour	7 (50)	7 (50)
Dash cameras	8 (53.33)	7 (46.67)
Body-worn cameras (BWCs)	9 (60)	6 (40)

UAVs (drones)	11 (73.33)	4 (26.67)
Facial recognition software	2 (15.38)	11 (84.62)
Digital Evidence Management Software (DEMS)	12 (80)	3 (20)

Table 4:3 Importance and Satisfaction Ratings of Additional Risk Technologies

	Importance			**Satisfaction**		
	Not at all	Somewhat	Very	Not at all	Somewhat	Very
RT Type						
Crime mapping/Geographic information system (GIS) software	-	6 (42.86)	8 (57.14)	1 (7.14)	10 (71.43)	3 (21.43)
Predictive analytics software	1 (20)	2 (40)	2 (40)	1 (20)	10 (71.43)	-
Investigation case management software	-	4 (40)	6 (60)	1 (10)	8 (80)	1 (10)
Software to track cellphones and exploit cellphone data	-	3 (30)	7 (70)	-	9 (90)	1 (10)
Regional/national information sharing	-	2 (28.57)	5 (71.43)	1 (14.29)	3 (42.86)	3 (42.86)
Automatic License Plate Readers	-	8 (66.67)	4 (33.33)	2 (18.18)	6 (54.54)	3 (27.27)
Acoustic gunshot detection	-	-	-	-	-	-
Rapid DNA instruments	-	-	3 (100)	-	-	3 (100)
Mobile biometric devices	-	2 (40)	3 (60)	-	4 (80)	1 (20)
Closed-circuit television (CCTV) and video content analysis (VCA)	-	-	9 (100)	-	7 (77.78)	2 (22.22)
Gun/contraband detection	-	-	-	-	-	-
Early intervention systems concerning officer behaviour	-	1 (14.29)	6 (85.71)	3 (42.86)	2 (28.57)	2 (28.57)
Dash cameras	-	4 (50)	4 (50)	-	7 (87.5)	1 (12.5)
Body-worn cameras (BWC)	-	3 (33.33)	6 (66.66)	-	6 (66.66)	3 (33.33)
UAV (drones)	-	4 (36.36)	7 (63.64)	-	8 (72.73)	3 (27.27)
Facial recognition software	-	1 (50)	1 (50)	-	2 (100)	-

Digital Evidence Management Software (DEMS)	-	1 (8.33)	11 (91.67)	-	5 (41.67)	7 (58.33)

4.2.5 Future technology acquisition.

To explore the potential adoption and implementation of RT, participants were asked about their plans to acquire a range of technologies over the next five years. The five-year range was selected to match the most common timeframe of police services' strategic and operational plans. Specifically, participants were asked about their plans to adopt the following technologies, crime mapping/GIS software; predictive analytics software; investigation case management software; software to track cell phones and exploit cell phone data; regional/national information sharing; ALPRs; acoustic gunshot detection; rapid DNA instruments; mobile biometric devices; CCTV and VCA; gun/contraband detection; early intervention systems concerning officer behaviour; dash cameras; BWCs; UAVs; FRT; and DEMS.

Often, respondents were unsure of their service's plans to adopt technologies over the next five years. Additionally, respondents rarely indicated plans to adopt any of the technologies listed. Of the 17 technologies listed, respondents indicated an interest in some capacity for 11 of them. Specifically, software to track cell phones and exploit cell phone data (50%; n = 2), BWCs (33.33%; n = 2), DEMS (33.33%; n = 1), dash cameras (28.57%; n = 2), ALPRs (25%; n = 1), UAVs (25%; n = 1), predictive analytics software (22.22%; n = 2), FRT (20%; n =2), regional or national information sharing programs or databases (14.29%; n = 1), early intervention systems to identify or track problematic officer behaviour (14.29%; n = 1), acoustic gunshot detection systems (6.25%; n = 1). To explore police services' future RT acquisition and understanding of RT further, the following section includes semi-structured interviews with 11 Canadian police services followed by a content analysis of existing Canadian police services' strategic plans.

4.3 Phase Two: Semi-Structured Interviews

4.3.1 Demographic information.

Semi-structured interviews were conducted with 11 Canadian police services to gather insight regarding how their organization makes decisions about technology, as well as their perceptions of potential influences, benefits, and limitations associated with implementing RT. Interviews were conducted during September - December 2021 with individuals from a range of policing occupations (see Table 4.4). To protect the anonymity of participants, additional demographic information (e.g., gender, age, service title) was not collected.

Table 4:4 Semi-Structured Interview Participant Demographics

Employment Title	Service Jurisdiction Type	Employment Status
Deputy of Operations	Municipal	Active
Superintendent - IT Division	Municipal	Active
Access and Privacy Unit	Municipal	Active
IT Manager	Municipal	Active
Deputy Chief	Municipal	Active
IT Supervisor	Municipal	Active
Communications Division	Municipal	Retired
Chief	Municipal	Active
IT Manager	Municipal	Active
Superintendent - IT Division	Municipal	Active
Major Crimes Division	Federal	Active

4.3.2 Decision-making.

4.3.2.1 Process of acquisition.

Participants were asked how their current police service makes decisions regarding technology adoption. The process of technology acquisition ranged vastly from service to service. As a result, the processes were divided into two main codes: formal and informal. These two main codes will be discussed in detail below.

Responses were coded as formal if participants mentioned any form of procurement policy/procedure that was required by the service for technology adoption (e.g., request for proposals, proof of concepts, tendering, privacy impact assessments). Based on the semi-structured interviews, it seems that the standard processes of technology acquisition by police services are structured around the financial capabilities of the service and can include a procurement process to identify organizational needs, a request for proposal, point system evaluations, and a proof of concept. The following is an exemplary account of a formal acquisition process at a participant's service:

> *We followed a procurement process that required us to identify our needs, work with a procurement team to issue a request for proposal, receive that, review the requests based on our documented needs…you evaluated the presentation of shortlisted presenters for the technology. And once that was done, we also implemented a proof of concept phase where the vendor was required to be on-site and provide to us a proof of concept that what they could do would work. And then once that was done, we moved forward with the actual selection and contract negotiations with that particular vendor* (Participant 006).

Based on this participant's experience, their service follows the previously mentioned traditional acquisition process for all technology adoption requests. Another service echoed this process, while also highlighting the importance of maintaining a formal approach to technology adoption:

> *As an example, requests for purchases… We want to go to purchase something, we've often times had to tender it into an RFP [request for proposals] process to create fair competition. Otherwise, you know, you're open to… let's just say corruption. You can have vendors providing benefits that we're not allowed to take, so* (Participant 002).

According to Participant 002, without a formal process for technology acquisition, services create opportunities for bias in vendor selection (e.g., bribery, conflict of interest). As such, it is suggested that implementing a formal procurement policy will mitigate the opportunities for bias and promote fairness between suppliers.

Notably, one police service has implemented a unique formal process for technology acquisition that circumvents the traditional approach in hopes of quicker rates of adoption. The unique formal process is as follows:

> *But, we've set up like an adaptive sourcing program where we've prequalified a bunch of vendors that can deliver some services to us within different streams. So, analytics… so, now we've prequalified a bunch of vendors for a 5-year period that we can say we've got an issue that we want to look at and it falls within analytics… we can now quickly engage those vendors in a prequalified state. It's not to circumvent the procurement process. We went through the RFP thing to get them all prequalified but it makes us more agile at the development stage* (Participant 002).

According to this service, prequalifying vendors in different sectors of technology requirements (e.g., analytics) using formal requests for proposals allows their organization to quickly engage with products and make timely decisions. This was the first and only mention of an innovative formal approach to technological decision-making.

Police services also discussed contingencies in their selection of formal acquisition processes. It seems that the chosen route for technology acquisition can depend on several factors. The cost of the technology was noted as a contributing factor to the formal process selection, as the following respondent mentioned: "*anything under $25,000 we always try and get three quotes…between $25,000-$50,000 you* ***have*** *to have three quotes*" (Participant 004).

According to Participant 004, there is flexibility in the requirements for purchasing technology dependent on the cost of the item. For lower-cost items, this police service is encouraged to obtain three quotes from different vendors, but it is not a strict requirement. For higher-priced items (above $25,000), this service must provide three separate vendor quotes. The novelty of the product on the market was also mentioned as a contributing factor to the decision-making process. As Participant 004 illustrates, "... *it's always depending on the product…If it's something that's really new and the market may not be really ripe yet, we will do proof of concept*". This account implies that a proof of concept is contingent on how established the product is in the policing environment. If a piece of technology is not well known, this service would implement a formal proof of concept to test the potential effectiveness and efficiency of the technology in their organization.

Responses were coded as informal if there was a lack of policy/procedure in place for technology acquisition or if there was any mention of failing to follow an existing formal policy/procedure. The following is an exemplary account of a service's acknowledgment of an existing formal process to technology acquisition while sharing a more preferred informal method:

> *Technically it's supposed to be done through a…business case if it's going to be for the whole organization…[but] we'll have brainstorming sessions to try and put down…have multiple ways and different technologies that we could use to solve the problems that we're looking at. And then, try to formalize on and agree on the least impactful overall to the organization is always number one…cost is always huge and ongoing support as well* (Participant 007).

Participant 007's experience with technological decision-making involves an informal brainstorming session with members to choose organizational priorities in their technology selection. Other police services mentioned similar benefits of incorporating less traditional approaches to technological decision-making, as more members can provide input and ideas can move much quicker than through traditional channels.

As such, regardless of the existence of a formal process for technology acquisition, most participating police services also incorporated informal methods into their decision-making. As Participant 002 illustrates, "*Sometimes it's very informal*". Participant 009 adds to this sentiment by stating, "*It's a little bit of both*". Participant 008 also states, "*So, if you think of traditional policing procurement rules, which are totally broken…*". While this narrative was common amongst participants, the type of informal acquisition process and the points at which these processes were implemented varied greatly between services.

However, the police services who followed informal acquisition processes also highlighted unclear organizational directives alongside an unfamiliarity with new technologies. As stated by Participant 006, "*As often happens, it's…we're not necessarily knowing fully what we want*". This statement suggests that the informal approach to technological decision-making can begin as early as the formulation of ideas for adoption. This sentiment was reiterated by Participant 004, "*Yeah, first it starts with the idea which is informal, right? So, somebody has a little hunch…or they heard another agency did something that could be interesting*". Similarly, Participant 007 explains, "*To a degree…we definitely let everybody [within the IT department] have some say in what we do and what we adopt*". According to these responses, ideas for technology adoption are not formulated through formal channels, such as organizational needs established in strategic or business plans. Rather, hunches, inspiration from other agencies, and a

reliance on individuals within the organization who are comfortable with technology seem to ignite the decision-making process.

When discussing how their organizations make decisions about technology, many respondents expressed frustrations with their current processes. These frustrations ranged in nature from individualistic concerns to organizational barriers. Participant 005 highlights their frustration with the timeline of technology decisions, "*Very delayed… It's like pulling teeth*". The existing formal approach to decision-making in their service seems to delay implementation to the point of frustration. Participant 005 also adds, "*Yeah, there is a formal process. There's a requirements document that they have…a template that can be filled out. The problem is that no one knows about it*". According to Participant 005, the lack of awareness across the organization for members to formally bring ideas forward also hinders technological decision-making.

Other concerns surrounded organizational barriers, including Participant 009's experience, "*We don't have a formal environment for private companies to come in or even public companies to come in and make presentations for us*". According to this account, the limited space for live demonstrations from vendors within their police service hinders their ability to make decisions about technology. Last, some services highlighted issues surrounding strategic planning/assessment for technological decisions. Participant 008 shares their experience, "*...well, isn't that a little backwards, wouldn't you think about policies and governance…before you make a multimillion-dollar purchase?*". The deficiencies in the order of operations conveyed by Participant 008 are echoed in criticisms leveled by civil liberties organizations (Gates, 2002; Hood, 2020; Joh, 2014; 2016; 2017; Lupton & Michael, 2017; Patton et al., 2017; Piccorelli & Elias, 2018; Saulnier & Thompson, 2016), as technology frequently seems to be adopted prior to proper ethical vetting. To delve deeper into these

concerns, participants were asked about potential factors that could influence technological decision-making at their police service.

4.3.2.2 Influences.

As previously mentioned, participants were asked to describe the factors that influence their technological decision-making. With this specific focus on decision-making, seven themes emerged: 1) Society; 2) Vendors and marketing; 3) COVID-19; 4) Evidence-based policing; 5) Economy; 6) External government body; and 7) Organizational. The following section is dedicated to discussing each of these seven themes in detail. While each of these themes will be discussed separately, it is important to note that there are interconnections between themes as many factors co-exist in policing environments.

Societal influence played a large part in police services' decision-making surrounding technology. Responses were coded as having societal influence if there was any reference to public engagement/consultation or societal pressure. Collectively, the data shows that members of the public are not frequently engaged in police decision-making. As Participant 002 states, "*We don't engage the public so much. We do when it becomes contentious*". However, many services spoke to the importance of including the public in decisions about technologies that will directly impact their privacy (e.g., FRT). Participant 004 nicely summarizes the technology-dependent nature of including public opinion:

> *We do think about the public and we want to make sure that there's an awareness because there are products that can be taboo, which if you're doing the research, you may have heard or you may have seen the facial recognition software. So, we do have to keep the community in mind when we do these things because we want to make sure that whatever we do, the community will feel not at risk or that their privacy's impacted.*

Similarly, Participant 006 shares, "*...if we were building something that was external facing, then we would engage in some focus groups*". While the importance of public opinion was acknowledged in many conversations, the physical act of engaging/educating the public in police decision-making seems to occur post-implementation or not at all. Engaging members of the public at the onset of decision-making does not seem to be prioritized by Canadian police services.

Many services spoke of the influence of societal pressures to adopt technology solutions. Respondents often referenced BWCs as a glaring exemplar when speaking of this influence. Participant 003 shares, "*I think definitely the political climate. Body-worn [cameras] are something that just everybody is looking to do at this point to address the concerns that are out there*". This sentiment was echoed by Participant 011:

> *It's just because the public wants us to have them, because they think that it'll make us less racist and be held more accountable, but that's not ever solving that issue of whatever they think that we're doing. So, I don't see actually the bodycams are having a huge impact on how we're doing our jobs, to be honest – maybe in the States, not here.*

Overall, the data shows that public pressure can be a driving force in technology adoption by police services. According to respondents, despite the effectiveness of the technology, if there is enough pressure from the public to demonstrate transparency in certain facets of policing, the technological "solution" will be implemented.

Every participating police service also acknowledged the considerable influence of vendors and marketing. Participants mentioned several influencing factors involving technology vendors, including cold calls/emails, discount offerings, live demonstrations, research and development agreements, reputability, sales tactics, shared values, and social media. Most

interestingly, every respondent identified the compelling influence of vendor conferences/trade shows in police decision-making. As Participant 007 states, "*I would say, in our industry, trade shows are huge*". Similarly, Participant 009 shares, "*...I rely heavily on trade shows, to be opened up with expos*". Members also mentioned the multitude of perceived benefits associated with attending these vendor shows, including exposure to unknown technologies, visualizing solutions to organizational issues, and assessing the standards of technology in a live demonstration environment. Accordingly, it seems that some police services rely on technology conferences/trade-shows to ignite their interest in acquiring a product for their members.

While the influence of technology conferences/trade-shows was frequently highlighted in the one-on-one interviews, only a few participants shed light on the potential issues with this form of reliance to drive organizational decision-making. Participant 008 explains,

> *... it's because the chiefs go to these conferences and they see this really shiny thing, right, and well we have to have this or we have to have that. OK…what are we attempting to do here, before we even get into a particular solution, what's the problem?*

According to this account, technology conferences/trade-shows can prompt an interest in technology acquisition regardless of an existing strategic plan. Furthermore, Participant 002 demonstrates the issue with relying on vendors' sales tactics by stating, "*Because the vendors will tell you great stories. You don't actually know if it works in your environment so you take a bit of a leap of faith*". The overall sentiment of these accounts is that with a lack of practical strategic plans outlining specific issues in need of technological solutions and without proper demonstrations of the technology in a policing environment, relying on technology conferences/trade-shows can be an organizational risk.

This research took place during the COVID-19 pandemic. As such, many public and private sector organizations experienced a foundational shift in operations tethered to a stark increase in the use of digital technologies. Policing was no exception. Respondents frequently mentioned the impacts of COVID-19 on their technological decision-making. Participant 004 illustrates the propensity of this impact, "*Anyway, COVID definitely accelerated many different little areas of our organization*". Most respondents mentioned quickly adopting virtual conference platforms to accommodate the work-from-home mandates across Canada. The influence of the pandemic is illustrated by Participant 010, "*it would have taken us three years to implement [Microsoft] Teams in a non-COVID world… [instead, Microsoft] Teams was implemented in a couple of months*". Additionally, Participant 001 describes their experience, "*...this would be a great opportunity for Microsoft Teams…So, that was a necessity. The pandemic drove that to some degree*". Participants also mentioned pressures from COVID-19 to move civilian services online (i.e., record checks, freedom of information requests, and evidence submissions). While the rapid adoption of digital technologies by police services was revered by many participants, concerns were also raised about the strong influence of COVID-19 on decision-making. In reference to implementing civilian services online, Participant 003 shares, "*We tried to keep people away as much as possible and safe, but unfortunately there were roadblocks… There's a lot of guesswork on how to navigate things during COVID*". Based on these responses, the COVID-19 pandemic influenced many technological decisions within police services.

The influence of evidence-based policing was another theme that emerged throughout the analysis. Most participating police personnel agreed that research-based decision-making surrounding technology is a relatively new phenomenon. As exemplified by Participant 007,

"*...we're seeing more research-driven things come to the frontline now*". Corresponding with other organizational changes driven by evidence-based policing (e.g., crime analysis), technological decision-making seems to be following suit. In reference to how decisions are brought forth, Participant 001 states, "*...individuals will bring that in and say listen we've seen this research or there's some evidence out there that this could work*". Similarly, Participant 006 explains, "*It was results-driven and it's hard to argue with results*". These participants suggest that evidence can provide an irrefutable foundation for technological decision-making. However, despite these accounts of the potential that evidence can play in technology adoption and implementation, some accounts suggest that there is room for improvement in how this information is used. For instance, Participant 006 shares, "*...it wouldn't be necessarily that these agencies would seek out academia as the source of that [evidence]. Maybe it should be quite honestly*". While police personnel acknowledge the potential for research-driven decision-making, it is not often at the forefront of these technological decisions.

According to the respondents, the economy, specifically the operational budgets of police services, plays a substantial role in their technological decision-making. Every participating service spoke of the influence of budget size on their decisions to acquire and implement new technologies. For example, Participant 010 shares, "*But in public safety, if that strategic business plan was not in [the] budget for that year…you can't move forward with the technology*". Often, police personnel discussed budget size as a negative influence on their decision-making. Participant 011 expands on this sentiment, "*...budget is a huge limiter, unfortunately, I think that we end up with subpar products because we are forced to budget*". According to this statement, it is possible that services are unable to acquire desired products and are compelled to select potentially lower-quality technologies due to budget constraints. In addition, Participant 006

mentioned that the size of the service and the corresponding budget size plays a direct role in which adoption style they choose to identify with by noting, "*I'm in an organization right now that can't afford to be on the cutting edge of technology…we are not going to be the early adopters…it's unfortunate but then we have to leverage the experience of others*". In this service's experience, being a smaller scale organization in relation to other municipal police services across Canada has restricted their budget and limited their ability to adopt newer technologies at their leisure. Consequently, smaller services with smaller operational budgets seem to be reliant on larger organizations to adopt newer technologies and share their experiences prior to purchase. Due to the substantial influence of budget size on a service's decision-making, some services have sourced external funding to adopt new technologies. For instance, Participant 007 states, "*We've got a lot of provincial grants…which gives us a little more leeway into some additional funds for project work and new tech*". Overall, it seems that operational budgets play a considerable role in technological decision-making across services.

External party involvement was perceived as another influential player in services' decision-making surrounding technology adoption. Many participants explained that technology decisions are frequently made for them because of legislative changes implemented by the Canadian municipal, provincial, and federal governments. As Participant 002 mentions:

> *We see a lot of legislative changes…So, that's driving some technology change within our systems. We used to be able to upload data quite easily to the government, now they want it a different way. So, that changes how we do things*.

According to this account, if the government mandates technological changes within their organizational structure, police services are also expected to follow suit. Most respondents mentioned specific technologies and experiences with legislative changes. For example, in 2017,

the Canadian Radio-Television and Telecommunications Commission mandated telecommunication companies and emergency responders to equip themselves with Next-Generation 911 technology (CRTC, 2017). Participant 004 shares their experience:

> *If there are any laws that had been changed…then we have to move forward with that. CRTC was mandated to have a network system that you could text to 911. So, we have systems in place that have to get updated so that we can receive those calls. That wasn't something necessarily that we triggered internally but it was an external influence.*

Based on these accounts, it seems that the government can have a strong influence on a police service's technology acquisition.

Overwhelmingly, organizational influence was the strongest across services. Responses were coded as having organizational influence if they contained any mention of departmental decisions, member or executive involvement, procurement policies/procedures, strategic/business plans, organizational effectiveness/efficiency, or influence from other police services. Many services mentioned a reliance on their IT branch to drive decision-making concerning technology. As Participant 006 mentions, "*We typically rely on our IT people to provide us with the solutions that they feel are great without necessarily providing them with a roadmap or a direction*". However, the level of reliance on IT departments varied drastically across services. Participant 004 speaks to the limitations of heavy reliance on IT, "*We find it's very important to not just be IT in a silo and make these decisions because it doesn't work. It just doesn't work*". According to this perspective, decisions surrounding RT should include other members of the organization as well as external stakeholders.

Member or executive involvement also seemed to be a substantial organizational influence in technological decision-making. Specifically, the importance of including end users

in decision-making was heavily emphasized by respondents. Participant 002 explains, "*Everything we do here really does support policing. So, we can roll out a technology but if it doesn't work for the front-line members, the ones who have to use the technology, then it's not worth it*". According to this account, the end users of technology are crucial to ensuring technological acceptance and use therefore, they should be included in the decision-making process. While this sentiment was shared across services, many participants spoke to frustrations with the influence of senior management on technology decisions. Participant 003 shares a conflicting experience involving senior management, "*I remember even with our remotely-piloted vehicle, we had a couple members of senior leadership who were very intent on using it for enforcement. In my mind, it was an absolutely no*". Similarly, Participant 011 shares, "*This Chief is a little bit different, he likes to make decisions himself, so usually it'll just be him deciding in the end*". These accounts illustrate the strong influence that senior leadership can have on decision-making within police services over and above designated IT departments, end users, and external stakeholders.

An interesting finding that emerged in the discussions of organizational influence was the reliance on the experiences of other police services' technology adoption and implementation. Every participant spoke to a form of external influence which involves taking inspiration from what other police services are doing/have done regarding technology. As Participant 007 highlights, "*So, you rely on other services… to find out what they're doing to try and pave your way to get to the same place*". Participant 006 expands on this statement, "*... the way we look at it is you're constantly leapfrogging the technology*". In this instance, "leapfrogging a technology" suggests that services rely on the adoption and usage experiences of other services and adjust their plans to adopt and use the technology accordingly. For example, if a service has

a negative experience with a certain vendor or function of the technology, the service that is leapfrogging the technology would potentially choose an alternate vendor or request enhancements to the impaired function. In doing so, a large portion of technological decision-making becomes reliant on the subjective opinions of other services. While inspiration from other police services was common for all respondents, the size of the service seemed to have an impact on how reliant the service was on the advice of others. Specifically, smaller services mentioned more reliance on large services to acquire, adopt, and assess technologies before considering the same technologies for their service. For instance, Participant 009 mentions, "*We're unsophisticated in regards to the use of technology and we're generally a late adopter…we adopt technology which has proven successful for other police services*". According to this statement, word of mouth can be used strategically when services are limited in other facets of decision-making (e.g., budget restrictions, and service size). However, the success of the technology is no longer based on empirical evidence but rather on the opinions and experiences of other police services that could have vastly different organizational and strategic missions, demographics, and community relations.

Taken together, the data demonstrate a multitude of influencing factors that can contribute to police services' decision-making surrounding technology adoption and implementation. The caveat here is that the magnitude of these factors varies drastically between and within services depending on several facets (e.g., operational budget, service size, and management style). The following section will explore this further by delving into the perceived impacts of RT in police services.

4.3.3 Perceived impacts of risk technologies.

To explore the perceived impacts of RT in police services, respondents were asked, "*What benefits have you seen from acquiring and implementing new technology during your career?*" as well as "*What concerns do you have surrounding the adoption and implementation of technologies?*". The following section will expand on each of these questions by discussing key themes that emanated from the one-on-one interviews with police personnel.

4.3.3.1 Benefits.

When participants were asked, "*What benefits have you seen from acquiring and implementing new technology during your career?*", five key themes emerged. These five themes include benefits to 1) Analytics/Intelligence; 2) Efficiency; 3) Information Sharing; 4) Investigations; and, 5) Safety. Each of these themes will be discussed in detail.

A few respondents discussed the big data potential that parallels the introduction of RT. The perceived benefit of increasing data collection seems to be the accompanying analytics and intelligence capabilities. The usage of analytics and intelligence varied among participants, as some highlighted the benefit of using the information to enhance the front-line officer experience and others pointed to assessing organizational efficiencies (i.e., officer behaviour). Participants 006 and 009 nicely illuminate this contrast. As Participant 006 shares,

> *It's just presenting it in a way that's consumable for the end users. So, we would look at taking information that might have just existed in a spreadsheet in Excel somewhere and representing it spatially on a map. Instead of having to look down through columns and rows to find addresses and information, I can find that information on a map and drive to it or it'll pop up on a map as I'm driving.*

According to this account, Participant 006 believes one of the benefits of introducing RT into their service is the ability to analyze the information and present it in a more digestible format

for front-line officers. While Participant 009 also agrees with the benefit of presenting information to officers in a format that is quick and accurate, they also state "*But looking at officer behaviour through the use of data is really important whether it be GPS data or whether it be RMS…or CAD data…All of that tells a story about how effective we are at work*". This statement highlights the additional perceived benefit of analyzing information for organizational effectiveness and efficiency. Overall, the increased volume of information and the potential to analyze the information in a multitude of ways have shown to be valuable for some police services on both the front and back ends of their organization.

Alongside the benefit of the mass accumulation of information, is the ability to share that information more effectively. Respondents often mentioned a positive experience with DEMS and other information-sharing platforms as they have increased their ability to communicate with other police services. According to Participant 008, a Police Information Portal exists to promote this very benefit, "*We have something called the Police Information Portal and that [has] allowed us to share information nationwide*". According to this account, the ability to share information related to investigations and persons of interest has proven to be beneficial for police services. Additionally, Participant 009 believes that information sharing between police services has increased their ability to network and share successful practices and policies that ultimately inform internal governance structures/decisions. Participants also mentioned the increased ability to communicate and share information with community partners (e.g., Children's Aid Society, hospitals, and courts). For example, when discussing their relationships with various community partners, Participant 011 stated "*...we're able to be more responsive back and forth between organizations*". The introduction of RT has ultimately provided police services with the

perceived ability to collect and communicate information more effectively with other police services and external agencies.

Frequently, services mentioned the efficiencies that RT have provided to their organization. Operational efficiency was a common perceived benefit, as participants highlighted the time that front-line officers save while using several forms of RT (i.e., mobile technology, DEMS, SPIDR). For instance, Participant 004 discussed the benefits they've witnessed for front-line officers following their implementation of DEMS. According to their account, DEMS have provided a service that allows citizens to submit evidence via a link rather than having officers physically collect information for the investigation. Participant 004 also discussed the perceived benefits of implementing a new technology called SPIDR:

> *So, SPIDR is really cool. When the 911 call comes in, the call taker will take their information and they'll ask them for an email or cell phone number. And then, what happens is that based on the call type… we will send text messages or emails to the citizen that made the call to give them updates on their case. So either the officer is going to be 40 minutes late at attending your home or they might say "this is the officer that has been assigned to your investigation." That kind of information. And, we found that to be really beneficial for our citizens because now they know what's going on versus just waiting and waiting and waiting.*

As such, implementing various RT has seemingly provided police services with the ability to mobilize and digitize many aspects of the organization to enhance the speed and quality of their work.

The final two themes, investigations and safety, were both rare but notable benefits that were discussed in the one-on-one interviews. In terms of investigations, a few participants

mentioned the benefit of virtual platforms and mass data storage systems. For example, Participant 008 discussed the benefit of long-term mass data storage in solving cold case investigations as information/evidence can now be stored digitally. Correspondingly, officer safety was discussed in a conversation with Participant 004. According to their account, RT (i.e., ALPRs) have provided officers with additional safety and increased awareness of their surroundings. As mentioned, while these two themes were rarely highlighted, they are important benefits to acknowledge when discussing RT. It is possible that other services have not perceived these benefits or have not implemented similar technologies to relate to these experiences.

4.3.3.2 Concerns.

Correspondingly, participants were asked about their concerns surrounding technology adoption and implementation. Six themes emerged including concerns related to 1) Inefficiency; 2) Privacy/Security; 3) Public Attention; 4) Resistance; 5) Technical Issues; and 6) Training. Each of these themes will be discussed in detail.

Interestingly and in stark contrast to the discussions surrounding the benefits of RT, many services highlighted several inefficiencies they have dealt with because of technology adoption. Participants frequently shared their frustrations with the economic inefficiencies plaguing their service post-implementation. Specifically, respondents noted frustrations with the price of the items as well as the mass data accumulation that follows the adoption of RT (e.g., BWCs). These dissatisfactions centered around unexpected subscription costs to store the information, dedicating existing staff to managing the increasing data accumulation, and integration challenges leading to disuse and wasted funds. Participant 011 shares their experience:

> *And so the downside is with all these technologies, it still requires us to take full-time equivalent people… and move them into the back end of a technology. So although on the*

front end it looks like wow, look at all this time savings. On the backend, we are – it's costing more money as well. So for instance our cloud-based stuff and taking in the citizen video and everyone now has a ring camera – doorbell camera thing. So the service is ingesting more and more technology from the community, it's costing more and we're storing it.

Consistent with previous literature (i.e., Brayne et al., 2018; Fan, 2018; Strom, 2017; White, 2014), most participants had experienced some form of unanticipated financial inefficiencies post-implementation. Overall, the results show that unexpected costs and personnel required to maintain RT can substantially concern police services.

Concerns surrounding privacy and security were often discussed in the one-on-one interviews. Every participating service mentioned the limitations of privacy and security in some capacity. These concerns stemmed from the management of captured data via RT. Specifically, issues with data leaks, mishandling data, proper protection measures, redaction, and data corruption were highlighted. Participant 005 discusses their perspective:

I think from any police officer or any security professional is that we're always concerned about the information being leaked out, not being controlled, proper protection, whether it's confidential informant protections or witness privacy issues and protecting the integrity of the investigation. Even retention of our evidence, if it's digital and the hard drive fails, now we're really hooped. So, having those proper hardware protections.

According to Participant 005, their service worries about the overall protection of the data they collect, store, and manage through newly implemented RT. These findings mirror existing

literature surrounding privacy and security risks of digital technologies in public sector spaces (i.e., Joh, 2017; Pearce, 2010).

An interesting finding that emerged from the discussions was the perceived concern of increased public scrutiny because of technology implementation. Many participants believe that the increased visibility of police through various forms of RT (e.g., BWCs) has created a space to hold officers to a much higher standard than ever before especially when compared to the private sector and other external parties adopting similar technologies. Participant 010 shared their experience with public scrutiny surrounding their adoption of ALPR technology:

> *So we did dramatic steps to educate the public on ALPR and we received some pretty significant negative criticism from the public on ALPR. But a person from Hells Angels, a known biker gang can go out to the vendor and buy a ALPR solution for the same price we can and they can implement the technology tomorrow with zero public scrutiny…yet public safety gets scrutinized heavily for use of technology.*

The frustration exemplified by Participant 010 was a common sentiment across participants. According to Participant 011, increased RT adoption and subsequent public scrutiny have led to a staffing crisis in policing:

> *But the one way it's hindered is that everybody can offer their opinion and suddenly be an expert in policing and that has grossly damaged the policing profession to the point where people don't want to work here anymore, we can't get people to be hired… that is a huge terrible side effect.*

According to these accounts, police are at a crossroads of increasing public demand for transparency and accountability while also experiencing severe scrutiny for their technological decision-making.

Diving deeper into this conversation, participants were asked why they believe the public has such negative responses to technology. Many respondents believe that the increased scrutiny they experience is due to a misconception of what the technologies are and what they are being used for. As Participant 011 mentions, "*I guess, with facial recognition…the public actually thinks we're infringing on their public – or on their right, that it's unfortunate, because the value in it is there to protect them and to protect our entire country*". According to this statement, misconceptions about technology use by police services have hindered their ability to implement certain potentially beneficial technologies. Similarly, Participant 004 mentions, "*So, something like implementing facial rec[ognition] or any other technology like even ALPR…our community may not be ready for it because maybe they're not educated as to how it's being used*". Consequently, limited and/or skewed public knowledge surrounding policing has created a push for increased public engagement and consultation in services' technological decision-making (Hill et al., 2022).

Member resistance was another common concern brought forth by participants. Many respondents noted the struggle to implement novel technologies in a space that is heavily resistant to change. As Participant 007 points out, "*This industry is definitely not one that adopts change very well*". Some participants made note of their experiences with resistance from management and front-line employees that ultimately led to the disuse of the product(s). Participant 007 shares:

> *We've definitely walked on down the road of implementing systems for people that we would expect would make their life easier…that sometimes backfires just because of that change process or it's initially harder at first than it is going to be four months from now and they just walk away from it and say "no…I'm done…I'm out.*

According to this account, the unwillingness to learn new technologies has impacted police services' ability to implement desired products. These findings are consistent with previous work on police culture and technology adoption (e.g., Koper et al., 2014; Strom, 2017).

Only a small number of participants noted their concerns surrounding technical issues post-implementation. Specifically, there were mentions of the difficulty conceptualizing products that work in policing environments as well as general technical errors. Participant 011 shares their concerns surrounding the technical issues they experienced with the implementation of a DEMS:

> *...it's just a terrible, uncomfortable process I think that you have to go through when you're unrolling a brand-new technology and not only new technology, an entirely new way of doing business. I keep telling our team we could plan for four years and be crippled and not roll it out and still have problems down the road. So once you start – yeah, so we're just in that uncomfortable phase right now.*

Despite having done research into their product selection and planning for successful implementation, unanticipated technical issues post-implementation created difficulties for the operations of their service. Overall, the sentiment shared by participants was that implementing a new RT that will have a substantial impact on the operations of policing can be a concerning process that requires extensive testing and troubleshooting to be successful.

Last, concerns were highlighted surrounding the level of training received in the use of newly implemented RT. Specifically, some participants believe that the level of training received for technology use is inadequate. Participant 007 shares their concern with a reliance on IT to conduct all the training for new technologies:

> *...there's never enough training put into new systems and it's always, in my experience anyways, it's who's going to train people on these things and that shouldn't necessarily fall to IT as we're not the ones that use this system*.

Accordingly, it seems that there are two concerns involved in the training of new technologies. First, there is a requirement for more training on newly implemented products. Second, there is no consensus on who should conduct the training for these technologies. Participant 011 also shares concerns surrounding who is delegated to train end-users:

> *And so when we're bringing in these new things, we need people who work in the field to be taken out of their role to come in and figure out how this works, how it applies. So we're also moving people out of positions to try to – to get the technology up and running.*

Unlike Participant 007, Participant 011's service relies on various field staff to conduct the training for newly implemented technologies. This limited consistency in training has been identified in previous literature and has sparked discussions surrounding technology misuse and unsuccessful implementation (Koper et al., 2014).

4.3.4 Recommendations.

The following section expands on participants' recommendations and potential solutions to technological decision-making. Specifically, participants were asked, "*How can police best make decisions about technology?*". Responses were categorized into four main themes: 1) Collaboration/Engagement; 2) End-user Focus; 3) Research-driven/Evaluations; and 4) Strategic Direction. Each of these themes will be discussed in detail below.

Incorporating some form of collaboration/engagement into technological decision-making was the most common recommendation from participants. The recommended style of

collaboration varied from involving/educating the public on the intended uses of the technology, increased communication with other police services, and engaging subject matter experts/external stakeholders. Many participants believe that increasing public engagement with police services' technological decisions will lead to more informed decision-making, as well as enhanced trust and transparency. Participant 010 shares, "*I think there has to be a lot more education to the public that we don't want – I think lots of people do it in individual chunks, but there's a dramatic amount of education that needs to be done*". While others believe that communicating with other police services will lead to more informed decision-making. Participant 011 refers to this recommendation as "*comparative benchmarking*" where services share their experiences with vendor selection, benefits, and limitations of the technology. Last, participants suggested involving subject matter experts to enhance decision-making. Participant 009 shares their recommendation, "*It also provides an opportunity for subject matter experts to… spread their knowledge across many police services that are relying on maybe people who are not as skilled as some of the most esteemed experts in our field*". According to these recommendations, participants see the benefits of incorporating other voices into their technological decision-making processes.

Another common recommendation was shifting the decision-making process towards a focus on the end-user(s). Many participants believe that implementation will continue to be unsuccessful if end-users are not regarded as the focal point. As Participant 001 points out, "*Implementation fails because the end users aren't the focus. So, far greater emphasis on getting their use and input of it*". Similarly, Participant 002 shares, "*Everything we do here really does support policing. So, we can roll out a technology but if it doesn't work for the front-line members, the ones who have to use the technology, then it's not worth it*". These accounts

suggest that police services should be involving the end-users of technology at the onset of the discussions not only to increase implementation success but also to include their voices on what technologies would be beneficial to their work. It is important to note that end-users extend beyond front-line officers and can include any personnel within the policing organization (e.g., IT personnel, crime analysts, administrators) who are directly impacted by the acquisition and implementation of a new RT. Further, failing to include end-users can result in avoidable barriers post-implementation. Participant 002 shares their experience with implementing a new outlay of technology within police vehicles:

> *It looked great in the lab, right? As soon as we started giving it to the people on the street, it's like "ok, I can't reach my coffee… this thing when I do this, this thing happens". It became very unwieldy for them out in the front-lines. So, that actually was good for us because it took away the tunnel vision and the bias. You know, what looks really flashy on a pamphlet or in a static environment doesn't actually translate into that in the real world.*

Based on this example, by not including end-users, technologies can be adopted that create inefficiencies in how police do their jobs. To avoid these issues, Participant 004 shares their service's approach, "*... now we really put the decision-making in the hands of the officers, so they really have a very large voice when we're picking technologies. It could be civilians too. It depends on who we're servicing, right?*". Ultimately, including end-users was universally viewed as crucial to services' technological decision-making.

A few participants suggested a proactive approach to decision-making involving a reliance on research-based information. Specifically, the discussed recommendations involved a collection of individuals, whether it be an internal research department or an external academic

group, who research technological solutions to organizational issues. For example, Participant 008 suggests that academics provide police with reliable evidence-based information to make informed decisions about technology. On the other hand, Participant 005 recommended the following, "*I think there needs to be an element of a proactive internal unit that does research and implements projects that they think have the best value as well as the best impact*". Regardless of who conducts the research, there seemed to be a consensus toward an evidence-based approach to technological decision-making. Further, some participants suggested an added reactive approach to evaluate products post-implementation. Participant 001 suggests:

> *So, the tracking of effectiveness of it in terms of do we need to keep it over time. It would be far more focused on implementation and the resources that go into that. To convey to a culture which hates change and hates the way things are, the inherent value to them. Again, it's been told and never sold.*

According to this account, implementing an additional evaluation process beyond the initial research-based decision-making can provide insight into the effectiveness of the products over time. Additionally, it is possible that these evaluations can be used to demonstrate the effectiveness of the products to the members of the organization and subsequently increase the success of the technology.

Last, participants mentioned frustrations with technological decision-making that does not reflect the strategic or operational goals of the organization. Correspondingly, suggestions were made to outline organizational issues and potential solutions in a formal strategic plan prior to any engagement with vendors or general discussions about technology. As Participant 006 points out:

> *... technology should support the strategic direction of the organization, not dictate the direction of the organization. I would suggest that they have a strategic vision in mind of what it is that they want to accomplish and then seek out the solutions.*

Participant 010 shares a similar sentiment with the following statement, "*I think we have to do a better job seeing big picture within the organization*". The perspectives suggest that police services should focus on the strategic and operational goals of the organization before considering a technological solution. As discussed in the literature (i.e., Strom, 2017), RT are often adopted without strategic direction and subsequently result in some form of unsuccessful implementation (e.g., misuse, disuse, resistance, ineffectiveness).

Based on the recommendations provided by participants, it seems there is room for improvement in how the police can best make decisions surrounding technology adoption and implementation. Specifically, suggestions highlighted the need for multiple actors working in collaboration to make decisions. Additionally, there is a push to include the voices and opinions of the end-users of the technology. While pushing the standard away from making siloed decisions, participants also recommended the inclusion of evidence-based decision-making. Tethered to the movement towards evidence-based decision-making is the recommendation to take a step back to examine the strategic needs of the organization prior to identifying any technical solutions. Taken together, the provided recommendations can serve as a starting point in the guidance and best practices for technological decision-making by police services.

4.4 Phase Three: Content Analysis of Strategic Plans

As many of the one-on-one interviews and survey responses pointed to the prioritization of strategic planning for successful technology adoption and implementation, Phase 3 of the research study involved collecting and analyzing publicly accessible strategic plans from

Canadian police services at the municipal, provincial, and federal level. The publicly accessible strategic plans were collected from police services' websites during October 2021 and were subsequently analyzed in December 2021. The dates, intended durations, and styles of the strategic plans varied greatly between organizations, with some services having outdated versions on their websites (see Table 4.5). Of the 160 websites for municipal/regional services across Canada, 71 (44.37%) provided accessible strategic plans through their service's website. Additionally, the provincial (i.e., Ontario Provincial Police and Royal Newfoundland Constabulary) and federal agencies (i.e., Royal Canadian Mounted Police) provided publicly accessible strategic plans through their websites. The following table demonstrates the strategic plan availability per province for municipal/regional services.

Table 4:5 Municipal/Regional Police Services' Strategic Plan Availability by Province

Municipal/Regional Police Service	Year	Dated/Current	Length of Plan (Years)
Alberta			
Camrose Police Service	2019 - 2022	Current	4
Edmonton Police Service	2020 - 2022	Current	3
Lacombe Police Service	2019 - 2021	Current	3
Lakeshore Regional Police Service	2016 - 2019	Dated	4
Lethbridge Police Service	2019 - 2022	Current	4
Medicine Hat Police Service	2019 - 2022	Current	4
Taber Police Service	2021 - 2026	Current	6
British Columbia			
Central Saanich Police Service	2021	Current	1
Nelson Police Department	2018 - 2023	Current	6
New Westminster Police Service	2016 - 2019	Dated	4
Oak Bay Police Department	2018 - 2022	Current	5
Port Moody Police Department	2017 - 2019	Dated	3
Saanich Police Department	2018 - 2022	Current	5
Vancouver Police Department	2017 - 2021	Current	5
Victoria Police Department	2020	Dated	1
West Vancouver Police Department	2016 - 2019	Dated	4
Manitoba			
Altona Police Service	2019	Dated	1
Brandon Police Service	2018	Dated	1

Winnipeg Police Service	2020 - 2024	Current	5
New Brunswick			
Bathurst City Police Service	2018 - 2022	Current	5
Fredericton Police Force	2018 - 2020	Dated	3
Kennebecasis Regional Police Force	2018	Dated	1
Nova Scotia			
Cape Breton Regional Police Department	2018 - 2021	Current	4
Halifax Regional Police	2015 - 2025	Current	11
Ontario			
Aylmer Police Service	2019 - 2021	Current	3
Barrie Police Service	2020 - 2022	Current	3
Belleville Police Service	2019 - 2021	Current	3
Brantford Police Service	2020 - 2022	Current	3
Brockville Police Service	2018 - 2020	Dated	3
Chatham-Kent Police Service	2018 - 2020	Dated	3
Cornwall Police Service	2018 - 2020	Dated	3
Deep River Police Department	2019 - 2021	Current	3
Durham Regional Police Service	2020 - 2022	Current	3
Gananoque Police Service	2017 - 2020	Dated	4
Greater Sudbury Police Service	2019 - 2021	Current	3
Guelph Police Service	2019 - 2021	Current	3
Halton Regional Police Service	2020 - 2023	Current	4
Hamilton Police Service	2019	Dated	1
Hanover Police Service	2021 - 2023	Current	3
Kawartha Lakes Police Service	2019 - 2021	Current	3
Kingston Police	2019 - 2022	Current	4
London Police Service	2019 - 2021	Current	3
Niagara Regional Police Service	2019 - 2021	Current	3
North Bay Police Service	2017 - 2020	Dated	4
Ottawa Police Service	2019 - 2020	Dated	2
Owen Sound Police Service	2020 - 2022	Current	3
Peel Regional Police Service	2020 - 2023	Current	4
Peterborough Police Service	2020 - 2023	Current	4
St. Thomas Police Service	2019 - 2022	Current	4
Sarnia Police Service	2020 - 2022	Current	3
Saugeen Shores Police Service	2020 - 2022	Current	3
Sault Ste. Marie Police Service	2019 - 2021	Current	3
Smiths Falls Police Service	2021 - 2023	Current	3
South Simcoe Police Service	2018 - 2021	Current	4
Stratford Police Service	2016 - 2018	Dated	3
Strathroy-Caradoc Police Service	2018 - 2020	Dated	3
Thunder Bay Police Service	2015 - 2017	Dated	3
Timmins Police Service	2017 - 2019	Dated	3

Toronto Police Service	2014 - 2016	Dated	3
Windsor Police Service	2020 - 2022	Current	3
Woodstock Police Service	2020 - 2022	Current	3
York Regional Police Service	2020 - 2022	Current	3
Nishnawbe-Aski Police Service	2015 - 2018	Dated	4
Treaty Three Police Service	-	-	3
UCCM Anishnaabe Police Service	2019 - 2023	Current	5
Rama Police Service	2015 - 2018	Dated	4
Saskatchewan			
Dalmeny Police Service	2018 - 2021	Current	4
Prince Albert Police Service	2017 - 2020	Dated	4
Regina Police Service	2019 - 2022	Current	4
Saskatoon Police Service	2020 - 2024	Current	5
Weyburn Police Service	2021	Current	1

Note. The Canadian territories are exclusively governed by the RCMP; the Royal Newfoundland Constabulary governs Newfoundland and Labrador. Only English-speaking provinces were included in the analysis; therefore, Quebec was excluded.

As exemplified by the literature, police services have been found to make decisions about technology independently of their organizational strategies and goals (Hendrix et al., 2019; Strom, 2017). Therefore, the upcoming section discusses the results of a content analysis of 71 collected strategic plans at the municipal, provincial, and federal levels. This content analysis focuses exclusively on identifying police services' organizational direction in relation to technological solutions presented in their strategic plans. Additionally, I sought to identify designated decision-makers in the discussions of technological solutions. In doing so, the hope is to provide insight and recommendations to police services regarding their future technological decision-making. Thematic analysis of the 71 strategic plans revealed three overarching codes: 1) Technological Goals; 2) Technological Solutions to Goals; and, 3) Designated IT Plans. It is important to note that nine police services did not make any mention of technology both as a goal or as a solution in their strategic plans. The themes will be discussed in detail below.

4.4.1 Technological goals.

Of the 71 examined strategic plans, 19 services outlined some form of technological goal to take on over a period ranging from two to five years in the future. Most commonly, services referred to these goals as "innovation and technology". When referring to the goal of innovation and technology, services discuss the intentions to modernize divisions of their organization using technology. For example, Lethbridge Police Service discussed their intentions to "... *be innovative leaders in identifying new technology to meet the changing demands of policing, achieve the Service's strategic priorities and satisfy public expectations*". Oftentimes, to achieve these technological innovation goals, services identify objectives such as enhancing/upgrading existing technologies and software, researching new technologies, initiating pilot projects for potential technology adoption, and implementing technologies. The effective and efficient use of existing technologies was also a form of technological goal outlined by two services. These goals referred to ensuring that existing technologies were being used in their most efficient and effective manner for the organization. For instance, New Westminister Police Service outlined the following objective, "*Ensure the efficient use of personnel and technology*". In other words, ensuring that adopted resources are being used to their full potential before adopting new technology. Last, three police services discussed the management of information as their technological goal. For example, Peterborough Police Service highlighted the need for technology to bolster their organization's information management and investigative efforts, "*[Continue] our commitment to managing information and investigative solutions using current and emerging technology*". To achieve this goal, strategic objectives such as hiring additional IT civilian staff, designing, and implementing an IT plan, and implementing new technologies.

4.4.2 Technological solutions to goals.

In the absence of or in addition to technologically specific goals, several services provided technological solutions to goals throughout their strategic plans. Technological solutions were typically provided for goals such as crime prevention and reduction (e.g., traffic safety), enhancing organizational excellence, providing evidence-based policing services, providing opportunities for development training, increasing police visibility, and enhancing community partnerships. Interestingly, goals tailored to crime prevention and reduction frequently included road safety/traffic control and the technological solution tethered to this goal unanimously included the implementation or continuation of the use of ALPRs. For example, Hanover Police Service stated the following as their solution to the goal of "safe public spaces", "*Implement [the] use of the Automatic Licence Plate Reader to reduce the incidence of improperly licenced vehicles, help intercept wanted persons, stolen vehicles and suspended drivers, and identify other licence plate infractions*". Based on this finding, it seems that the perceived effectiveness of ALPRs to reduce crime is a shared notion across several police services. Other proposed technological solutions to various goals included the implementation of Real-Time Operations Centre (RTOC), CCTV cameras, Trunk Mobile Radios (TMRs), UAVs, predictive analytics software, Smart Squad mobile application, e-ticketing, BWCs, in-car cameras, Virtual Desktop Infrastructure (VDI), DEMS, and NG 9-1-1.

4.4.3 Designated IT plan.

Designated IT plans were included in 13 of the examined strategic plans. The designated IT plans were developed in collaboration with a service's internal IT department or an external collaborating IT body such as the Information, Communication, and Technology Committee (ICTC) of the Canadian Association of Chiefs of Police (CACP), the Police Regional Information Data Entry (PRIDE), and the Ontario Police Technology Information Co-operative

(OPTIC). These external committees exist to provide services with information and technology solutions more effectively and efficiently than if they were to independently research, adopt, and implement technologies. Overall, there were limited variations in the contents of the plans. The IT plans often included a list of specific technologies that will be introduced to the organization over the course of the outlined timeline (e.g., NG 9-1-1, e-ticketing). Other details included monitoring cybersecurity, focusing on research and development, and assigning members to external committees.

Overall, the evidence of past, current, and future uses of RT, the perceived benefits and limitations of technology use on police personnel, and the perceived influences on technological decision-making by Canadian police services have provided an additional perspective into the exploration of technological acquisition processes of how these services can best accomplish their technological goals. Attempting to understand how police make decisions about technology through a macro-level interpretation is crucial for expanding our criminological knowledge on the subject and for guiding Canadian police services in an effective, efficient, and ethical direction for future use of these technologies that will fortify trust and legitimacy with the public. The following chapter will provide an in-depth discussion of the results presented above and how these findings contribute to existing literature and the proposed theoretical framework. Last, theoretical and practical implications, limitations, and future research directions will be discussed.

CHAPTER 5: DISCUSSION & CONCLUSIONS

5.1 Introduction

The purpose of this chapter is to expand on the results presented in Chapter Four and to make connections to existing empirical literature and theoretical constructs. As a reminder, this dissertation was guided by the following research questions: 1) How do police make decisions about which risk technologies to acquire?; 2) What role does the private sector play in the acquisition and implementation of risk technologies by Canadian police services?; 3) What are the impacts of acquiring and implementing risk technologies on police personnel?; and, 4) How can police services best acquire and implement new risk technologies to meet their organizational and strategic missions while safeguarding rights and avoiding unethical uses? To examine these research questions, a three-phased methodological approach, involving a national survey, semi-structured interviews with police personnel, and a content analysis of Canadian police services' strategic plans, was undertaken. The following chapter will discuss these results as they relate to the complexities of policing and technology.

First, results will be used to exemplify the apparent disconnect between formal and informal technology acquisition processes within services and the subsequent impacts associated with circumventing formal processes despite their existence. This discussion will then be tied to broader issues of trust and transparency in public safety spaces. Second, results will be discussed in relation to the shifting role of policing in the era of EBP and rapid technological advancement. Expanding on the theoretical discussion in previous chapters, I will discuss the sizeable shift in policing from working for the community to working for private sector companies. In doing so, I will identify police as knowledge workers for third-party companies *and* as consumers of the products these companies provide. Third, results will be used to substantiate a call for accountability through collaborative decision-making and formal strategic planning. This

subsection will not provide concrete implications but will open the door to potential avenues of what accountable technological decision-making could look like. Last, I will discuss the importance of research in technological decision-making. Specifically, I will elaborate on how we can bring research to the forefront of decision-making and the role it can play in policing spaces. To conclude the chapter and the entirety of this dissertation, the limitations of the project will be identified. Namely, 1) the limited previous research on the topic, 2) the small unrepresentative samples, and 3) the onset of the COVID-19 pandemic. Future directions for research will then be discussed followed by a brief overview of the project and my concluding thoughts.

5.2 Complexities of Policing and Technology

5.2.1 Disconnect between formal and informal acquisition processes.

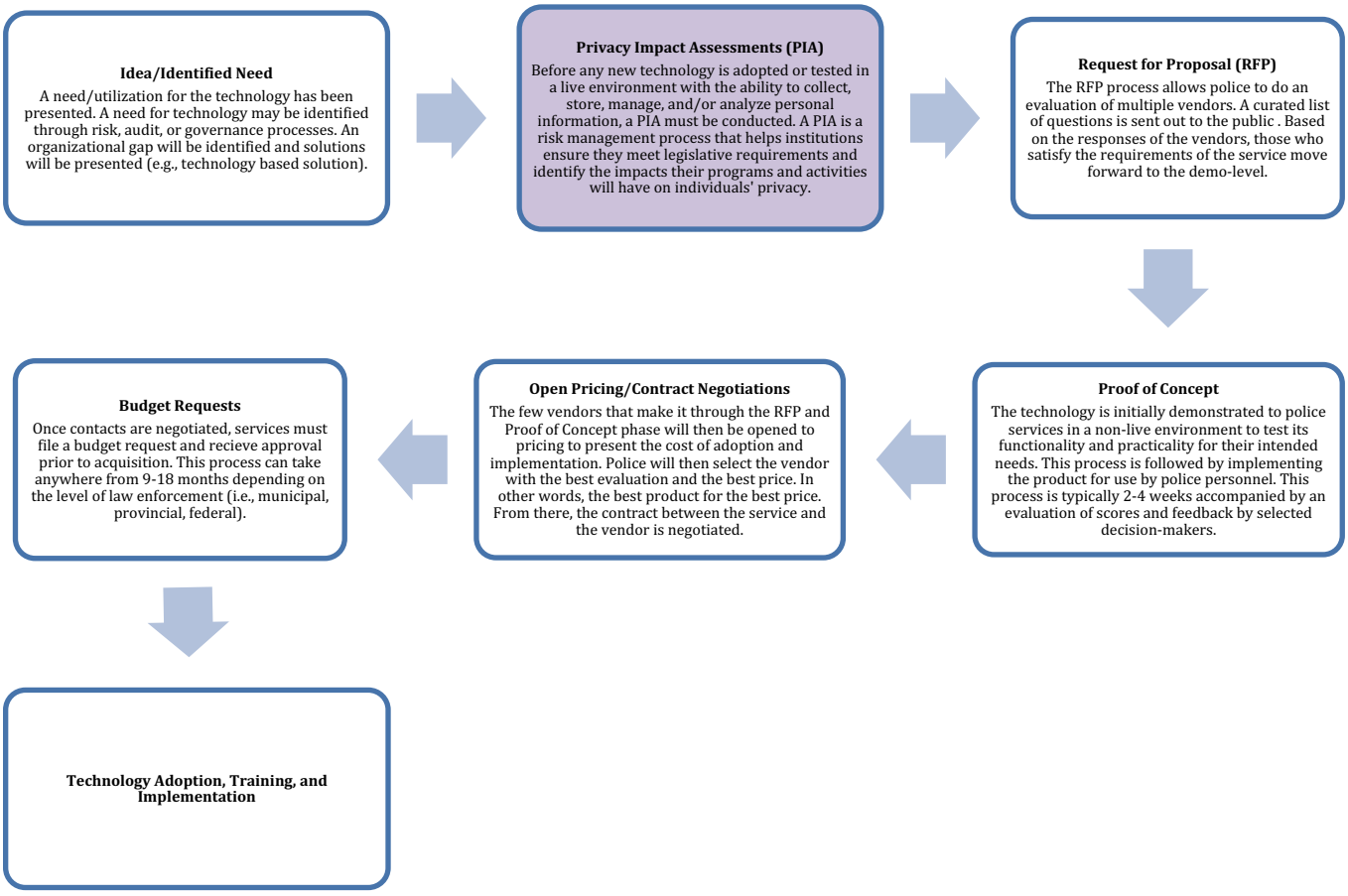
The first overarching research question sought to explore how Canadian police services make technological decisions. With little to no previous literature on specified technological decision-makers within Canadian police organizations, the initial targeting of a sample population for the current study posed substantial difficulty. Throughout Phases 1 and 2 of the research, participating police services acknowledged various decision-makers when identifying which technologies to bring into the organization. Dominantly, IT department staff and high-ranking leadership (i.e., Chiefs of Police and Deputy Chiefs) are instrumental in these processes. Participants also identified other participating parties that could play a role in the decision-making process, such as a designated departmental task force/procurement team. To triangulate the data, the strategic plans of Phase 3 were analyzed for any mention of decision-makers regarding technology. Of the 71 plans, 18 listed predetermined decision-makers for their future technological endeavours - most of which listed the decision-makers highlighted by the previous

phases of the current study. However, many additional decision-makers were identified including, the Police Service Board, court officers, support services division, criminal investigations division, technology projects manager, community services officer, executive management, and the CACP. Oftentimes, the listed categories of decision-makers were not mutually exclusive and various actors were involved in the technological decisions of the organization.

The delegation of staff members involved in decision-making surrounding RT acquisition can vary in a few circumstances. For instance, throughout the semi-structured interviews of Phase 2, participants made note of specific task forces or procurement teams composed of different members of the organization depending on the type of technology in question. As Participant 004 illustrated, "*... it's always depending on the product*". To explain further, if the intended RT will impact multiple sectors of the police service (e.g., administrative, front-line, executive), services are likely to incorporate the voices of multiple staff members in the decision-making process. However, if the RT is one that will strictly impact the operations of the IT department, it is likely that the IT department will be instrumental in the decision-making process. Thus, as exemplified by the results of the research, the beginnings of police decision-making regarding RT adoption and implementation are not linear or consistent processes. Whether the decision to include these individuals in the decision-making process is a predetermined process or not remains somewhat unclear. While the products themselves can influence who is involved in the decision-making process, this was not always the case for participating services. However, the inclusion of intended decision-makers in the strategic plans of the organization could promote transparency surrounding this issue.

Beyond the selection of individuals for technological decision-making, the process by which the technology is adopted varied greatly across services. Based on the semi-structured interviews, most Canadian police organizations have a formal process in place when acquiring technology that follows the broad outline of a demonstrated need, privacy impact assessment, request for proposal, public tendering (frequently dependent on the cost of the desired product), proof of concept, contract negotiations, and technology procurement. The following chart exemplifies a standard practice of technology adoption by Canadian police services:

Figure 5:1 Reported Formal Technology Adoption Process by Canadian Police Services



While these formal steps are crucial to the adoption of technology, the way in which Canadian police services adopt RT often includes informal processes as well (e.g., lack of organizational direction, vendor pre-qualification, brainstorming sessions, hunches, recommendations from

other services). These findings were echoed by Strom (2017) in their analysis of US police departments, as they found limited evidence for a formal process for decision-making surrounding RT adoption. Identifying these informal processes can provide a more transparent understanding of what is "working" for services across the country and can contribute to an empirical guideline of sorts for services looking to acquire similar products and services. However, these informal processes were also reported as occasionally trumping the formal procurement processes in place and "*totally breaking the rules*" (Participant 008) alongside mounting frustrations with the existing formal processes.

Ultimately, the results suggest that "what works" is a muddled combination of formal and informal means that can vary contextually (e.g., cost, end-user, product, existing vendor relationship, time). As Strom (2017) highlights, "agencies appear to adopt technology ad-hoc in response to a constellation of factors" (p. 1). The findings of the current study also revealed a multitude of factors ranging from the macro to the micro level (see Figure 5.2). As previously discussed, the factors found to influence the technological decision-making processes of Canadian police services include the COVID-19 pandemic, evidence-based policing, cost (i.e., technology, infrastructure, and personnel), government legislation, societal pressures, the private sector (i.e., vendors and marketing strategies), and the organization of policing (i.e., end-user involvement, inspiration from other services, IT departments, management decision-making, and technological effectiveness/efficiency). These factors, with the addition of the COVID-19 pandemic, are consistent with existing research on police technological decision-making and their impacts on the operations of policing (Bayerl et al., 2013; Strom, 2017).

Figure 5:2 Reported Influences on Police Technological Decision-Making

Main Themes	Sub-Themes
Organizational	• Executive / Management • Policy • Recommendations • Strategic Plans • Perceived Effectiveness / Efficiencies • Operational Budgets
Private Sector	• Trade Shows / Conferences • Cold Calls / Emails • Discounts • Demonstrations • R&D Agreements • Vendor Reputation • Sales Tactics • Shared Values • Social Media Presence
External Third-Party	• Government Legislation
Societal	• Public Engagement / Consultation • Public Pressure / Criticism • Accountability / Transparency
COVID-19	• Work-From-Home Mandate(s)
Evidence-Based Policing	• Crime Analysis • Academic Literature • Executive Reports

On the surface, police services opting to circumvent existing formal processes despite their existence seems like a viable solution to quickly acquire desired RT with minimal obstacles. As exemplified by the results, participants highlighted the necessity for informal mechanisms during the onset of the COVID-19 pandemic. Following the work from home mandates, services had to quickly adopt Microsoft conference platforms to maintain organizational functioning. Due to drastic time constraints, the decision-making process to adopt these platforms required the circumvention of formal acquisition process for the benefit of the organization. However, the way in which police personnel go about using these informal processes can have significant impacts on the end-user, the organization, and the community in which they serve. As Crozier (1972) discusses, it is possible for the individuals of an organization to manipulate and circumvent established processes to maintain or shift power dynamics. For example, when a police service chooses an informal process of RT acquisition (e.g., consulting another police service regarding their experience), the contextual elements of

the service (e.g., size, culture, leadership style) and the impacts on the end-user potentially go unacknowledged. It is possible that without an established strategic need by the end-user accompanied by a lack of empirical evidence and a formal vetting process, acquired RT could negatively impact the work of the end-user (e.g., resistance, misuse, lack of training, faulty technology, limited effectiveness).

When technologies are adopted to modernize operations, police services often struggle with successful implementation and as a result, they become rhetorically integrated as a means of demonstrating/quantifying police accountability (Sanders et al., 2015). End-user resistance and technology disuse are ongoing issues for police services (Willis et al., 2020) and it is possible that, if not approached correctly, circumventing formal acquisition process could exacerbate these organizational problems. Understandably, the current study found member resistance to be one of the most impactful factors of RT on police personnel. Many participants mentioned the frustrations of working in an environment that has such a high level of information demands from multiple sources while being simultaneously resistant to changing strategic operations. In line with previous research and organizational theorizing (e.g., Koper et al., 2014), member resistance to RT acquisition and implementation can significantly impact police personnel and their ability to fulfill ever-increasing knowledge requests in an efficient, effective, and ethical manner. Part of this unwillingness to engage with emerging technologies could be resolved through a more evidence-based approach to technology adoption as well as through a more inclusive approach to decision-making that places end-users at the forefront of expressing organizational strategic and operational needs.

From a broader standpoint, the informal processes utilized by police to acquire RT are often unknown to those who are directly impacted by the technology (Goldstein, 1960; Manning,

1992). As a result, discrete technological decision making by police could raise substantial concern from the communities that they serve. For example, choosing discrete informal methods to adopt a technology with privacy concerns (e.g., BWCs) could contribute to existing tension and distrust between police and community members. From the viewpoint of a concerned citizen, if police are willing to use undisclosed loopholes to acquire technologies with vast data capabilities, what does that mean for their privacy rights as a citizen in the community? Further, circumventing processes in hopes of rapid acquisition could be viewed as wasteful in the eyes of the taxpayer if the technology is not successfully integrated into the service. As operational budgets for technological advancement continue to rise, it is likely that communities and stakeholders will call for increased accountability around technological decision-making.

These concerns connect to a wider discussion of police discretion and siloed decision-making. The level of discretion afforded to police services to make decisions creates a complexity and fluidity to the organization that is difficult to overcome (Sanders & Henderson, 2013). Further, discretionary decision-making by police has established a strong tendency for services to make decisions in silos (Engel & Whelan, 2010; Goode & Lumsden, 2018). Participants made note of siloed technological decision-making as a catalyst for member resistance. For example, if end-users of the RT are not meaningfully brought into the decision-making process to discuss their technological needs and expectations, this could lead to a negative cultural impact on personnel post-adoption. In the case of the current research, respondents often stressed the importance of involving end-users in the decision-making process. Despite these claims, respondents also made note of senior management frequently making siloed decisions without end-user input. Correspondingly, and in line with previous research

(Brown & Doucet, 2020), siloed decisions to acquire RT are often unsuccessful in their subsequent implementation.

These siloed decision-making processes have also fostered a long-standing distrustful relationship with communities, and even more so with minority populations (Engel & Whelan, 2010; Ferguson, 2017; Egbert & Leese, 2021). As exemplified by the results, decisions about technology rarely incorporate voices that are external to policing. While informal processes can provide quick solutions to organizational issues, neglecting to meaningfully engage members of the community in these decisions can reinforce existing distrust in the police. The potential for increased distrust in the police points to the importance of transparent decision-making in public safety spaces. Scholars have echoed the necessity for transparency by police on multiple occasions, and in multiple instances (e.g., Engel & Whelan, 2010; Jackson, 2015; Kochel & Skogan, 2021). While the use of RT in policing spaces have made the police more accountable in their front-line duties (Chan, 2001; Fan, 2018; Rossler, 2019), the decisions to acquire those technologies have not been afforded the same level of transparency. The results of the current research suggest that decisions that are often made behind closed doors both internally to certain members of the organization and externally to members of the public. The lack of transparency surrounding these decisions could have significant implications for trust in the police. As Schafer (2013) explains:

> For the police to be perceived as just internally and externally, operations, decision-making and related behaviours must generally be transparent and must generate a degree of trust. Internally, officers must be able to understand how agency leaders make decisions and treat personnel; optimally, that understanding will facilitate the emergence of a high degree of trust between line personnel and those who direct their operations.

> Externally, the public must be able to understand how agencies behave in order to have confidence that their police force is working to ensure a high degree of efficiency, efficacy and equity in operations; optimally, that knowledge will ensure that citizens trust police personnel and forces (p. 131).

Evidently, if police services are insistent on circumventing formal acquisition processes in favour of informal means, it is crucial to establish a mechanism for transparency to both internal members and the communities they serve. A failure to be transparent about technology acquisition processes and decision-making will ultimately result in negative internal and external perceptions of policing. A detailed description of what these transparency mechanisms could look like will be discussed in subsequent sections (i.e., 5.2.3 & 5.2.4).

5.2.2 Shifting the role of policing.

As discussed, Ericson and Haggerty (1997) characterize police as knowledge workers who are increasingly responding to knowledge requests from both internal and external entities. Further, the increasing acquisition of RT perpetuates a never-ending cycle of demands for information. More recently, various empirical works have expanded this characterization. For example, Sheptycki (2020) and Bowling et al. (2019) expand PRS theorizing by characterizing police as governed by screens and as functioning in plurality with external agencies (e.g., private security). Additionally, Terpstra et al. (2019) further this concept with the introduction of 'abstract policing'. According to Terpstra et al. (2019), police work is becoming increasingly distant from the communities they are intended to serve due to increasing knowledge demands and technology use. With minimized citizen interactions, police work is less about street-level bureaucracy and more about collecting, storing, analyzing, and managing information. Results of the current study support the role of police as knowledge workers. Responses demonstrated that

DEMS were one of the most prominent RT acquired by police services with the majority of respondents indicating that the technology is 'very important' to the strategic operations of their service (see Table 4.3). Services often acquired or planned to acquire DEMS in hopes of becoming more efficient in the storage and management of increasing volumes of information that are collected via RT. Additionally, the perceived importance of analytics, intelligence, and data sharing both internally and with community partners was widely demonstrated. According to police personnel, the sheer volume of data that can be collected, stored, and managed has resulted in a complete restructuring of how to plan fiscal operational budgets. In line with PRS theorizing, these findings suggest that police primarily operate as knowledge workers who prioritize the flow of information and rapid technology acquisition to satisfy various knowledge requests.

Although the characterization of police as knowledge workers has been extensively theorized and empirically demonstrated (Bowling et al., 2019; Chan, 2001; Ericson & Haggerty, 1997; Manning, 1977, 1992; Egbert & Leese, 2021; Sheptycki, 2013, 2019, 2020; Terpstra et al., 2019), the current study proposes an addition to this role. Specifically, I argue that Canadian police services operate as both knowledge workers *and* consumers. Through the lens of SC, we can theorize that the rapid acquisition of private sector technologies in policing spaces has shifted the roles and capabilities of the police to be driven by economic means and the ownership of information rather than by "community consumerism" - where the police predominantly provide services driven by the needs/demands of the public (Loader, 1999; Reiner, 1992; Squires, 1998). Under SC, police can be characterized as the main consumers of a niche market of RT designed and produced by private technology corporations to collect mass volumes of information used to surveil and classify populations in various contexts.

Correspondingly, as consumers, police services would be susceptible to typical marketing strategies that the average consumer of technology experiences (Dencik et al., 2018; Hood, 2020; Joh, 2017; Sanders & Sheptycki, 2017). The results of the current study support this notion, as it was demonstrated that technological decision-making is largely influenced by vendor interactions. Trade shows and police conferences were frequently highlighted as the initial factor to spark interest in acquiring RT. Respondents also made note of vendor marketing influence through cold calls/emails, live demonstrations, discounts, reputation, shared values, and social media. Technological decision-making by the police often veered from strategic direction and operational needs in favor of successful sales tactics demonstrated by the company. These findings suggest that police are not living in a vacuum and are just as susceptible to the external forces of consumerism as the public. Given these results, it seems that the characterization of police as knowledge workers *and* consumers moves police away from serving their community to serving the capitalistic needs of the private sector.

As such, the expected duties of police to fulfill ever-increasing requests for information from the public and private sector, paired with their roles as consumers of technology and information, creates several insurmountable problems to conduct their work in an effective, efficient, and ethical manner. As demonstrated by the results, concerns were raised regarding the inefficiencies of RT created by the private sector in policing spaces. With differing strategic priorities between the private sector (i.e., profit) and the police (i.e., law enforcement and knowledge work), the promises of the technological capabilities presented to police may not be carried out in practice. The disconnect between sales tactics and practical uses of the technology led to unanticipated costs and data collection that police services were unequipped to manage. Specifically, the majority of respondents identified the implementation costs of their most

recently acquired technology exceeded expectations. These findings strongly mirror existing research on technology use in policing spaces. Decisions to acquire RT to collect substantial amounts of information are found to be much more costly than originally expected (Brayne et al., 2018; Fan, 2018; Strom, 2017; White, 2014). Consequently, this hinders the ability for police services to maintain subscription costs and acquire additional supporting RT. Ultimately, this leaves police personnel in a discretionary position of deciding which RT and data are of the highest *importance* to collect and store.

Further, as consumers of private sector technology, police services expressed concerns surrounding the privacy and security of collected information via RT. Specifically, responses indicated perceptions of insecurities surrounding data leaks, mishandling data, proper protection measures, redaction, and data corruption. These findings suggest that police remain in a vulnerable and uncertain position regarding the control of the private sector in policing knowledge work. These findings closely align with PRS theorizing, as Ericson and Haggerty (1997) depict police services as losing control over knowledge production and management to external agencies. The perceived insecurities surrounding, often sensitive information, supports existing concerns in the literature (Gates, 2002; Hood, 2020; Joh, 2014; 2016a; 2016b; 2017; Lupton & Michael, 2017; Patton et al., 2017; Piccorelli & Elias, 2018; Saulnier & Thompson, 2016), by stakeholders, civil liberties associations, and the public, as police services are often unaware of where the knowledge they produce ends up or how it is used beyond the walls of the organization (Ericson & Haggerty, 1997). These findings highlight the government's decreasing control over the ownership of information to the likes of large-scale corporations and they illuminate a need for regulation/external involvement in the technological decision-making of the police to ensure that knowledge work is carried out in an ethical manner. The following section

will delve into the possibilities for accountability through collaborative decision-making and strategic planning.

5.2.3 Calls for accountability through collaborative decision-making and strategic planning.

Concerns raised in the data throughout the current study demonstrate a need for the accountability of RT use by public safety personnel. While not explored, it seems that issues surrounding transparency, informal processes of acquisition, limited external engagement, and privacy concerns could be mitigated through some form of oversight/regulation. Providing a concrete solution for these issues is outside the scope of the current study, however, I will offer a few recommendations to increase the accountability of RT acquisition and implementation. To accomplish this, multiple actors (e.g., private sector companies, the public, and police services) need to work together in an ongoing fashion to provide oversight over RT. In what follows, I will discuss potential avenues for increased accountability using collaborative decision-making and strategic planning.

Collaborative decision-making is not a new concept for police as, historically, public consultations have been used to address controversial topics, police chief searches, and community needs/values (Neyroud, 2001). However, results of the current study highlight a crucial need for meaningful engagement of both internal membership and external parties. Participants discussed frustrations with a general lack of awareness regarding technology acquisition and how to bring ideas from the frontlines to upper management. Additionally, some services noted a heavy reliance on IT departments to make recommendations for RT acquisition. Contrastingly, other services mentioned the necessity of ensuring technological solutions will work for the end-user and the importance of including them in the decision-making process. In terms of engaging the public in technological decision-making, services often mentioned the

importance of including the public, while also stating that consultations only tend to happen when the technology is perceived to be a contentious issue (e.g., FRT). These findings align with existing research on public input on police decision-making, where police services efforts to engage the public seem to exist at a surface level to satisfy external pressures for accountability and fail to genuinely incorporate external voices (Gasper & Davies, 2018; Mangan et al., 2018).

While there are several notable consultation methods (e.g., collaborative governance models, citizens' assemblies, and kitchen table talks [KTT]), police services typically opt for Police Accountability Community Teams (PACT) where open access meetings are held involving representatives from the police, other public service partners, and any members of the community who choose to attend (Walters, 2005). However, these models have shown to be unsuccessful in genuinely *engaging* external voices into police decision-making. Namely, previous research has discovered a lack of transparent reporting structure, the prioritization of "professional" opinions over those of the public, power imbalances, and tokenism (Gasper & Davies, 2018; Mangan et al., 2018). Additionally, decisions to engage external members in RT discussions are frequently ad hoc to the decision to acquire the technology. To best engage the community in technological decision-making, scholars have stressed the importance of collaborative learning and including a diverse range of participants (Cook, 2002; Hill et al., 2022; Laird, 1993; Modise, 2023). If police services take the time to bring together voices and resources to educate the public on outward-facing RT, it is likely that the issues from the PACT model would be mitigated. Overall, an education-focused approach to collaborative decision-making can increase transparency and foster a trustful relationship between police and community members (Bradford et al., 2020; Bragias et al., 2021; Hill et al., 2022).

Another potential avenue to increase transparency in technological decision-making is through police services' strategic planning. Often, participants noted the importance of aligning technological decision-making with the strategic directions of the organization through their formal strategic plans. Despite the acknowledged importance of strategic planning in technological decision-making, participants discussed that the processes of RT adoption were inconsistent, unclear, complex, and frequently veered from organizational directives. Further, police leaders highlighted the issue of organizational strategies being driven by RT rather than organizational strategies driving technology adoption. These findings emulated those by Strom (2017), as they discussed "... a strong association between policing strategy and technology uses was not found" (p. 1). Similarly, Brown and Doucet (2020) found in their discussions with recently retired Canadian police leaders, the omnipresent issue of technology aligning with the strategic plan of the organization was crucial to the ultimate success of its adoption and implementation. An interesting compliment to these findings stems from the content analysis of Canadian police services' strategic plans. As previously mentioned, 19 services outlined some form of technological goal to take on over a period ranging from two to five years in the future. This finding closely aligns with the concerns about placing technology at the forefront of organizational direction rather than using technology as a tool in a metaphorical toolkit of solutions. As Hendrix et al. (2019) suggest, there needs to be greater emphasis on how technological solutions can aid services in achieving their goals and missions by identifying how they will be used, who will use them, and what services intended to accomplish with their use. To accomplish these suggestions, a larger focus needs to be placed on evidence-based decision-making.

5.2.4 The role of empirical research in technological decision-making.

Both proactive and reactive evidence-based practices were recommended for future technological decision-making. Specifically, participants highlighted the importance of research and development teams and contracting external academic groups to aid in decisions about technology. Additionally, there were calls for an ongoing evaluation process for adopted technologies to ensure they are meeting the intended goals/missions of the organization. Despite these claims, most participating police personnel agreed that utilizing empirical research in technological decisions is rare and not typically used at the forefront of these decisions. These findings raise questions as to how empirical research can be best integrated into police services' technological decision-making.

The EBP paradigm that currently influences North American policing places a reliance on data and statistical inferences to guide and shape operational directives (Greene, 2014; Sanders & Langan, 2021). In practice, however, police tend to use EBP for administrative purposes and fail to utilize evidence to its full potential (Lumsden & Goode, 2018). Research also suggests that the receptivity to evidence in operational settings is very low (Kennedy, 2010; Rojek et al., 2015; Tompson et al., 2017; Weisburd & Neyroud, 2011). Even when services have personnel who are receptive to EBP, the data used to make these inferences has been found to include incorrect and missing data. As it stands, randomized control trials (RCTs) and other quantitative methodological research are viewed as the gold standard of evidence to support police decision-making (Lumsden & Goode, 2018; Sanders & Langan, 2021). While quantitative methods can be incredibly useful in ad hoc technological decisions (e.g., effectiveness evaluations), they fall short of providing a holistic understanding of the inner workings of police environments. As highlighted by the results, without an understanding of the perception of end-users, the acquisition of RT is likely to be unsuccessful. For EBP to genuinely ignite change throughout the

complexity that is policing and to shift how police approach RT adoption, both quantitative and qualitative approaches must be undertaken (Greene, 2014; Sanders & Langan, 2021). For example, findings from the national survey did not highlight the private sector as highly influential in police technological decision-making, however, using qualitative semi-structured interviews, it became clear that technology vendors do have a substantial influence on these processes. Through implementing more mixed methods research, the existing influences on decision-making (e.g., siloed decisions, private sector companies, politics) can be mitigated, as the voices of those impacted by the technologies can be used to substantiate or refute the quantitative findings.

Further, robust *external* research needs to become a pillar of technological decision-making by police (Sanders & Langan, 2021). As Engel and Whelan (2010) suggest, through the partnership of academics and police services, the external validity of the data can be used to mitigate scrutiny and support decision-making. Additionally, these partnerships can increase the omnipresent issue of transparency. Ultimately, the perceived legitimacy of the police can be re-established through the willingness of police services' to "open their doors" to academics. More recently, there has been an increase in police-academic partnerships, and they have begun to include long-term research relationships that include a multitude of projects (Engel & Henderson, 2013). However, for research to make a meaningful impact in decision-making processes, the organizational/strategic values of the service must align with those of the researcher (Bradley & Nixon, 2013; Ricciardelli et al., 2016; Marks et al., 2010). It would be of use to both parties to foster a relationship of open communication, trust, and transparency prior to undertaking a research partnership (Fleming, 2012). Further, research should include practical implications and recommendations for best practices rather than a focus exclusively on abstract

theorizing. In doing so, the often demonstrated disconnect in research expectations/deliverables between police and academics can be minimized. Overall, the role of research should be commonplace for any decisions surrounding RT equipped with mass data collection capabilities.

5.3 Limitations and Future Directions

While this research provides an in-depth examination of the processes involved in police decision-making surrounding RT, as well as the multitude of factors that impact said decision-making, the findings of this research have some limitations. As Ross and Bibler Zaidi (2019) point out, as researchers, we uphold the responsibility to the academic community and the public to be transparent regarding the limitations of our studies. As such, in this section these limitations are discussed in detail with suggestions to mitigate their impacts in future research endeavors. Namely, limited previous research in the field, small sample sizes and unknown target populations, and the restrictions put in place by the COVID-19 nationwide mandates.

5.3.1 Limited previous research.

As previously mentioned, limited research exists surrounding organizational decision-making by the police. Even further, the process by which the police make decisions to acquire and implement RT is scarce. Given the limited previous research and lack of methodological guidance, it is possible that the current project design did not ask the correct questions and/or was too limited in scope. However, the triangulation of the methods did add new insights to the literature on the acquisition of RT by police. With increasing technological innovations being acquired by the police, this dissertation offers only starting point into understanding police decision-making surrounding the acquisition of RT but much more is needed.

5.3.2 Sample size.

The results presented by this research offer valuable insights into the intersecting influences on police decision-making. However, a large limitation of the study is that French-speaking police services were excluded, therefore, I did not have a representative sample of all police services in Canada. As such, the analysis should not be considered generalizable to all police services in Canada. Additionally, the sample sizes of both Phases 1 and 2 could limit the external validity of these findings. As previously mentioned, 27 participants filled out the quantitative survey. In terms of extrapolating statistical inferences from this data, this number is quite low. For instance, Budiu and Moran (2021) recommend a minimum of 40 participants when utilizing quantitative methods for data to hold substantial validity and usability. Despite these claims, there are instances where lower participant numbers are deemed acceptable (Nix et al., 2019).

There were a few challenges involved in the recruitment of participants that made this identified standard difficult to achieve. Specifically, key decision-makers involving technology ranged vastly across and within Canadian police services. The complexities of ever-changing decision-makers rendered me unable to determine the genuine target population and required casting a broad net as the recruitment strategy. As I have discovered, key police personnel involved in the decisions surrounding technology acquisition and implementation typically involve the Chief of Police, the Deputy Chief of Police, IT departments (including managers and lower-level employees), end-users of technology, and, in larger services, some form of a Research and Development team. With the identification of this population, future research can target their recruitment more specifically.

It is also important to note that this dissertation does not intend to produce statistical inferences from the findings of the Phase 1 quantitative survey. The sole purpose of the survey

was to serve as a foundation for understanding how Canadian police services are making decisions about RT. Given the exploratory nature of this research, this quantitative phase was a necessary component for triangulating data through mixed methods research in order to achieve a rich understanding of technological decision-making. With that said, readers and scholars wishing to extrapolate findings from the quantitative portion of this work should proceed with caution.

The limitation of sample size within qualitative research is a contentious issue but one worth noting. Some scholars suggest that an individual case study can be an adequate sample size in qualitative works due to the quality of the data collected, while others suggest that a sample size of ten is sufficient for sampling among a homogenous population (Sandelowski, 1995). Meanwhile, Creswell (1998) suggests that researchers should aim for a sample size of 20-30 participants. Despite these suggestions, one can argue that determining sufficient sample size in qualitative research is simply a matter of judgment and experience in the assessment of data quality (Sandelowski, 1995). Blaikie (2018) adds to this argument by suggesting that the ontological assumptions of 'qualitative' and 'quantitative' research lack rigour and specificity, leaving methodological issues (e.g., sample size) confusing and unproductive. In Phase 2 of this research, 11 participants were successfully recruited for the semi-structured interviews. Like the issues with sampling in Phase 1 of the research, working with an unknown target population presented difficulties in determining the guidelines for an adequate sample size. While the lower level of participants can be seen as a limitation (e.g., Creswell, 1998), further research in this area will confirm whether the experiences of the participating police services are common across other police services.

5.3.3 COVID-19.

The COVID-19 pandemic erupted simultaneously with the commencement of the current project. In Canada, work-from-home mandates were dealt to most organizations (including all Canadian police services), ultimately causing severe methodological restrictions when designing research projects with community partners. The REB of Ontario Tech University halted in-person projects for the foreseeable future and required all subsequent project applications to adapt their proposed in-person methodologies to a virtual alternative. While these policy changes did not have a substantial impact on the Phase 1 quantitative survey or the Phase 3 content analysis, Phase 2 of the project was restricted exclusively to interviews via an online conferencing platform (e.g., Google Meet). The most glaring limitation of this national mandate was the restricted access for recruitment purposes and the diminished personal connection typically found in qualitative work. Additionally, I was limited in my ability to properly recruit participants as they were likely preoccupied with the adaptations of the work-from-home mandates, ultimately making them reluctant to add to their existing workload. With that said, the ability to connect virtually created the possibility to interview police services across the country with ease. Future research interested in conducting semi-structured interviews with police personnel should (if possible) provide both an in-person and virtual option to maximize the recruitment potential and to accommodate the preference of participants.

5.4 Future Research Directions

Given the exploratory nature of this study, future research should attempt to explore RT acquisition with different populations of public safety professionals and identify how these interactions speak to larger debates about safety and surveillance. The current study focused exclusively on Canadian police services with most participants serving at the municipal/regional

level. It would be interesting to involve police services from different countries and different levels of enforcement (e.g., municipal, provincial, federal). An international comparison of technology acquisition could enhance our understanding of how to navigate these processes in a transparent, evidence-based, and ethical manner. Further, a deeper exploration of alternative law enforcement populations could lead to increased knowledge regarding the successful implementation of RT and the minimization of wasted taxpayer dollars on misused or disused products. This study provides evidence of different ways to acquire and implement technology (i.e., formal and informal) alongside their perceived impacts on police personnel, but future research could explore if these perceived impacts are similar across populations.

Second, an expansion of the application of the proposed theoretical framework would be another avenue to explore. To elaborate, future research could focus on the application of macro-level theoretical frameworks to understand how decisions are made surrounding technology adoption and implementation in public safety spaces. As demonstrated by the current study, when utilizing a macro-level lens to understand technology in policing, several political, economic, social, technological, and legal factors actively contributed to the technological decision-making of Canadian police services. Future policing research should consider how to best apply PRS and SC frameworks to additional decision-making processes within policing. Namely, it would be particularly useful to have some insight into the creation of organizational strategic plans.

Third, scholars could investigate the role that the private sector technology companies play in the marketing of products to police services. The police personnel who participated in this study were transparent in that vendors, particularly the marketing at trade-shows and conferences, can ignite the adoption process. While outside of the scope of the current

dissertation to explore the perceptions of technology vendors, it is a noteworthy and important area to consider given the increased interconnectedness of the public and private sectors to work together in maintaining these technological advancements.

Fourth, the topic of ethics was absent from the discussion of technological decision-making with participants. Ethics are integral to the success of technology and are required from the point of concept to mitigate potential bias and invasions of privacy that have been demonstrated in the past across multiple organizations (Aizenberg & van den Hoven, 2020; Martin, 2020; Tavani, 2008). While focusing exclusively on policing, ethics are deeply ingrained in all facets of the organization. Notably, each service maintains a set of values that police personnel are expected to abide by in their daily lives. Similarly, these codes of conduct drive decision-making surrounding hiring, training, and conducting operational duties. As a result, it would be expected, given the rapid integration of RT and their big data capabilities, that the adoption and use of these devices would follow suit to these established ethical values. It is not sufficient to expect ethical values to begin and end with a procurement process, rather, a process needs to be implemented that can actively evaluate the ethical implications of technological decision-making. To identify which ethical values are of the utmost importance, the impacts of the anticipated RT need to be acknowledged. For instance, with the emergence of AI in various sectors of society (e.g., education, medical, financial), transparent discussions, education, and safeguards are required prior to acquisition by police to minimize the potential harm that can come from a failure to acknowledge the ethical implications of RT. Future research should focus on how ethics are integrated into technological design, adoption, implementation, and use.

Last, future research should look to incorporate multiple actors/voices in the discussion of technology adoption and implementation by police. As outlined above, due to the invasive nature of RT (e.g., AI), relying on variable adoption processes can increase the chances of misuse, wasted resources, resistance, and privacy violations. Most participants mentioned the necessity of collaborative and informed decision-making when considering emerging products. These findings alongside existing research on the importance of public engagement suggest that end-users, stakeholders, subject matter experts, police administrators, and members of the public could all be useful in making decisions about the use of RT by police.

5.5 Conclusion

As discussed at the outset of this dissertation, existing research surrounding technology tends to focus on perceptions of RT post-implementation. The limited research that has focused on the processes of technology adoption by the police relied heavily on organizational theories to interpret their findings. Attempting to understand the complexities of RT in policing spaces through organizational theories and ad-hoc analyses is useful in its own manner, but inevitably, it hinders the ability to understand the issue at its core. Narrowing research to understanding technology post-implementation at an organizational level neglects an entire system that is contributing to how decisions are made in these powerful institutions. This can become increasingly problematic when the decisions involve the use of tools capable of perpetuating the existing marginalization of at risk-populations who have historic conflicts with the police. Further, if technology is already in the process of being adopted, researchers are placed at a disadvantage in their ability to contribute meaningful suggestions and best practices.

The use of the combination of PRS and SC as a framework for understanding technological decision-making by the police helps scholars to analyze influential factors beyond

the organization that could guide recommendations for future research and acquisition processes. From what it seems, the adoption of RT is not a linear process, nor is it a simplistic one. Most services have their own approach on how to best navigate these decisions and have little oversight to aid in these decisions. The complexity of how police decide to move forward with risk assessment tools equipped with highly invasive data-collecting properties is in dire need of further exploration. This dissertation has sought to inch closed the gap in understanding the various processes of technology acquisition by police from the voices of police personnel themselves, as they are often instrumental in these processes.

Ultimately, this research provides a unique empirical examination of how municipal/regional police services decide to acquire and implement RT beyond the existing organizational literature, which primarily involves technical evaluations of effectiveness and efficiency. This research has also created the opportunity for a transactional approach to research where academics and practitioners can mutually benefit. In order to help police navigate the increasing involvement of RT throughout Canadian municipal/regional police services, we must concentrate on how they can best achieve their organizational strategic goals using RT as a *potential* solution, while being reflexive of the possible undue influences on decision-making.

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Appendix A

Canadian Municipal/Regional Technology Acquisition and Implementation Survey

We are conducting research to examine the acquisition and implementation of various technologies by Canadian municipal/regional police services. Your services' response to this survey will help build the foundation for evidence surrounding the impacts of emerging technologies on the organization of police. This survey will take approximately 20 minutes to complete, and is divided into two sections:

- **Section A** focuses on your services' recent experiences acquiring and implementing technologies into the workplace; and
- **Section B** focuses on your services' current or future plans to acquire and implement selected technologies, and how significant these technologies are to the outlined goals and objectives of your service.
- **Section C** involves demographic questions about you and your service.

Section A: Experiences Acquiring and Implementing New Technology
The next few questions are about your services' experience acquiring and implementing new technologies. Implementing a new technology can include purchasing new technology or making significant upgrades to an existing technology.

Aa1. Please think about your services' experience acquiring and implementing new technologies. Over the past two years, what technology has made the biggest impact on your services' strategies and activities? [Open-ended response]:

A1. We are interested in learning about your services' **most recent** experience acquiring and implementing a new technology. Please select the type of technology that was **most recently** acquired and implemented in your service?

- Crime mapping/Geographic information system (GIS) software
- Predictive analytics software
- Investigation case management software
- Software to track cellphones and exploit cellphone data (e.g., Stingrays)
- Regional/national information sharing (e.g., COPLINK)
- Automatic License Plate Readers (ALPR)
- Acoustic gunshot detection (e.g., ShotSpotter)
- Rapid DNA instruments
- Mobile biometric devices (e.g., facial recognition, fingerprint identification)
- Closed-caption television (CCTV) and video content analysis (VCA)
- Gun/contraband detection
- Early intervention systems concerning officer behaviour
- Dash cameras
- Body-worn cameras (BWC)

- o UAV (drones)
- o Facial recognition software
- o Digital Evidence Management Software (DEMS [e.g., Evidence.com])
- o Other [Please specify]: _____

A2. Approximately how long ago was this purchase made?

1. Within the past year
2. More than one year, less than two years ago
3. More than 2 years, less than five years ago
4. More than five years ago

A3. Is this a new system or an upgrade to an existing system in your service?

1. New
2. Upgrade

A4. Who participated in the decision of the specific make and model to purchase? [Please check **all** that apply]:

- o IT director or another technical expert
- o Chief or deputy chief
- o Command staff
- o Departmental task force
- o Other [Please specify]: _____
- o Unsure

A5. How did you decide which specific products to consider? [Please check **all** that apply]:

- o Conducted scan of practice, such as an informal poll of other services' practice
- o Consulted with someone in another department
- o Vendor exhibit at a conference
- o Advertisement in trade magazine
- o Vendor website
- o Publication or website of government or professional association
- o Approached by a vendor
- o Product was specified by a grant or other external funding
- o Other [Please specify]: _____

A6. To your knowledge, are there any published industry or professional association standards for this technology?

1. Yes
2. No
3. I don't know

A6a. **[IF A6 = YES]** Did the technology your service purchased meet those standards?

1. Yes
2. No
3. I don't know

A7. To what extent did the performance of this technology meet your expectations?

1. Greatly exceeded expectations
2. Somewhat exceeded expectations
3. Performed about as expected
4. Somewhat below expectations
5. Greatly below expectations

A7a. **[IF A7 = SOMEWHAT BELOW OR GREATLY BELOW EXPECTATIONS]** Did you ask the vendor to correct the problem(s) or adjust the technology to meet your expectations?

1. Yes
2. No

A7b. **[IF 7a = YES]** On a scale of 1 to 5, where 1 is not at all satisfied and 5 is completely satisfied, how satisfied were you with the vendor's ability to correct the problem?

Not at all satisfied **1**	**2**	**3**	**4**	*Completely satisfied* **5**

A8a. To what extent was the cost of **purchasing** the technology in line with your services' expectations?

1. Cost greatly exceeded expectations
2. Cost somewhat exceeded expectations
3. Cost was about as expected
4. Cost was somewhat below expectations
5. Cost was greatly below expectations

A8b. To what extent was the cost of **implementing** the technology in line with your services' expectations?

1. Cost greatly exceeded expectations
2. Cost somewhat exceeded expectations
3. Cost was about as expected
4. Cost was somewhat below expectations
5. Cost was greatly below expectations

A9. In implementing this technology, did your service experience any of the problems described below:

	Yes	No
Poor vendor support		
Inadequate training of technical staff		
Inadequate training of end users		
Resistance from end users		
Poor management support		

Lack of preparation with the service		
Staff resistance		

A9a. **[IF POOR VENDOR SUPPORT = YES]** Was the **poor vendor support** your service experienced a minor problem or a major problem?

1. Minor problem
2. Major problem

A9b. **[IF INADEQUATE TRAINING OF TECHNICAL STAFF = YES]** Was the **inadequate training of technical staff** your service experienced a minor problem or a major problem?

1. Minor problem
2. Major problem

A9c. **[IF INADEQUATE TRAINING OF END USERS = YES]** Was the **inadequate training of end users** your service experienced a minor problem or a major problem?

1. Minor problem
2. Major problem

A9d. **[IF RESISTANCE OF END USERS = YES]** Was the **resistance of end users** your service experienced a minor problem or a major problem?

1. Minor problem
2. Major problem

A9e. **[IF POOR MANAGEMENT SUPPORT = YES]** Was the **poor management support** your service experienced a minor problem or a major problem?

1. Minor problem
2. Major problem

A9f. **[IF LACK OF PREPARATION WITHIN THE SERVICE = YES]** Was the **lack of preparation within the service** that your service experienced a minor problem or a major problem?

1. Minor problem
2. Major problem

A9g. **[IF STAFF RESISTANCE = YES]** Was the **staff resistance** your service experienced a minor problem or a major problem?

1. Minor problem
2. Major problem

A10. Did you experience any other difficulties implementing this technology?

1. Yes
2. No

A11. **[IF A10 = YES]** What were they? [Open-ended response]:

Section B: Current Technology Implementation and Future Technology Acquisition
*Next, we are interested in the technologies that your service has implemented or plans to acquire in the next **five years**.*

Crime mapping or geographic information systems (GIS) software

B1a. Has your service used **crime mapping or GIS software** in the past two years?
1. Yes
2. No

[IF B1a = NO, SKIP TO B1d]

B1b. How important is **crime mapping or GIS software** for achieving the goals of your service?
1. Not at all important
2. Somewhat important
3. Very important

B1c. How satisfied are you with crime mapping or GIS software for achieving the goals of your service?
1. Very satisfied
2. Somewhat satisfied
3. Not at all satisfied

B1d. **[IF B1a = NO]** Does your service plan to acquire **crime mapping or GIS software** within the next five years?
1. Yes
2. No
3. I don't know

Predictive analytics software

B2a. Has your service used **predictive analytics software** in the past two years?
1. Yes
2. No

[IF B2a = NO, SKIP TO B2d]

B2b. How important is **predictive analytics software** for achieving the goals of your service?
1. Not at all important
2. Somewhat important
3. Very important

B2c. How satisfied are you with predictive analytics software for achieving the goals of your service?
1. Very satisfied

2. Somewhat satisfied
3. Not at all satisfied

B2d. **[IF B2a = NO]** Does your service plan to acquire **predictive analytics software** within the next five years?

1. Yes
2. No
3. I don't know

Investigation case management software

B3a. Has your service used **investigation case management software** in the past two years?

1. Yes
2. No

[IF B3a = NO, SKIP TO B3d]

B3b. How important is **investigation case management software** for achieving the goals of your service?

1. Not at all important
2. Somewhat important
3. Very important

B3c. How satisfied are you with investigation case management software for achieving the goals of your service?

1. Very satisfied
2. Somewhat satisfied
3. Not at all satisfied

B3d. **[IF B3a = NO]** Does your service plan to acquire **investigation case management software** within the next five years?

1. Yes
2. No
3. I don't know

Software to track cellphones and exploit cellphone data

B4a. Has your service used **software to track cellphones and exploit cellphone data** in the past two years?

1. Yes
2. No

[IF B4a = NO, SKIP TO B4d]

B4b. How important is **software to track cellphones and exploit cellphone data** for achieving the goals of your service?

1. Not at all important
2. Somewhat important
3. Very important

B4c. How satisfied are you with software to track cellphones and exploit cellphone data for achieving the goals of your service?

1. Very satisfied
2. Somewhat satisfied
3. Not at all satisfied

B4d. **[IF B4a = NO]** Does your service plan to acquire **software to track cellphones and exploit cellphone data** within the next five years?

1. Yes
2. No
3. I don't know

Regional / national information sharing (e.g., COPLINK)

B5a. Has your service used **regional or national information sharing programs or databases** in the past two years?

1. Yes
2. No

[IF B5a = NO, SKIP TO B5d]

B5b. How important are **regional or national information sharing programs or databases** for achieving the goals of your service?

1. Not at all important
2. Somewhat important
3. Very important

B5c. How satisfied are you with regional or national information sharing programs or databases for achieving the goals of your service?

1. Very satisfied
2. Somewhat satisfied
3. Not at all satisfied

B5d. **[IF B5a = NO]** Does your service plan to acquire **regional or national information sharing programs or databases** within the next five years?

1. Yes
2. No
3. I don't know

Automatic license plate readers (ALPR)

B6a. Has your service used **automatic license plate readers (ALPR)** in the past two years?

1. Yes
2. No

[IF B6a = NO, SKIP TO B6d]

B6b. How important are **automatic license plate readers (ALPR)** for achieving the goals of your service?

1. Not at all important
2. Somewhat important
3. Very important

B6c. How satisfied are you with automatic license plate readers (ALPR) for achieving the goals of your service?

1. Very satisfied
2. Somewhat satisfied
3. Not at all satisfied

B6d. **[IF B6a = NO]** Does your service plan to acquire **automatic license plate readers (ALPR)** within the next five years?

1. Yes
2. No
3. I don't know

Acoustic gunshot detection (e.g., ShotSpotter)

B7a. Has your service used **acoustic gunshot detection systems** in the past two years?

1. Yes
2. No

[IF B7a = NO, SKIP TO B7d]

B7b. How important are **acoustic gunshot detection systems** for achieving the goals of your service?

1. Not at all important
2. Somewhat important
3. Very important

B7c. How satisfied are you with acoustic gunshot detection systems for achieving the goals of your service?

1. Very satisfied
2. Somewhat satisfied
3. Not at all satisfied

B7d. **[IF B7a = NO]** Does your service plan to acquire **acoustic gunshot detection systems** within the next five years?

1. Yes
2. No
3. I don't know

Rapid DNA instruments

B8a. Has your service used **rapid DNA technologies** in the past two years?
1. Yes
2. No

[IF B8a = NO, SKIP TO B8d]

B8b. How important are **rapid DNA technologies** for achieving the goals of your service?
1. Not at all important
2. Somewhat important
3. Very important

B8c. How satisfied are you with rapid DNA technologies for achieving the goals of your service?
1. Very satisfied
2. Somewhat satisfied
3. Not at all satisfied

B8d. **[IF B8a = NO]** Does your service plan to acquire **rapid DNA technologies** within the next five years?
1. Yes
2. No
3. I don't know

Mobile biometric devices (e.g., facial recognition, fingerprint identification)

B9a. Has your service used **mobile biometric devices** in the past two years?
1. Yes
2. No

[IF B9a = NO, SKIP TO B9d]

B9b. How important are **mobile biometric devices** for achieving the goals of your service?
1. Not at all important
2. Somewhat important
3. Very important

B9c. How satisfied are you with mobile biometric devices for achieving the goals of your service?
1. Very satisfied
2. Somewhat satisfied
3. Not at all satisfied

B9d. **[IF B9a = NO]** Does your service plan to acquire **mobile biometric devices** within the next five years?

1. Yes
2. No
3. I don't know

Closed-circuit television (CCTV) and video content analysis (VCA)

B10a. Has your service used **closed-circuit television (CCTV) and video content analysis (VCA) software** in the past two years?

1. Yes
2. No

[IF B10a = NO, SKIP TO B10d]

B10b. How important is **closed-circuit television (CCTV) and video content analysis (VCA) software** for achieving the goals of your service?

1. Not at all important
2. Somewhat important
3. Very important

B10c. How satisfied are you with closed-circuit television (CCTV) and video content analysis (VCA) software for achieving the goals of your service?

1. Very satisfied
2. Somewhat satisfied
3. Not at all satisfied

B10d. **[IF B10a = NO]** Does your service plan to acquire **closed-circuit television (CCTV) and video content analysis (VCA) software** within the next five years?

1. Yes
2. No
3. I don't know

Gun/contraband detection systems

B11a. Has your service used **gun/contraband detection systems** in the past two years?

1. Yes
2. No

[IF B11a = NO, SKIP TO B11d]

B11b. How important are **gun/contraband detection systems** for achieving the goals of your service?

1. Not at all important
2. Somewhat important
3. Very important

B11c. How satisfied are you with gun/contraband detection systems for achieving the goals of your service?

1. Very satisfied
2. Somewhat satisfied
3. Not at all satisfied

B11d. **[IF B11a = NO]** Does your service plan to acquire **gun/contraband detection systems** within the next five years?

1. Yes
2. No
3. I don't know

Early intervention systems concerning officer behaviour

B12a. Has your service used **early intervention system to identify or track problematic officer behaviour** in the past two years?

1. Yes
2. No

[IF B12a = NO, SKIP TO B12d]

B12b. How important are **early intervention systems to identify or track problematic officer behaviour** for achieving the goals of your service?

1. Not at all important
2. Somewhat important
3. Very important

B12c. How satisfied are you with early intervention systems to identify or track problematic officer behaviour for achieving the goals of your service?

1. Very satisfied
2. Somewhat satisfied
3. Not at all satisfied

B12d. **[IF B12a = NO]** Does your service plan to acquire **early intervention system to identify or track problematic officer behaviour** within the next five years?

1. Yes
2. No
3. I don't know

Dash cameras

B13a. Has your service used **dash cameras** in the past two years?

1. Yes
2. No

[IF B13a = NO, SKIP TO B13d]

B13b. How important are **dash cameras** for achieving the goals of your service?

1. Not at all important
2. Somewhat important
3. Very important

B13c. How satisfied are you with dash cameras for achieving the goals of your service?

1. Very satisfied
2. Somewhat satisfied
3. Not at all satisfied

B13d. **[IF B13a = NO]** Does your service plan to acquire **dash cameras** within the next five years?

1. Yes
2. No
3. I don't know

Body-worn cameras (BWC)

B14a. Has your service used **body-worn cameras (BWC)** in the past two years?

1. Yes
2. No

[IF B14a = NO, SKIP TO B14d]

B14b. How important are **body-worn cameras (BWC)** for achieving the goals of your service?

1. Not at all important
2. Somewhat important
3. Very important

B14c. How satisfied are you with body-worn cameras (BWC) for achieving the goals of your service?

1. Very satisfied
2. Somewhat satisfied
3. Not at all satisfied

B14d. **[IF B14a = NO]** Does your service plan to acquire **body-worn cameras (BWC)** within the next five years?

1. Yes
2. No
3. I don't know

UAV (drones)

B15a. Has your service used **UAV (drones)** in the past two years?

1. Yes

2. No

[IF B15a = NO, SKIP TO B15d]

B15b. How important are **UAV (drones)** for achieving the goals of your service?
1. Not at all important
2. Somewhat important
3. Very important

B15c. How satisfied are you with UAV (drones) for achieving the goals of your service?
1. Very satisfied
2. Somewhat satisfied
3. Not at all satisfied

B15d. **[IF B15a = NO]** Does your service plan to acquire **UAV (drones)** within the next five years?
1. Yes
2. No
3. I don't know

Facial recognition software

B16a. Has your service used **facial recognition software** in the past two years?
1. Yes
2. No

[IF B16a = NO, SKIP TO B16d]

B16b. How important is **facial recognition software** for achieving the goals of your service?
1. Not at all important
2. Somewhat important
3. Very important

B16c. How satisfied are you with facial recognition software for achieving the goals of your service?
1. Very satisfied
2. Somewhat satisfied
3. Not at all satisfied

B16d. **[IF B16a = NO]** Does your service plan to acquire **facial recognition software** within the next five years?
1. Yes
2. No
3. I don't know

Digital evidence management software (DEMS [e.g., Evidence.com])

B17a. Has your service used **digital evidence management software (DEMS)** in the past two years?

1. Yes
2. No

[IF B17a = NO, SKIP TO B17d]

B17b. How important is **digital evidence management software (DEMS)** for achieving the goals of your service?

1. Not at all important
2. Somewhat important
3. Very important

B17c. How satisfied are you with digital evidence management software (DEMS) for achieving the goals of your service?

1. Very satisfied
2. Somewhat satisfied
3. Not at all satisfied

B17d. **[IF B17a = NO]** Does your service plan to acquire **digital evidence management software (DEMS)** within the next five years?

1. Yes
2. No
3. I don't know

B21. Have you acquired or are you considering acquiring any other technologies that we have not asked about?

1. Yes
2. No

B21a. **[IF B21 = YES]** Please briefly describe these technologies you are considering acquiring [Open-ended question]:

B22. If you would like to provide any additional information about your experiences with technology acquisition and/or implementation, please enter it here [Open-ended question]:

Section C: Demographic Questions

C1. What is your current job title? [Open-ended question]:

C2. What is your age? [Open-ended question]:

C3. Are you…?

1. Male
2. Female

3. None of these options apply to me: Please Specify
4. Prefer not to answer

C4. You may belong to one or more racial or cultural groups on the following list. Are you? (Click all that apply)

a) White
b) Indigenous/Aboriginal
c) South Asian (e.g., East Indian, Pakistani, Sri Lankan, etc.)
d) Chinese
e) Black
f) Filipino
g) Latin American
h) Arab
i) Southeast Asian (e.g., Vietnamese, Cambodian, Malaysian, Laotian, etc.)
j) West Asian (e.g., Iranian, Afghan, etc.)
k) Korean
l) Japanese
m) Other – Please Specify
n) I prefer not to answer

C5. What best describes where you do your work?

1. Urban region
2. Suburban region
3. Rural area

C6. What region of Canada do you work in?

1. Atlantic (NL, PEI, NS, NB)
2. Central (ON, QC)
3. Prairie (AB, SK, MB)
4. West Coast (BC)
5. Northern (YT, NT, NU)

C7. Approximately, how many sworn officers work at your service?

1. Under 10
2. 10 to 50
3. 51 to 100
4. Over 100

C8. After we analyze the results of this survey, we plan to conduct follow-up in-depth interviews with police service personnel across Canada. If you are interested in participating in an interview, please leave an email and/or phone number in the box below (this is in no way connected to your survey answers). [Open-ended question]:

Final Page of the Survey

Thank you for participating! If you have any questions or concerns please contact the Student Lead, Dallas Hill, at dallas.hill@ontariotechu.ca. To stay up to date on this research project, you can follow the researcher on Twitter at https://twitter.com/dallhill2

Appendix B

Consent Form – Phase 1: Online Survey

Consent Form to Participate in a Research Study

Title of Research Study: The Acquisition and Implementation of Digital Technologies by Canadian Municipal Police Services

Name of Principal Investigator (PI): Dr. Christopher O'Connor

PI's contact number/email: 905-721-8668 ext. 5882 or christopher.oconnor1@ontariotechu.net

Name of Student-Lead: Dallas Hill dallas.hill@ontariotechu.net

Departmental and institutional affiliation(s): Faculty of Social Science and Humanities at Ontario Tech University

Introduction

You are invited to participate in a research study entitled *The Acquisition and Implementation of Digital Technologies by Canadian Municipal Police Services*. You are being asked to take part in a research study. Please read the information about the study presented in this form. The form includes details on study's procedures, risks and benefits that you should know before you decide if you would like to take part. You should take as much time as you need to make your decision. You should ask the Principal Investigator (PI) or the Student-Lead to explain anything that you do not understand and make sure that all of your questions have been answered before signing this consent form. Before you make your decision, feel free to talk about this study with anyone you wish including your friends and family. Participation in this study is voluntary.

This study has been reviewed by the Ontario Tech University Research Ethics Board #16344 on June 7, 2021.

Purpose and Procedure:

Purpose:

The main objective of this survey is to collect a wide-ranging understanding of the potential impacts that digital technologies have on police services in a Canadian context. The survey will explore the perceptions of sworn police personnel from various ranks (e.g., front-line officers, chiefs, management, executives) regarding the current acquisition, implementation, and usage of digital technologies, and potential impacts of these technologies on the success of policing activities. The administered survey will be an adoption from a previously validated measure of police perceptions of technology acquisition and implementation (i.e., Strom, 2017) with moderate modifications to acknowledge the technological and cultural differences between American and Canadian policing organizations. The results of this survey will serve as a starting point to understanding how police make decisions about which technologies to invest time and resources into.

Procedures:

This study includes a 20-minute survey which will be administered to 141 municipal/regional police services across Canada. The survey is divided into two sections: recent experiences acquiring and implementing technology and current/future plans for the acquisition of digital technologies. The first section of this survey includes asking participants to indicate their most recent experience acquiring and implementing digital technologies, whether it be a new form of technology or an upgrade to a previously existing system. The second section of the survey is designed to prompt information about the previously outlined digital technologies that respondents' police service has implemented or plans to implement over the next five years. Specifically, this section will highlight the importance of each technology for the outlined goals and strategies of respondents' police service. A statistical analysis software (i.e., SPSS) will be used to analyze the quantitative data collected during this phase of the study. This information will be used to generate descriptive statistics and to contextualize potential relationships in the data. As previously mentioned, this study is exploratory in nature and the data analyzed from the survey will be used to inform theory and guide subsequent semi-structured interviews.

Potential Benefits:

You will not directly benefit from participating in this study.

Potential Risk or Discomforts:

There is the risk that superiors might pressure you to participate, or not to participate, in this research project. As a reminder, your participation is completely voluntary and no one will know, other than myself, whether you participated or not. Your individual responses to the online survey are entirely anonymous, as there are no identifiers that can connect you to the data.

Some of the questions in the survey pertain to the operations of a police service and asking police personnel to answer these questions could potentially form a violation of your job duties. Participants are reminded to respect the privacy and confidentiality of their service when answering the survey by only sharing information that is allowed to be shared.

Use and Storage of Data:

- ***Anonymous Data:***
    - The individual responses via online survey are entirely anonymous, as there are no identifiers that can connect you to the data.
- ***Data Storage:***
    - The primary data storage location will be an access limited Google Drive folder controlled by the PI, Dr. Christopher O'Connor, as maintained by Ontario Tech University. The files in this folder will be individually password protected.
    - Questionnaires will be completed online via the Qualtrics platform, they will then be exported, password protected, and stored in an access limited Google Drive controlled by the PI, Dr. Christopher O'Connor, as maintained by the Ontario Tech University.
- ***Access to Data:***

- Access to the data is restricted to the PI, Dr. Christopher O'Connor, and the Student Lead, Dallas Hill. The data will be kept for a period of ten years for future publications and will then be deleted.
- There are no plans to use this data for secondary research purposes.
- All information collected during this study, including your personal information, will be kept confidential and will not be shared with anyone outside the study unless required by law. You will not be named in any reports, publications, or presentations that may come from this study.

Confidentiality:

Your participation in this study is confidential:

- Your participation in the online survey will be entirely anonymous. No data will be collected connecting you to your responses.
- Your privacy shall be respected. No information about your identity will be shared or published without your permission, unless required by law. Confidentiality will be provided to the fullest extent possible by law, professional practice, and ethical codes of conduct. Please note that confidentiality cannot be guaranteed while data is in transit over the Internet.

Voluntary Participation:

Your participation in this study is voluntary and you may partake in only those aspects of the study in which you feel comfortable. You may also decide not to be in this study, or to be in the study now, and then change your mind later. You may leave the study at any time without affecting your employment status. You will be given information that is relevant to your decision to continue or withdraw from participation. Such information will need to be subsequently provided. You may refuse to answer any question you do not want to answer by clicking to the next question in the survey.

Right to Withdraw:

If you withdraw from the research project during the online survey, any data that you have contributed will be removed from the study and you do not need to offer any reason for making this request.

- Prior to the completion of the online survey, you may exit the survey by closing the browser window, and your answers will not be recorded.
- You may exercise your right to withdraw up until you submit the survey. Once completed, the data submitted cannot be traced back to you and thus, withdrawal from the study cannot be granted.

Conflict of Interest:

There is a potential conflict of interest created by the researchers when asking the service to recruit participants via email. However, your participation in this research is entirely voluntary and you may exercise your right to withdraw at any time with no impact to your job security.

Researchers have an interest in completing this study. Their interests should not influence your decision to participate in this study.

Compensation, Reimbursement, Incentives:

You will not incur any expenses as a result of your participation in the study. Further, you will not suffer any disadvantage or reprisal for withdrawing from the study.

Debriefing and Dissemination of Results:

If you choose to provide us with your contact information, we will inform you directly of the results of the study, including any public events or publications. You are welcome to contact any member of the research team if you have any questions about the status of the study results.

Participant Rights and Concerns:

Please read this consent form carefully and feel free to ask the researcher any questions that you might have about the study. If you have any questions about your rights as a participant in this study, complaints, or adverse events, please contact the Research Ethics Office at (905) 721-8668 ext. 3693 or at researchethics@ontariotechu.ca. If you have any questions concerning the research study or experience any discomfort related to the study, please contact the researcher Dallas Hill at dallas.hill@ontariotechu.net. Please note that the security of e-mail messages is not guaranteed. Messages may be forged, forwarded, kept indefinitely, or seen by others using the internet. Do not use e-mail to discuss information you think is sensitive. Do not use e-mail in an emergency since e-mail may be delayed. By signing this form, you do not give up any of your legal rights against the investigators, sponsor or involved institutions for compensation, nor does this form relieve the investigators, sponsor or involved institutions of their legal and professional responsibilities.

Consent to Participate:

a. Online Consent

1. I have read the consent form and understand the study being described.
2. I have had an opportunity to ask questions and my questions have been answered. I am free to ask questions about the study in the future.
3. I freely consent to participate in the research study, understanding that I may discontinue participation at any time without penalty. A copy of this Consent Form has been made available to me.

☐ I agree

Appendix C

Consent Form – Phase 2: Interviews

Consent Form to Participate in a Research Study

Title of Research Study: The Acquisition and Implementation of Digital Technologies by Canadian Municipal Police Services

Name of Principal Investigator (PI): Dr. Christopher O'Connor

PI's contact number(s)/email(s): 905-721-8668 ext. 5882 or christopher.oconnor@ontariotechu.ca

Name of Student-Lead: Dallas Hill dallas.hill@ontariotechu.net

Departmental and institutional affiliation(s): Faculty of Social Sciences and Humanities at Ontario Tech University

Introduction

You are invited to participate in a research study entitled *The Acquisition and Implementation of Digital Technologies by Canadian Municipal Police Services*. You are being asked to take part in a research study. Please read the information about the study presented in this form. The form includes details on study's procedures, risks and benefits that you should know before you decide if you would like to take part. You should take as much time as you need to make your decision. You should ask the Principal Investigator (PI) or study team to explain anything that you do not understand and make sure that all of your questions have been answered before signing this consent form. Before you make your decision, feel free to talk about this study with anyone you wish including your friends and family. Participation in this study is voluntary.

This study has been reviewed by the University of Ontario Institute of Technology (Ontario Tech University) Research Ethics Board #16344 on June 7, 2021.

Purpose and Procedure:

Purpose:

The main objective of this study is to collect a deeper understanding of the potential impacts that digital technologies have on police services in a Canadian context. The interviews will explore the perceptions of sworn police personnel from various ranks (e.g., front-line officers, chiefs, management, executives) regarding the current acquisition, implementation, and usage of digital technologies, and potential impacts of these technologies on the success of policing activities. You have been invited to participate in this study because including the voices of a diverse sample of police personnel is crucial to analyzing the decision-making processes of Canadian services. Given the social-distancing measures in place to help contain the COVID-19 pandemic,

you will need a computer, laptop, or tablet with an internet connection. You will need an email address. Participants who can do video calling will be encouraged to participate in the interview via video call over the platform Google Meet. If you meet these criteria and are able to participate in an interview in English, you are eligible for the study.

Procedures:

A 30–45-minute interview will be scheduled at your convenience, to be conducted via video call over the platform Google Meet. For the video calling interview format, you will be sent a link via email along with simple instructions for how to access this platform. You will be provided with the questions you will be asked beforehand via email. The series of open-ended questions is designed to prompt you to share your experiences with the acquisition and implementation of digital technologies. You are free to decline to answer any of the questions.

The interview session will be recorded and associated with your pseudonym, not your real name. The audio of the recording will be transcribed for analysis. Any inadvertent mention of your name will be redacted from the transcript to further anonymize your participation.

Potential Benefits:

You will not directly benefit from participating in this study.

Potential Risk or Discomforts:

There are no known or anticipated risks to you from participating in this study.

Use and Storage of Data:

All interviews will be recorded. Interview recordings will be transcribed by the Student Lead, Dallas Hill, and the original recording will be deleted after the transcripts have been verified. Anonymized transcripts will be kept in electronic form in an access restricted Google Drive folder.

All information collected during this study, including your personal information will be kept confidential and will not be shared with anyone outside the study unless required by law. You will not be named in any reports, publications, or presentations that may come from this study.

Confidentiality:

As noted, the interviews will be recorded, and participants will be given a pseudonym that will be assigned to both the interview recording and questionnaire. No record will be made connecting participants' pseudonyms with their real names, and once a pseudonym is associated

with a questionnaire response or interview recording, connection with contact information (e.g., phone number or email address) will be deleted.

Your privacy shall be respected. No information about your identity will be shared or published without your permission, unless required by law. Confidentiality will be provided to the fullest extent possible by law, professional practice, and ethical codes of conduct. Please note that confidentiality cannot be guaranteed while data is in transit over the Internet.

Voluntary Participation:

Your participation in this study is voluntary and you may partake in only those aspects of the study in which you feel comfortable. You may also decide not to be in this study, or to be in the study now, and then change your mind later. You may leave the study at any time without affecting your employment status. You will be given information that is relevant to your decision to continue or withdraw from participation. Such information will need to be subsequently provided. You may refuse to answer any question you do not wish to answer during the interview by saying, 'pass'.

Right to Withdraw:

If you withdraw from the research project at any time, any data that you have contributed will be removed from the study provided that you are able to provide the research team with your pseudonym. You do not need to offer any reason for making this request. Requests to withdraw from the study must be made within one month of the interview date, in order to extract your contributions from the analysis. After that point, it will not be possible to remove your contributions as they will have been incorporated into the analysis, but they will of course remain anonymous.

Conflict of Interest:

Researchers have an interest in completing this study. Their interests should not influence your decision to participate in this study.

Compensation, Reimbursement, Incentives:

A $10 donation will be made to the Ontario Police Memorial Foundation (OPMF) for participating in the interview. It is important to note that in the event of a withdrawal from the study, the donation will still be made. You will not incur any expenses as a result of your participation in the study. Further, you will not suffer any disadvantage or reprisal for withdrawing from the study.

Debriefing and Dissemination of Results:

If you choose to provide us with your contact information, we will inform you directly of the results of the study, including any public events or publications. You are welcome to contact any member of the research team if you have any questions about the status of the study results.

Participant Rights and Concerns:

Please read this consent form carefully and feel free to ask the researcher any questions that you might have about the study. If you have any questions about your rights as a participant in this study, complaints, or adverse events, please contact the Research Ethics Office at (905) 721-8668 ext. 3693 or at researchethics@ontariotechu.ca. If you have any questions concerning the research study or experience any discomfort related to the study, please contact the researcher Dallas Hill at dallas.hill@ontariotechu.net. Please note that the security of e-mail messages is not guaranteed. Messages may be forged, forwarded, kept indefinitely, or seen by others using the internet. Do not use e-mail to discuss information you think is sensitive. Do not use e-mail in an emergency since e-mail may be delayed. By signing this form, you do not give up any of your legal rights against the investigators, sponsor or involved institutions for compensation, nor does this form relieve the investigators, sponsor or involved institutions of their legal and professional responsibilities.

Consent to Participate:

a. Online Consent

Include the following statements:

1. I have read the consent form and understand the study being described.
2. [If applicable] I have had an opportunity to ask questions and my questions have been answered. I am free to ask questions about the study in the future.
3. I freely consent to participate in the research study, understanding that I may discontinue participation at any time without penalty. A copy of this Consent Form has been made available to me.

☐ I agree

Appendix D

Recruitment Email – Phase 1

Sender: Dallas Hill [dallas.hill@ontariotechu.net]
Target audience: Police personnel across all Canadian municipal services who have experience with the acquisition and implementation of digital technologies
Subject line: Optional Research Study: Acquisition and Implementation of Digital Technologies
Header: Online Survey

Body (General):

Subject: Request for Participants in Canadian Municipal/Regional Technology Acquisition and Implementation Survey

Hello,

I am attempting to contact police personnel involved in the acquisition and implementation of digital technologies (e.g., data management systems, drones, big data, body worn cameras, surveillance cameras) in Canadian municipal/regional police services to participate in a short survey. In particular, I am interested in surveying police personnel about recent experiences implementing new technologies and plans for future digital technology acquisition. Would you be able to forward the below request to people within your police service that best fit that description (e.g., Deputy Chief, Chief, IT Unit, Administration, Executive Management, Uniformed Officers)?

Sincerely,

Dallas Hill

Subject: Request for Participants in Canadian Municipal/Regional Technology Acquisition and Implementation Survey

Hello <name>,

I am a PhD candidate working under the supervision of Associate Professor Christopher O'Connor in the Criminology and Social Justice program at Ontario Tech University. My dissertation involves the examination of Canadian municipal/regional police services' recent experiences with implementing digital technologies (e.g., data management systems, drones, body worn cameras, surveillance cameras) and the identification of future plans for technology acquisition. Digital technologies are becoming increasingly intrinsic to police work; therefore, we would be very interested in hearing more about your perceptions and experiences with their acquisition, implementation, and use.

To that end, we are looking for participants to fill out a brief survey (completion time approximately 15 minutes). If you are interested in participating, please click on the following link to complete the survey and learn more about the research project:

https://uoitsocialscience.eu.qualtrics.com/jfe/form/SV_cBKXqStfXFrhwCa

The results of this study will be shared through publications and presentations, but your specific responses are anonymous and cannot be traced back to you. Your participation in this survey is completely voluntary. If you have any questions about the survey, please contact me at dallas.hill@ontartiotechu.net.

If you have any questions regarding your rights as a participant or have any concerns about this study, please contact the Research Ethics Office at researchethics@ontariotechu.ca or 905.721.8668 x3693.

This study has been reviewed by the Ontario Tech University Research Ethics Board #16344 on June 7, 2021.

Sincerely,

Dallas Hill

Appendix E

Recruitment Email – Phase 2

Sender: Dallas Hill [dallas.hill@ontariotechu.net]
Target audience: Those who indicated interest in the online survey (i.e., Phase 1)
Subject line: Optional Research Study: Acquisition and Implementation of Digital Technologies
Header: Follow-Up Interview Recruitment

Body:

Hello,

My name is Dallas Hill, and I am a PhD student working under the supervision of Dr. Christopher O'Connor in the Criminology and Social Justice program at Ontario Tech University. I am contacting you because you indicated interest in participating in a follow-up interview to discuss your experiences with the acquisition, implementation, and use of digital technologies (e.g., data management systems, drones, big data, body worn cameras, surveillance cameras).

Participation in this study is entirely voluntary and there is no obligation nor need to participate if you do not want to do so. The study involves a 30–45-minute one-on-one interview **[virtually via Google Meet]** to discuss your experiences with recently introduced technologies. More specifically, we would like to get an understanding of how police services make decisions about which digital technologies to acquire; the perceived impacts of acquiring and implementing these technologies on police personnel and how police services can best acquire and implement new digital technologies to meet their technological needs. We are looking for approximately 20 participants for this study. I'd like to note that in appreciation of participants taking the time to speak with me, I will be donating $10 to the Ontario Police Memorial Fund (OPMF) for every interview.

If you are interested in participating, please contact me at dallas.hill@ontariotechu.net with your preferred availability. I will then send a confirmation email indicating that you have been signed up for one of those times and provide you with further information concerning the link to the interview. If you have to cancel your appointment, please email me at dallas.hill@ontariotechu.net.

If you have any questions regarding your rights as a participant or have any concerns about this study, please contact the Research Ethics Office at researchethics@ontariotechu.ca or 905.721.8668 x3693. This study has been reviewed by the Ontario Tech University Research Ethics Board #16344 on June 7, 2021.

Sincerely,

Dallas Hill

Appendix F

Social Media Posting: Series of Tweets

Phase 1 Recruitment Post:

1. You are invited to participate in a research study entitled *The Acquisition and Implementation of Digital Technologies by Canadian Municipal Police Services*. [Insert link].
2. This 20-minute survey will explore the perceptions of sworn police personnel from various regarding the current adoption and implementation of digital technologies and potential impacts of these technologies on the success of policing activities.
3. Police personnel from any Canadian municipal/regional service who have experience with the acquisition and implementation of digital tech, including the decision-making process, can participate.
4. This study has been reviewed by the Ontario Tech University Research Ethics Board #16344 on June 7, 2021.

Phase 2 Recruitment Post:

1. You are invited to participate in a qualitative research study entitled *The Acquisition and Implementation of Digital Technologies by Canadian Municipal Police Services*.
2. We are looking for approx. 20 participants to complete a 30–45-minute virtual one-on-one interview to discuss your experiences with recently introduced technologies at your service.
3. In appreciation of your time, I will be donating $10 to the Ontario Police Memorial Fund (OPMF) for every interview. If you are interested in participating, please contact me at dallas.hill@ontariotechu.net.
4. This study has been reviewed by the Ontario Tech University Research Ethics Board #16344 on June 7, 2021.

Appendix G

Data Management Plan
Project Name: The Acquisition and Implementation of Digital Technologies by Canadian Police Services
Project Identifier: 12565
Research Team: Dr. Christopher O'Connor (PI), Dallas Hill (Student Lead)
Project Data Contact: christopher.oconnor1@ontariotechu.net; dallas.hill@ontariotechu.net

Overview of Data Management

- Data will be stored electronically on the Ontario Tech G-Suite in a password protected folder and computer. Data will be kept for a period of 10 years to allow for publications to be developed out of the data. After that time period, the data will be destroyed. The PI, Dr. Christopher O'Connor, will be in charge of the data management plan. There are no perceived instances of substantive changes to the personnel overseeing the project's data. In the event of a change to personnel, the REB will be notified immediately.

Detailed DMP

Access to Data

- The PI, Dr. Christopher O'Connor, is responsible for the data.
- During all phases (i.e., collection, analysis, long-term storage) both the PI, Dr. Christopher O'Connor, and the Student Lead, Dallas Hill, will have access to the data.

Data Collection

- Data from Phase 1 (i.e., survey) will collect digital data via Qualtrics. Phase 2 (i.e., semi-structured interviews) will collect audio data via external audio recording device that will be later transcribed into PDF text format.
- I will denote dates in YYYYMMDD format, include a summary of content (e.g., Questionnaire or Transcript) as part of the file name, and keep track of document versions either sequentially (e.g., V01, V02) or with a unique date and time (e.g., 20210309_1800).
- All data will be stored electronically in the following formats: PDF, doc, xlsx, and mp3.
- Initial data from Phase 1 will be entirely anonymous. Phase 2 will involve the participants email addresses (for recruitment and scheduling) and audio recordings. Email addresses will be kept in the folder created for the study on the Ontario Tech G-Suite and the file will be password protected. Audio recordings will be transcribed by the Student Lead, Dallas Hill, into a PDF text format that will redact any identifiable information (e.g., names, locations). Prior to the destruction of the audio recordings, they will be placed into a password protected folder on an external hard drive. Therefore, the mp3 files can only be accessed properly by downloading and entering a password on the device where they have been downloaded. The external hard drive will be kept in a locked filing cabinet during data collection in the home office of Student Lead, Dallas Hill. Once transcriptions are created, individually password protected, and stored in the folder created for the study on the Ontario Tech G-Suite, the audio recordings will be destroyed so no identifiable information remains.

De-identification of Data

- Digital transcripts that will remove any identifiers from the audio files will be done immediately following the semi-structured interview. The identifiers that may need to be removed include any names, addresses, or information that is specific to the participant. As previously mentioned, the original recordings will be destroyed immediately following transcription.

Data Storage During Analysis

- Phase 1 data will be analyzed using SPSS software and Phase 2 data will be analyzed using the NVivo12 software on a password protected computer. During analysis, data will be stored in a folder created for the study in a Google Drive on the Ontario Tech G-Suite. All data in PDF, doc, and xlsx formats will be individually password protected before being uploaded into the Google Drive folder. As previously mentioned, all mp3 files will be stored on an external hard drive in a password protected folder, as they cannot be individually password protected. At this stage, only the PI, Dr. Christopher O'Connor, and the Student Lead, Dallas Hill, will have access to the data. The timeline for analysis is approximately two months.

Long Term Data Storage

- All data (i.e., digital survey data and transcripts) will be kept in a separate folder in a Google Drive on the Ontario Tech G-Suite. All data in this folder will be individually password protected. At this stage, only the PI, Dr. Christopher O'Connor, and the Student Lead, Dallas Hill, will have access to the data. This data will be stored for a time period of 10 years to allow for publications to be developed out of the data. After this point, the data will be destroyed. Data will not be stored with any identifiers.

Transferring Study Data

- There will be no transferring of study data.

Data Sharing

- Aggregate data will be used in publications and the Student Lead's dissertation. Participants will be notified of this in the consent forms in both phases of the study.
- The data will not be shared with future research projects in a secondary use of data capacity.

Data Breach Contingency Plan

- In the event of a data breach, the REB will be notified immediately. Additionally, any issues surrounding legal, ethical, and intellectual property will be dealt with in accordance with the REB and TCPS2 recommendations. As there is no identifiable data being stored with the data, there is no risk to participants if there is a data breach.

Appendix H

Interview Guide

Before interview starts: Remind participant that the interview is being recorded and go over the informed consent form including plans for transcription and the de-identification of this recorded data.

1. **Can you tell me a bit about yourself?** (Probe: Job description and previous experience? Previous Jobs? Education?)

2. **How does your service typically make decisions about which technologies to acquire**? (Probe: Formal? Informal? One person? Several People? The same people each time?)

3. **What was your role in the decision-making process surrounding new technology at your service?** (Probe: Final say? Initial interest? Part of a collaborative effort?)

4. **What are the key influences on decision-making surrounding technology in your service?** (Probe: economic, social, organizational, evidence-based?)

5. **What benefits have you seen from acquiring and implementing new technology during your career?** (Probe: Job performance, increased efficiency, job satisfaction?)

6. **What concerns do you have surrounding the adoption and implementation of technologies?** (Probe: Increased media attention, community ties, increased surveillance? Any instances of tech disuse post-implementation)

7. **What role do the technology companies play in the acquisition and implementation process?** (Probe: Are they involved in the decision-making? Do they provide individualized marketing to interested police services? Are they involved post-implementation? No role?)

8. **How can police best make decisions about technology acquisition and implementation to meet their technological needs?** (Probe: Community input? Technology trials? Evidence-based approaches?)

9. **Are there currently any technologies that are having a noticeable impact on how police do their jobs?** (Probe: [E.g., body cameras, license plate readers, surveillance technology] Do these technologies make your job more difficult or easier?)

10. **Do you have any questions for me or anything further to add that I missed?**

11. **Before we finish, I'd just like to get some basic demographic information from you in order to get a sense of the participants in this study.** Can you tell me your...a) age, b) highest level of education achieved c) approximate income level d) race/ethnicity e) gender?

Finally, I'd like to thank you very much for participating in this research project. Your responses were very helpful. If you would like a copy of the final report on this research project, please leave an email with me and I will send you a copy once the study is complete. This email will in no way be connected to your responses. If for some reason you change emails/jobs, feel free to send me your current contact info at any time or you can track me down online to obtain a copy of the final report.

Thanks for all of your help and insights. It's much appreciated.