POLICING, SENSEMAKING & THE POLITICS
OF ARTIFICIAL INTELLIGENCE IN CANADA

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Abstract

One of the most crucial issues of our time for social scientists is to understand how Artificial Intelligence (AI) is transforming democratic societies. Here I study Canadian police policy making in the era of AI. As the police enacts the state monopoly of legitimate violence over a given territory, the ways in which it engages with AI to enhance this power—or not—and how society responds to it, are crucial dynamics illustrative of the challenges AI pose for policymakers. I introduce the concept of *Police AI Technological Innovations* (PAITI): the procurement or use of a new piece of capital equipment that uses algorithms and AI to enhance—and potentially transform—police decision-making practices. The first contribution of this dissertation is to explore how police leaders and other key policy actors make sense of PAITI. With limited information or technical background in AI, police leaders are tasked with translating complex technologies in policing terms; weight accountability and budgetary considerations; assess the needs and receptivity to change of their members; and consider how various stakeholders will respond to the AI turn in policing.

Furthermore, this dissertation examines how this sensemaking impacts the very principles of democratic policing: that police services obey the rule of law (not tyrants), limit interventions in people's lives, and are ultimately accountable to citizens. PAITI risk embedding police services within urban infrastructures, where they will be less visible or accountable to citizens, but more informed on them. PAITI policy is as such central to the continuous power struggle over the future of democratic policing.

In a first theoretical chapter, this dissertation develops an assumption-based model to explore how the police simplifies PAITI according to its preferences. It is rooted in political science, Science and Technology Studies, and police sociology literature on how the police traditionally approaches innovations and organizational changes. I argue police leaders facing complex decisions regarding police AI technologies make sense of them through a simplification process centred on (1) the impact of technologies on traditional policing (enhancement or transformation), and (2) the type of surveillance capacities they enhance (direct or indirect). I introduce these simplifications under the form of two distinct, complementary continuums. On a *change* continuum, police leaders make sense of PAITI through a simplification process centred on the impact of technologies on traditional policing. Innovations that *enhance* what is valued as "real" police work by making it more efficient will be more likely to be adopted than innovations that fundamentally *transform* the nature of police work. On a *surveillance* continuum, an innovation that develops police surveillance capacities in a way that is *visible* to the public and habilitates the police to identify individuals *directly* is less likely to be favoured by police leaders.

This theoretical argument is developed through the case of Canadian municipal PAITI policies, in three empirical chapters. Chapter 2 studies how environmental factors influence automatic licence plate readers (ALPR) programmatic dimensions. It fleshes out interactions between sensemaking, technical capacities, and context, by contrasting the Montreal and British Columbia cases. Chapter 3 refines our knowledge of organizations sensemaking of place-based predictive policing (PP). It gives a voice to officers who do not interact with PP. Implemented in 2017, the Vancouver Police Department exemplifies how police services' technoscientific attitudes of PP risk perpetuating historic flaws and biases of policing under a false sense of algorithmic impartiality. Chapter 4 highlights the political dimension of body-worn cameras (BWC). Now equipped and dependent on AI, BWC have become powerful surveillance tools. I argue there is an emerging ability in the public debate to understand and adapt to BWC as PAITI. The chapter notably discusses the case of Toronto, where AI was a key consideration during its 2020 BWC rollout.

Résumé

Comprendre comment l'Intelligence artificielle (IA) transforme nos sociétés démocratiques est un enjeu crucial pour les sciences sociales de notre époque. J'étudie ici les politiques publiques policières à l'ère de l'IA. La police promulguant le monopole de la violence de l'État sur un territoire donné, la manière dont elle approche l'IA afin d'accentuer ce pouvoir—ou pas—et comment la société répond, sont des dynamiques illustratives des défis que pose l'IA pour nos décideurs. Je développe le concept d'innovations technologiques policières de l'IA (PAITI), soit l'acquisition d'instruments utilisant les algorithmes et l'IA pour accroître—et potentiellement transformer—les processus décisionnels policiers. La première contribution de cette thèse est d'explorer comment les décideurs policiers font sens des PAITI. Avec une formation technique limitée en IA, et peu d'informations, les leaders policiers doivent décrypter des technologies complexes; mesurer les impacts budgétaires et de transparence; évaluer les besoins et réceptivités de leurs membres, et prévoir les réactions de parties prenantes variées par rapport au tournant IA de la police.

Cette thèse examine de plus comment cette construction de sens (*sensemaking*) impacte les principes même de la police démocratique: que la police obéit à la règle de droit (et non des tyrans), limite son intervention dans la vie des individus, et est ultimement redevable devant les citoyens. Le risque des PAITI est de voir la police se fondre dans l'infrastructure urbaine, où elle en saura plus sur les citoyens, mais sera moins visible ou redevable envers eux. Les politiques policières de l'IA sont donc au centre de la lutte de pouvoir continue sur le futur de la police démocratique.

Dans un premier chapitre théorique, cette thèse développe des hypothèses explorant comment les leaders policiers simplifient les PAITI selon leurs préférences. Mon approche est ancrée dans la littérature STS, la sociologie policière, et la science politique. J'argumente que les dirigeants policiers faisant face à des décisions complexes sur les technologies policières de l'IA en font sens à travers un processus de simplification centré sur (1) les impacts des technologies sur la police traditionnelle (renforcement versus transformation), et (2) le type de capacités de surveillance qu'elle promulgue (direct ou indirect). Je présente ces simplifications sur la forme de deux continuums distincts et complémentaires. Sur le continuum du *changement*, les dirigeants policiers construisent le sens de PAITI à travers un processus de simplification centré sur l'impact des technologies sur la police traditionnelle. Les innovations qui *renforcent* le « vrai » travail policier auront plus de chance d'être adoptées que celles qui *transforment* la nature du travail policier. Sur le continuum de la *surveillance*, une innovation qui développe des capacités de surveillances policières visibles et identifiant des individus directement sera moins favorisée par les dirigeants policiers soucieux de leurs relations avec le public.

Cet argument théorique est développé dans trois chapitre empiriques portant sur des municipalités canadiennes. Le chapitre 2 étudie les facteurs environnementaux influençant les programmes de lecteurs de plaques automatiques (ALPR). Il détaille les interactions entre construction de sens, capacités techniques, et contexte, en contrastant les cas d'études de Montréal et de la Colombie-Britannique. Le chapitre 3 raffine notre compréhension de la construction de sens organisationnelle de la police prédictive de lieux (PP). Des policiers non impliqués avec la PP y ont voix. Depuis 2017, la police de Vancouver exemplifie les risques de perpétuer des biais policiers historiques sous le faux semblant de l'impartialité algorithmique. Le chapitre 4 met l'emphase sur les dimensions politiques des caméras portatives (BWC). Dorénavant équipées et dépendantes de l'IA, les BWC sont devenues de puissants outils de surveillance. J'argumente ici que le public comprend de plus en plus cette transformation. Je démontre ceci à l'aide du cas de Toronto, où l'IA était au centre des considérations du service lors du lancement des BWC en 2020.

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AQSR	*Agents de quartier en sécurité routière*	LEO	Law Enforcement Officers
AIA	Algorithm Impact Assessments	LAPD	Los Angeles Police Department
ALPR	Automatic Licence Plate Reader	ML	Machine Learning
BLM	Black Lives Matter	MTQ	*Ministère du Transport du Québec*
BWC	Body Worn Cameras	MDAI	Montreal Declaration for a Responsible
BR	Bounded Rationality		Development of Artificial Intelligence
B&E	Breaking and Entering	OPD	Oakland Police Department
BC	British Columbia	OPP	Ontario Provincial Police
CPC	Calgary Police Commission	PPD	Philadelphia Police Department
CPS	Calgary Police Service	PAITI	Police AI Technological Innovations
CICC	*Centre International de Criminologie Comparée*	PRIME-BC	Police Records Information Management Environment– British-Columbia
CSPM	*Commission de la Sécurité Publique de Montréal*	PP	Predictive Policing
COP	Community Policing	RFI	Request for Information
CSO	Community Safety Personnel	RTM	Risk Terrain Modelling
CEW	Conducted Energy Weapon	RCMP	Royal Canadian Mounted Police
CI	Constructive Institutionalism	SPPAL	Saskatchewan Police Predictive b Analytics La
DL	Deep Learning	SPD	Seattle Police Department
DAS	Domain Awareness Systems	SPVM	*Service de Police de la Ville de Montréal*
DTES	Downtown Eastside of Vancouver	SAAQ	Société de l'assurance automobile du Québec
EFF	Electronic Frontier Foundation		
ERB	Ethics Review Boards	SSL	Strategic Subject List
FR	Facial Recognition	SQ	*Sûreté du Québec*
FPPM	*Fraternité des policiers et des policières de Montréal*	TPS	Toronto Police Service
FAQ	Frequently Asked Questions	TBS	Treasury Board of Canada Secretariat
GDPR	General Data Protection Regulation	UK	United Kingdoms
GeoDASH	Geographic Data Analysis and Statistics Hub	USA	United States of America
GPS	Global Positioning System	UdeM	*Université de Montréal*
GTA	Greater Toronto Area	UCLA	University of California, Los Angeles
GDS	Gunshot Detection Systems	VPD	Vancouver Police Department
HRP	Halifax Regional Police		
IPCO	Information and Privacy Commissioner of Ontario		
ILP	Intelligence Led Policing		

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Introduction: AI & the Politics of Policing

At nighttime in a wealthy suburban area, a mother is cleaning the dishes while laughing with her teenage son. Suddenly, a man who she recognizes shows up aggressively by the backyard window, and proceeds to break in. The mother runs across the house to the front lawn, protecting her son. In the background, the voice of a police dispatch is giving directions for a domestic violence case. The culprit rapidly has the family boxed in, threatening them with a crowbar. Within moments, a patrol car shows up. The screen centres on the words "Axon Signal," indicating four other cars from the fleet are on their way. But there is no time to waste: both officers jump out of their car, one of them equipped with Axon Flex 2 camera-equipped glasses. The criminal becomes erratic, violently waving his weapon toward the police officers. One of them pulls his side arm. This simultaneously triggers an Axon Signal alert shared with patrols in the area. Automatically, the Axon Flex 2 footage is streamed live on the screen of an off-location operator. Once the second officer pulls out the newest electroshock weapon from Axon, the Taser X2 Smart Weapon, the situation de-escalades. This likewise triggers an Axon Signal alert. The screen turns dark as the perpetrator is arrested.

The next scene of this Axon (2017) advertisement[1] shows one of the officers at the stage of creating the report. Only he is doing it with empty hands: no notepads or audio recorder in his hands. This is because his Axon Flex 2 eyewear is aided by advanced artificial intelligence (AI) tools.[2] They automatically record and transcribe the testimony of the women about her violent ex, adding both the victim interview and transcript to the report. Her licence plate information is recorded simply by placing it in front of his glasses through a text recognition algorithm.

The screen splits in two. The same officer, now glasses less, is frantically writing a report by hand as this side of the video fast-forwards, demonstrating how much longer it takes him. The inscription "**Officers** spend up to 2/3 of each shift **writing reports**" appears. That second screen is discarded, the calm AI equipped officer is listening to the victim. He

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[1] Axon. 2017. "Axon's Vision For the Future of Policing." Accessed June 1st, 2022.
https://www.youtube.com/watch?v=BAsXl6ElrYw
[2] AI is define here by the use of computers to mimic human decision-making & problem solving capacities (Copeland, 2022).

is not writing, nor is he asking her to slow down. A new inscription appears: "With AI Technology **officers can focus** on people, not paperwork."

In an urban setting, a depanneur cashier is counting his money in the middle of the night. Streets are empty. An officer looks at his watch, and calmly leaves the shop he is at. Across town, a shady looking man too is looking at his watch. He walks rapidly to his car, constantly looking around his shoulders. As both men walk, the voice of the officer narrates in the background: "I used to think my job was all about arrests, chasing bad guys." Close-ups of both men driving toward undisclosed locations ensue. During the drive, the officer is calm, coffee in hand while scanning the streets with his eyes. The other man seems anxious, frantically looking at his watch. The squeaking sound of his tires contrast the unruffled driving of the officer. Follows an aerial view of the suspicious man on a highway while the police car is on its underpass. The narration continues: "Now I see my work differently. We analyze crime data, spot patterns. Figure out where to send patrols."

The camera moves further away. The viewer can now distinguish the depanneur from the beginning of the advertisement. A few blocks further lays an underpass, which does not seem close to a highway exit. The viewer can presume it was the same one the officer took, almost as a shortcut. The focus of the camera is now on the driving suspect, as the officer continues his narration: "It has helped some US cities to cut serious crimes by up to 30 %."

The suspicious man parks his car on the street, walking rapidly toward the entrance of the commerce while putting on leather gloves. He reaches for his pocket. Only, when he gets to the parking lot of "Remo's Market" a pickup truck backs up. The officer is behind, gently saluting the shady looking man who freezes, embarrassed. As both man exchange looks, the second turns away. The narration concludes: "By stopping it, before it happens." The IBM logo and slogan "Let's build a smarter planet" then appears on the screen.[3]

The Axon and IBM advertisements portray a variety of AI induced police innovation. To jointly study these wide-ranging police AI applications, I introduce here the concept of *Police AI Technological Innovations* (PAITI): the procurement or use of a new

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[3] IBM. 2012. "Police Use Analytics to Reduce Crimes." Accessed June 1st, 2022.
   https://www.youtube.com/watch?v=5n2UjBO22EI,

piece of capital equipment that uses algorithms and AI to enhance—and potentially transform—police decision-making practices.

On the first look, these advertisements simply aim to sell said PAITI. Yet they also reflect how actors in police technological systems make sense of the role of police services in society. They hint at what policing fundamentally epitomizes from within, and how AI is made sense as means to further its fundamental missions. For IBM, this means preventing crimes before they happen.[4] For Axon, it is to "protect life" and to "make the bullet obsolete," both company slogans. Technology corporations sell themselves as necessary contributors to police *raison d'être*. An officer can "analyze crime data" and "spot patterns" to prevent crimes. Another is freed from excessive paperwork and can focus on *real* police work, whether that means "chasing bad guys," or taking the time to help a citizen fix a tire puncture. The latter is portrayed at the end of the first commercial, accompanied by the inscription "Automatic paperwork will triple officer time spent serving constituencies."

The public too, then, can gain from AI in policing. But it also giving something up. PAITI entail an unprecedented accumulation of data and technical capacities by police agencies. It changes the nature of police work, who are to spend less time on the road and more in front of computer screens. This inspires Elizabeth Joh' (2018) intuition that AI will in the long run lead to the *embeddedness* of police services in urban infrastructure, where they will be less visible but more informed on citizens. This is a fundamental development for democratic societies. If there is no interaction between the police and citizens, trust fade, police presence tame, and the turn to PAITI means the end of community policing as we know it. It means policing civilians instead of protecting them. No previous police technological innovation has had such a potentially overwhelmingly disruptive impact.

The potential embeddedness of policing resonates with what economist Klaus Schwab, founder of the Davos World Economic Forum, dubs the most crucial issues of our times for social scientists: understanding how the "fourth industrial revolution" of AI and Deep Learning (DL) is transforming our democratic societies (Schwab 2016). This era of

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[4] The idea that crime could be prevented before it happens garnered much attention when the IBM advertisement was first published, in 2012 (Perry et al. 2013). A decade later, Egbert and Leese (2021) introduced their book using this same IBM advertisement. Both works are foundational for this project. Perry et al. was influential (perhaps even a mandatory reading) for many early scholars of PP. Egbert and Leese introduced many theoretical ideas to the study of the nexus between AI, policing, and sensemaking which grounds this research.

great promise could see billions of people connected, organizations becoming more effective, and the leverage of AI to solve fundamental human issues such as the environmental damages caused by previous industrial revolutions or world hunger.

This same era of great peril could, in a bleaker scenario explored by Schwab, see private and public organization unable to adapt to continuous technological changes, drawn in data they cannot absorb. Power shift favoring those that control technologies could drastically increase inequalities and fragment societies.

The contrast between both scenarios hints that we are only beginning to understand how new surveillance and automatization instruments challenge the relationships between the state, its citizens, and the entities developing these technologies. Police organizations exemplify the complexity of these rapport. They lay at the intersection between regulators that oversee their actions, and private entities on which they depend for the procurement of PAITI. The middle ground is not always easy to find. In the USA, prosecutors were forced to abandon lawsuits based on lengthy police investigations leveraging AI because of private corporations' proprietary information considerations (Joh 2017a). In other cases, municipalities passed motions banning the use of certain PAITI preemptively (Sturgill 2020; Murray and Giammarise 2020; Burbank 2021). In Los Angeles (LA), citizens pressures led to the abandonment of its most advanced uses of AI (Haskins 2020).

These moments hint at the complexity, uncertainty and evolving nature of policy making in the era of AI. The inability of political masters to regulate their own armed arm so as to capture the benefits of AI without hindering principles of democratic policing would not bode well for its ability to craft sensible policies in other sectors. It is with this in mind that I study here police policy making in the era of AI. As the police enacts the state monopoly of legitimate violence over a given territory, the way it engages with technological innovations to enhance this power—or not—and how society, private corporations, and governments responds, are crucial dynamics illustrative of the challenges AI pose for policy makers. With limited information or technical background in AI, police leaders are tasked with making sense of complex technologies; weight accountability, budgetary, and public perception considerations; assess the needs and receptivity to change of their members; and consider how various stakeholders will be impacted or respond to policing's AI turn.

The complexity of the challenge posed by PAITI is especially imposing at the municipal policing level, on which this project focuses. While national agencies might have means to partly explore these considerations, at the local level, which is the primary law enforcement respondent of most North Americans, these decisions often rely on few select actors centred around police chiefs. Impactful set of policies regarding how much information police services (and therefore government) gather and exploit on citizens are as such decided primarily by local police leaders, who act on very limited information. This leads to vast differences in approaches, at times with unexpected consequences for citizen privacy, and the way they interact with law enforcement.

The main contribution of this dissertation is to explore how local police leaders (the target of the Axon and IBM advertisement) and other key policy actors make sense of different, multiplying, and complex PAITI. This dissertation does not focus on the moment (or decision) of adoption, but rather on the dynamic sensemaking exercises that police leaders continuously make on PAITI, what type of actors influences them, and how these can evolve across space and time.

A further contribution of this dissertation is to examine how leaders' sensemaking of PAITI impacts the very principles of democratic policing: that police services obey the rule of law (not tyrants), limit interventions in people' lives, and are ultimately accountable to citizens. These research questions are grounded in the theoretical assumption that the way individuals and organizations continuously translate AI technological innovation into terms that make sense to them is key to understanding how innovations are prioritized, evaluated, and rolled out by municipal police services, and that in turn, this impacts the nature of policing in democratic societies. It helps understand whether it is feasible to develop a model of policing that embraces AI without discarding the principles of democratic policing.

The theoretical framework of this dissertation is rooted in the works of many political scientists. Craig Parsons (2007) and Daniel Béland (2019) work on the role of ideas in political research grounded my approach. Virginia Eubanks' (2016) perspective on the politics and unintended consequences of AI contributed to forging my assessment of these issues. Matthias Leese (2021; Egbert and Leese 2021) was instrumental in both my understanding of predictive policing (PP, see next page), and how I conceptualize police

sensemaking. Benoit Dupont (et al. 2021) contributed to both the theoretical and empirical sides of this dissertation.

Power is a central consideration for political science as a discipline. The police are the armed branch of the state entitled to legally exert power using coercive means forbidden to other members of society. According to Max Weber in his second vocation lecture, "violence is what is *specific* to the state" (Weber 2020, 56). The police derives from the state's monopoly over the seemingly legitimate use of physical force, which is the key form of power in society. Yet this power is not unlimited, as it is conditional to political and citizen oversight. An officer is not sent by accident to patrol the streets. That presence is the result of policy decisions and moving power relations in societies.

Despite the profound political nature of policing, however, we must recognize that our discipline, political science, has not always given it the attention it deserves. As such, readers should expect this dissertation to be eminently interdisciplinary, as it draws on scholarship from different fields such as political science, public policy, police sociology, law, and criminology to provide a layered portrait of PAITI.

Discussion of the policing and AI nexus is about power and the role of the state, two things that political scientists care a lot about. Thus, while the present work may not read as a traditional political science dissertation, it addresses key issues that political scientists have studied since Weber.

PAITI, Citizens, and Their Police

PAITI, the procurement or use of a new piece of capital equipment that uses algorithms and AI to enhance—and potentially transform—police decision-making practices, take many forms. One example is *automatic licence plate readers* (ALPR),[5] which are cameras, either static or mounted on patrol cars, that take two pictures of every car that they encounter – one of the licence plates and one of the cars themselves – recording day, time, and Global Positioning System (GPS) coordinates. A second example is *predictive policing* (PP)[6] (Perry 2013), which use algorithmic formulas to generate

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[5] ALPR are also named by some providers simply as LPR. Alternatively, in England they are called Automatic Number Plate Readers (ANPR).

[6] The term PP is somewhat imprecise and potentially misleading. PP does not predict when and where crimes will happen, but rather forecast the likelihood of crimes happening at different points in times (Perry 2013).

estimates of future crimes locations (Moses and Chan 2018), pinpoint targeted areas for police intervention (Beck and McCue 2009), or identify plausible victims or perpetrators of crimes (Dupont et al., 2018). Police technological innovation also takes the form of *body-worn cameras* (BWC), which are wearable audio, video, or photographic recording equipment typically worn on the torso of patrol officers (Meyer and Tanner 2017). BWC hardware are not considered themselves PAITI, but ongoing development in BWC technology is such that the technology is becoming dependent on AI intervention to reach its full potential. This is demonstrated in the Axon Signal advertisement, where the Axon Flex 2 glasses are enhanced with multiple AI.

PAITI have potential benefits for the safety of our communities, as they promise to transition police services into more efficient and proactive organizations. They notably help services adapt to new immaterial threats of this era, such as ransomware, virtual identity theft, or online bullying. Yet PAITI come with their load of ethical and sociological considerations, as they risk completely transforming the citizen-police relationship notably by embedding police services (Joh 2017b; 2014; 2016a; 2018b). For instance, ALPR systems reduce bias in police running of licence plates and roadside stops. This is promising, as this is the most common interaction between citizens and the police, is the setting of many confrontations, and is therefore crucial to how the police is perceived by those it is charged with protecting (Bayley 1976; Lundman 1979; Rich 2013). On the other hand, they correspond to "dragnet" surveillance practices, meaning they collect data on everyone rather than only individuals under suspicion (Brayne 2017). This raises privacy concerns, as the police now surveys citizens that were "previously exempt from routine surveillance" (Haggerty and Ericson 2000 from Braynes 2017).

BWC also lower the police database inclusion "trigger mechanism" (Tracy and Morgan 2000) by recording information on all individuals encountered by patrolling officers, not only those deemed suspicious. This becomes particularly problematic when facial recognition (FR) is integrated to the software that runs live with the cameras, as is already the case with different Chinese BWC providers (Li and Cadell 2018; Soo 2018). Likewise, Los Angeles-based manufacturer Wolfcom started selling BWC equipped with

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Perhaps another concept such as forecasting policing software would be more accurate. However, the term PP has been widely adopted by academics, law enforcement, and corporations developing such PAITI.

live-FR during the first trimester of 2020 (Giddings 2020), leading to civil society and academic warnings of this evolution in the USA (Hood 2020; Doffman 2019). Importantly, this change is not necessarily visible for the public, as the software can be added to already integrated BWC hardware. This perspective, and the privacy concerns it rears, clouds an already complex evaluation process of this technology for police services.

To be sure, most major North American BWC providers have the technical capacity to integrate live FR to their products. However, some are actively distancing themselves from this market: industry juggernaut Axon declared a moratorium on the use of facial recognition technology (Axon Ethics Board, 2019b). A few legislatures, following the leadership of California lawmakers, have also banned FR usage in BWC (Cagle 2019). Despite this, virtually all BWC footage, including in Canada, can be extracted retroactively and fed to FR software. One exception to this rule concerns jurisdictions where FR is completely banned, such as San Francisco.

As for PP, it raises different types of challenges. A notable one is linked to the systematization of racial biases inherent to how data had previously been collected (Jefferson 2018; Chammah and Hansen 2016; Valera et al. 2018; O'Neil 2016; Eubanks 2016).

Data propriety is yet another source of polemics linked to PAITI, as services have at times been forced to drop criminal prosecutions under pressure from private companies eager to protect the proprietary information of the technology they developed (Joh 2017a). This has not been a problem for ALPR, PP, and BWC technologies, as the data collected from these remain the propriety of police services.

Taken together, present-day available police technological innovations made possible by advances in the field of AI and DL represent multifaceted challenges for police organizations. Internally, they need to ensure their staff is willing and able to successfully engage with AI transitions. In terms of crime prevention, they must strategically adapt to new crime trends while maintaining and developing quick response capacities. This means identifying which innovations provide the best balance between optimized technical capacities and cost efficiency. From a civil rights perspective, they need to ensure this transition does not lead to infringement of privacy rights nor the over policing of certain groups. In terms of policy, police leaders also have to develop comprehensive use and

accountability policies for these technologies, which notably determine for how long collected data will be stored and who can access it (Crump, 2016). These policies often have documented omissions and inconsistencies, notably in the case of BWC in the USA (Robinson and Koepke 2016).

Responses to PAITI internal, crime prevention, civil rights, and policy challenges are not mutually exclusive. The most efficient crime prevention strategy can often mean more data collection on individuals, and limited accountability mechanisms. Such an approach would change the informational power advantage of the police in a society. This underlines the importance of understanding how PAITI are made sense of today, as it hints at how democratic policing will evolve tomorrow.

Such complications are not unique to policing; AI has raised unforeseen challenges in multiple policy fields. Political science professor Virginia Eubanks (2018) has noted privacy and bias concern for AI technologies in the criminal justice field—of which the police is the "armed arm"—have many similarities with those in the fields of healthcare and welfare management. Computers have collected, crunched, and shared private citizen data across agencies and private actors since the 1980s. This includes extremely private information, such as one's health history. This has raised questions regarding the role of governmental agencies and private actors in data protection and privacy regulation.

These questions are amplified by the advances in the field of AI. Importantly, this does not impact all groups equally:

> Marginalized groups face higher levels of data collection when they access public benefits, walk through highly policed neighborhoods, enter the healthcare system, or cross national borders. That data acts to reinforce their marginality when it is used to target them for suspicion and extra scrutiny. Those groups seen as undeserving are singled out for punitive public policy and more intense surveillance, and the cycle begins again. It is a kind of collective red-flagging, a feedback loop of injustice (Eubanks 2018, 11).

Using real-life cases, Eubanks explains that when it comes to discussing the complex impacts of AI on our democratic societies, privacy and bias considerations are intertwined. In healthcare, imbalanced data collection means higher insurance fees and lesser services. In law enforcement, continued over policing is based on historical police biases that lead to greater minority crime data collection. As per welfare programs, they are typically

conditional to surrendering private information over a long period of time. This is done in the name of carefully crafted fraud detection programs, with the data itself being used at the detriment of the flagged beneficiary of said programs.

Despite this state crafted surveillance of the marginalized, Eubanks deplores there has been limited academic or public attention to the impact of AI on privacy and bias in most policy areas, including healthcare and welfare. Banking is perhaps the one exception. Issues of biased datasets across fields were initially raised by research on the opacity of credit scores decision-making, and the significant consequences of inherent racially biased financial data for individuals (Citron and Pasquale 2014; Pasquale 2015; Zarsky 2016).

Yet even AI policy in banking has not received nearly as continuous public, political and academic attention as policing. This is perhaps because of the growingly contentious nature of law enforcement in our societies. It is as such a prime field to examine how actors have been making sense of AI, and, circling back to Schwab, how the "fourth industrial revolution of AI" is impacting our democratic societies.

The AI turn in law enforcement shakens democratic principles in notable ways. To police is a core government responsibility, one which enables an institution to surveil and use coercive, potentially deadly force to restrain civil liberties of individuals on a given territory (Monjardet 1996). In a democracy, this power is limited by principles of democratic policing (Heymann 1997; Marx 1999; Brodeur 2010; Bonner 2020). This is defined first by a police service that follows the rule of law, not a powerful leader or group. Restraint is a second characteristic of democratic policing: police intervention in citizen lives is to be limited and follow specifically regulated situations. Third, democratic police services are to be transparent and ultimately remain accountable to citizens.

Police restraint is particularly put in question by the technological advancement permitted by the likes of big data, deep learning, and surveillance technologies. For democratic theorists Micheal D. Wiatrowski, Lynette Feder, and Tim Lenz (2003, 201), police misconducts, including over surveillance, corresponds to human rights denial of freedom that brims citizens from the benefits of living in a democratic society. Historically, cost restrained police ability to surveil citizens. PAITI now allow the continuous collection of data and surveillance of much more citizens at marginal costs. The increased capacity

to surveil citizens allowed by PAITI therefore puts in questions the very nature of police restraint, and henceforth democratic policing.

What's more, instead of sending officers in front of suspects locations, PAITI surveillance is now conducted behind computer screens. This embeddedness of the police complicates the ability of the public to keep it accountable, the third principle of democratic policing. This accountability dimension is not unique to policing: capturing the benefits of transformative technologies while updating overview mechanisms created in a pre-AI era is a challenge of many government agencies. One challenge is to keep actors accountable for actions that follow untransparent algorithmic decisions. In the case of law enforcement, this is especially problematic since the result of these can lead to the restriction of civil liberties of citizens. This dissertation will notably explore the political deficiencies of traditional police accountability mechanisms in responding to transparency challenges caused by PAITI.

Taken together, PAITI wobbles safeguards of democratic policing that are cost, visibility, and oversight. They reduce the cost of surveillance, make the police invisible to the public, and empower the police with tools that traditional accountability mechanisms are not equipped to overview. But this does not mean PAITI are incompatible with democratic policing. There are many ways governments and law enforcement could approach AI. PAITI can be used to protect citizens better, notably against new virtual threats. If properly regulated, AI can lead to safer communities, and less human mistake in police decision making. But AI can in parallel be used to increase state monitoring of citizens, which Eubanks demonstrate can have unequal consequences for marginalized groups. If improperly regulated, PAITI question fundamentals of democratic policing. More generally, if governments allow the police to know so much about citizens, why would it restrain other agencies (which do not have coercive powers) such access.

The consequences of adopting PAITI without consideration to principles of democratic policing are already visible in China. Police use of AI to surveil, control, and systematically discriminate against ethnic Uighurs demonstrate the invasive power state and police authorities can already reach with the present level of technological

advancement.[7] Therefore, if nothing is done to regulate their usage, the integration of PAITI by police services in democratic societies has the potential to thwart fundamental civil liberties such as the right to privacy. Outcry over English police services' testing of facial recognition technologies in the streets of London exposed the potential explosiveness of police services imposing these technologies in democratic contexts without thorough consultations (Murgia 2019).

Put simply, AI is not just any police policy case. PAITI promises to reduce the cost—and exponentially increase the scope —of police surveillance of citizens. According to traditional police sociology, this obstacle has historically been conceptualized as the natural limitation to police power in democratic and non-democratic societies alike (Martin 2007; Bittner 1970). Of course, virtually each police technological innovation has contributed to weighing the police-citizen power scale. Yet, none has had such a potentially overwhelmingly disruptive impact. Dragnet surveillance opportunities that AI opens are of different scale: they allow the police to target all citizens. In contrast, earlier police innovation increased police surveillance potential of targeted individuals suspected of precise crimes.

PAITI therefore trigger and amplify fundamental political questions that impact the type of society we aspire to develop into. Is dragnet surveillance (of police, government, or private entities) compatible with democratic principles and citizens' rights to privacy? In what ways are individuals and groups differently impacted by such practices? To what extent should we regulate the data entities hold on citizens? What policies successfully capture the benefits of AI in ways that avoid their downfalls? These general questions are to be kept in mind throughout this dissertation. Studied here in the context of law enforcement, they bring a unique contribution to the political analysis of the impact of AI integration on democratic societies.

In the same vein, neither is policing just any AI policy case. The consequences of unwarranted implementation of AI in the criminal justice field are of another proportion than in many other AI policy fields. For instance, multiple studies demonstrate risk

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[7] For comprehensive perspectives on the use by the Chinese State of surveillance technology against the Uyghur minority in Xinjiang, see the Central Asian Survey special issue on the topic, edited by Joanne Smith Finley (March 2019).

assessment software that predicts recidivist criminals at bail hearing —and on which judges rely heavily (Angwin et al., 2016)—are biased against black individuals (Skeem and Lowenkamp 2016). Crucially, similar to credit ratings, this injustice is based on opaque software that cannot explain their decision (their "thought process," so to speak) and are significantly hard to audit (Crawford and Schultz 2014). Yet, if both problems have similar roots, their consequences are of different proportions. Being denied a mortgage loan (Citron and Pasquale 2014) or given a disadvantageous credit rate (Zarsky 2016) is incompatible with democratic principles of equality and begs an unequivocal response, but it does not deny individuals from their most fundamental right to circulate freely.

Racially-biased risk assessment software at bail hearings is a drastic example. Still, this tangible reality underlines the inability of AI to impact groups and individuals equally; it cannot remain unaccounted for when evaluating PAITI. PP risk perpetuating historic discrimination, surveillance, over policing, and continued disempowerment of ethnic minorities, with the appearance of impartiality (Barocas and Selbst 2016). Similarly, some ALPR have been found to disproportionally target impoverish populations (Renan 2016, 1059). Often AI errors can be accounted for: a bad Netflix recommendation (false positive) will help perfect its algorithm without consequences on its clients. The same cannot be said about wrongful incarceration or over policing; appropriate safeguards need to be established.

In sum, the acquisition and integration of PAITI are not to be seen as regular state entity procurement. These technologies bring about their loads of challenges and ethical considerations. To complicate the matter, social movements such as Black Lives Matter (BLM) have in recent years put the police under more public scrutiny and social media has publicized police-citizen confrontations (Leblanc 2017; Bradford 2016; Fridell and Lim 2016). This makes the procurement of these technologies even more sensible. Moreover, police services have been found to be prime targets of austerity measures (Wenzelburger 2014), including in Canadian provinces (Jacques 2019). These add to the already complex considerations police services must deal with when contemplating PAITI.

Main Contribution

The main contribution of this dissertation is to explore how police leaders (the target of the Axon and IBM advertisement) and other key policy actors make sense of the different, multiplying, and complex PAITI. Furthermore, to examine how this sensemaking impact the three principles of democratic policing: rule of law, restraint, and accountability. These questions are grounded in the theoretical assumption that the way individuals and organizations translate AI technological innovations into terms that make sense to them is key to understanding how innovations are prioritized, evaluated, and rolled out by police services. In turn, this sensemaking impacts the nature of policing in democratic societies.

Especially in disruptive times, organizational leaders play a key role in sensemaking, acting as *sensegivers*. Because of their *symbolic* and *political capital*, the way actors such as police leaders initially make sense of "what is going on" creates an environment that structures their world and that of their organization. The burst of available police AI technological innovations corresponds to a disruptive time. It generates uncertainty that actors must *translate* (Campbell 2004; Sanders et al. 2015) through their interpretation of the world. As sensegivers, the way police leaders' approach, define, and simplify these changes is central to understand how police organizations will adapt. Given the previously detailed implications of PAITI for our democratic societies, this inquiry may help us better understand how leaders in other policy areas make sense of challenges of this era. It can help draft strategies that embraces AI without discarding the principles of democratic societies. This is notably true in the field of healthcare, where AI advances similarly accentuates and intertwines data privacy and bias challenges.

The continuous sensemaking exercise into what one's organization ought to become is challenging. With limited technical background in AI, police leaders are tasked with making sense of complex technologies; weight accountability, budgetary, and public perception considerations; assess the needs and receptivity to change of their members; and consider how various stakeholders will be impacted or respond to policing's AI turn. At the municipal level, these decisions often rely on few select actors centred around police chiefs. Impactful set of policies regarding how much information police services gather and exploit on citizens are therefore decided primarily by local police leaders, who act on very limited information.

As sensemaking is an inherently dynamic process, police leaders are likewise influenced by other policy actors from who they take cues. This leads to a complementary inquiry into which policy actors influence police leaders sensemaking of PAITI. This is because while sensegivers play a central role in organizational sensemaking, this process is not unidirectional. Sensemaking is by nature dynamic. As actors interact with each other, their respective translations of PAITI will mutually and continuously evolve. Police leaders looking inward to unions and active members will likely get different input on specific PAITI than if they are attentive to the public, community groups, and activists. Part of this inquiry is to determine what are these cues, and which one's (or who) influences police leaders sensemaking.

Aside from public and internal actors, political ones play a role in PAITI policy making. This dissertation will explain that in Canada, strict interpretation of the doctrine of police independence means political actors play a limited role in PAITI decision making, which remains the prerogative of police leaders. One exception to this rule, I argue, is that of Toronto mayor John Tory leadership on BWC during BLM mobilizations in June 2020.

On this last event, police sociology theory teaches us that organizations are attentive to innovations in other services. Multiple interviewees mentioned that all services want to be innovative, but no one wants to be the first out the gate. Adoption of BWC in Toronto, for instance, will likely influence the Montreal police, even if it already has rejected (twice) their adoption. This allows to reiterate that sensemaking does not stop at the decision moment to adopt or not. The initial moment services make decision on a given PAITI influence leaders sensemaking afterwards. Yet making sense of PAITI is a dynamic process that continues to evolve after initial translations and decisions. It is these later moments of sensemaking which this dissertation focuses on.

Thus, this dissertation studies police policy leaders sensemaking of AI. I adopt a constructivist perspective and draw from police sociology (Monjardet 1996; Chan 2007; Brodeur 2010; Jobard 2012; Favre & Jobard 1997), research on the social impact of AI (Joh 2014, 2016a, 2017, 2018a; Kroll 2018; Cath 2018; Cath et al. 2018; Karlin 2018), and the social construction of technology (Hughes 1983; Bijker 1995; Bijker et al. 2012). An underlying assumption of my approach is that police AI technological innovation adoption is not based on rationally calculated needs and crime statistics analysis. It is influenced by

key police leaders' and policy actors' (police unions and members, community groups, politicians) understanding of how these innovations impact the place of police in society (transformation, surveillance), state-police-citizen relationships (accountability), and the reaction to procuring these technologies of various stakeholders.

Taking a wider perspective, this study contributes to the study of ideas in public policy and political science (Béland & Cox, 2010). Ideational explanations advance a contextually contingent logic-of-interpretation that focuses on how individual action is the result of one's interpretation of what is realistic and/or what is desirable (Parsons 2007). Technology is socially constructed by actors and is hitherto not independent from ideas they have about the social and political. Police policy leaders make sense of PAITI through ideational constructs about what policing is, and how AI challenges such translations. In other words, they have ideas of what policing represent, and interpret PAITI through those lenses. This sensemaking is contested. Ideas on police reform and the BLM movement demonstrate the continuous power struggle over ideas on policing. The subject of this study is therefore fundamentally political, albeit rooted in an interdisciplinary literature.

I argue that police leaders facing complex decisions regarding police AI technologies make sense of them through a simplification process centred on (1) the impact of technologies on traditional policing (enhancement or transformation), and (2) the type of surveillance capacities they enhance (direct or indirect). I introduce these simplifications under the form of two distinct, complementary continuums. On a first *change* continuum, I argue that police leaders facing complex decisions regarding police AI technologies first make sense of them through a simplification process centred on the impact of technologies on traditional policing. Innovation that *enhances* what is valued by police culture as "real" police work by making it more efficient and systematic will be more likely to be made sense of positively than innovation that fundamentally *transform* the nature of police work. On a second *surveillance* continuum, an innovation that develops police surveillance capacities in a way that is *visible* to the public and habilitates the police to identify individuals *directly* is less likely to be favoured by police leaders. This is because citizens are more prone to contest surveillance apparatus if they are directly concerned by it.

This argument helps answer the first research question of how police leaders make sense of PAITI. It also gives indications on the categories of actors that influence leaders

sensemaking, and in which direction. In terms of change, police leaders first look inward to their members, and seek to find PAITI that do not transition away from their definition of police cultures (a concept which will be further fleshed out in Chapter 1, Part III). As per surveillance, they look toward the public and political masters they serve and seek PAITI which will not arise their protests, hence the favor for less visible, indirect surveillance of citizens.

The implication of this argument in terms of democratic policing is that AI contribute to an embeddedness of policing within urban infrastructures, as suggested by Joh (2018). The police will aim to enhance its surveillance capacities without arising citizen unease, as such favoring subvert data collection strategies. However, that individuals are not aware of police data collection does not make such strategies less invasive of their privacy. The biggest transformations to policing and the nature of surveillance are not necessarily those perceived as such within services or by citizens (Brayne 2017). A wider implication and challenge of this study of PAITI is therefore that their most profound impacts—on police-citizens relations, on democratic policing—are perhaps also the hardest to explicit.

Research Considerations

Researching the impact of AI on policing is a nascent field of study. This raises several questions: Where to start? Which PAITI are relevant? How do we determine which aspects of actors' environments matter more? Undoubtedly, a framework aimed at seizing the disruptive impact of AI on police policy cannot study every PAITI in a comprehensive manner. In the following paragraphs, I explain why ALPR, PP, and BWC are appropriate entry points into police PAITI policy. They are, of course, not the only accesses into the subject matter. Simply, exploring the impact of algorithmic intervention on police decision-making practices and police-citizen power relations need to start with precise technologies at a given time, a given place, and given use-policies. This also means that for each empirical technological case study (Chapters 2 to 4), one Canadian police service will be studied systematically. This grounding point will allow to leverage the theoretical framework developed in Chapter 1 to compare across place and time different instances of PAITI implementation.

While I assume social reality is intersubjective and, for researchers, is necessarily mediated, adequate research strategy help locate social factors that socially construct the "real" state of affairs (Harris 2008). Following a contextual constructionist perspective (Loseke and Best 2003), accounts provide analytical value by being grounded in "social, political and cultural processes" within which actors make sense of their environment (Hannigan 1995, 30). Therefore, understanding sensemaking "requires a focus on the interpretive actions and understandings of the people within the structural contexts and material realities that influence, shape and guide them" (Sanders et al. 2015). For the researcher, this implies a commitment to explore and display the relationship between account and context (Chen et al. 2011).

In terms of methods, this dissertation draws on 73 semi-directed interviews constructed with specific contexts in mind, complemented by desk research on both specific cases and the social, political, and cultural environments in which PAITI develops. This allowed to give a voice to selected documents from the perspective of a precise research project to enlighten interviewees interpretations. Organizational culture and context vary between cities and even within police services, meaning the analysis explores complementary actors and PAITI implementation examples for each technology. This allows to trace what is specific to different PAITI, what is the result of different environmental factors, and what can be traced back to traditional police culture influence on policymaking.

Now that the necessity to both anchor and widen this study is established, how do we determine which PAITI are analytically important? Leading law enforcement AI policy expert Elizabeth E. Joh (2020) suggests three questions that scholars should consider when studying different police uses of AI. First: are traditional police tasks being replaced by AI? Second: do novel challenges arise from this use of AI by police forces? Third: should the public and scholars be attentive to this increased reliance on AI by police services? A positive answer to all three questions confirms the analytical interest of a particular PAITI. It corresponds to minimal inclusion criteria for this research.

Three PAITI will be the object of an in-depth analysis for this project: mounted ALPR, PP, and BWC. These innovations first have in common that they all meet Joh's minimal requirements. Each allows the police to pursue its traditional functions of scanning

the streets to prevent and persecute criminality, but—to different extents —transforms human officer involvement with AI-induced tools that significantly supplant traditional police tasks. The rapidity and scale of surveillance allowed by these uses of AI by police services is unprecedented. It creates challenges for police services and police accountability institutions alike, and as such individually merit our attention.

The selection of ALPR, PP, and BWC as cases is further justified by their heterogeneous impact on traditional policing and surveillance practices. As per Canadian municipal police services, they have a high degree of police independence, which hints their sensemaking and decision on PAITI is not dictated by political masters. All three PAITI share the characteristic of having been considered with distinctive implications by major Canadian cities including Calgary, Montreal, and Vancouver. Yet, none of the three PAITI is widely established across the country, notably because of the absence of federal funding. Henceforth, these are technologies that different Canadian actors have begun translating, but individuals, stakeholders, and organizations are likely not settled on how to make sense of them. Accordingly, research on police AI policy in Canadian cities has remained largely untapped. Taken together, studying these technologies in Canadian municipal police services will contribute to our understanding of police sensemaking of PAITI.

Each innovation will, moreover, bring its own contribution to our understanding of police policy leaders' sensemaking, and the overall theoretical framework of this project. Chapter 2 will emphasize environmental factors that over a decade explain the dissimilarity in ALPR use-policy and programmatic dimensions between the Service de Police de la Ville de Montréal (SPVM) and British Columbia (BC) agencies. Chapter 3 will study the first permanent PP program implemented in Canada at the Vancouver Police Department (VPD). It will develop links with social impact of AI literature, and discuss a rapid sensemaking evolution of PP. Finally, Chapter 4 on BWC will highlight the political dimension of PAITI. The chapter compares and contrasts the publicized adoption cases of the Calgary Police Service (CPS) and the Toronto Police Service (TPS). In the latter, AI was a central consideration, which emphasizes the contentious dimensions of police integration of AI.

Because they have received distinct academic attention, the complete literature review for each technology will be presented towards the beginning of their dedicated empirical chapter: ALPR in Chapter 2, PP in Chapter 3, and BWC in Chapter 4. Prior to this, Chapter 1 will ground the theoretical framework of this dissertation, situate sensemaking, ideas, and the two continuums within larger PAITI literature, and further discuss case selection rationalization (the three PAITI, Canada, and the cities). A more detailed plan of the dissertation immediately follows.

Plan of the Dissertation

This dissertation's first chapter presents a conceptual framework of analysis of PAITI policy rooted in a constructivist ontology of policing. It leverages political science, social construction of technology texts, and traditional police sociology to study how AI is approached and understood by police leaders. It argues sensemaking provides a processual analysis of how sworn members continuously translate and simplify in a way that makes sense to them the unique position of the police within society. This constructivist framework is complemented by means of the bounded rationality argument, which allows to flesh out the psychological mechanisms that contribute to how police actors digest abundant information and make sense of uncertainty in their environments. Together, these ideational (sensemaking) and psychological (bounded rationality) explanations help argue PAITI policy is not based on rationally calculated needs and crime statistics analysis. It is influenced by key police leaders and policy actors' understanding of how these innovations impact the place of police in society (the change and surveillance continuums), state-police-citizen relationships (accountability), and the reaction to procuring these technologies of various stakeholders. Finally, the chapter addresses the value of studying PAITI sensemaking in Canada.

Chapter 2 studies how environmental factors influence ALPR programmatic dimensions. It fleshes out interactions between technical capacities, context, and sensemaking, by contrasting the SPVM and British Columbia (BC) cases. In the latter, ALPR were perceived as a threat to the balance of power between the public and the police. As such, their use policies have been limited. In Montreal, even though the city council was looking into ALPR in the summer of 2020, the public has been generally indifferent

to the PAITI. This underlines that technology is the product of the environment in which it operates and is socially constructed by the actors with which it interacts.

Chapter 3 refines our knowledge of police organizations sensemaking of place-based PP and contest the dominance of utopian sociotechnical imaginaries of AI. My interviews, in contrast with previous PP research, give a voice to the majority of North American Law Enforcement Officers (LEO) who do not directly interact with PP programs. This allows to underline that, internally, PP is no longer perceived as a crime persecution panacea. Implemented in 2017, the VPD stands out in Canada by implementing the first permanent PP program. Yet what might appear unique here shares many similarities with European and United State cases. The chapter argues the VPD exemplifies how police services' technoscientific attitudes risk of perpetuating historic flaws and biases of policing under a false sense of algorithmic impartiality. Between 2017 and 2022, the public understood PP is not simply a digital version of old "dots on the map" police strategies. Unregulated unsupervised algorithms pose considerable ethical and policy dilemmas that have only partially been accounted for by the VPD.

Chapter 4 highlights the political dimension of BWC and isolates the impact of AI on police sensemaking of technological innovations. Now equipped and dependent on AI, BWC have become powerful surveillance tools. The chapter discusses whether and how this paradigmatic change impacts actors sensemaking of BWC. It does so by contrasting the policy considerations proper to the current upsurge in BWC adoption in Canada with earlier USA cases. The chapter demonstrates an emerging ability in the public debate to understand and adapt to BWC as PAITI. It discusses the case of Toronto, where AI was a key consideration by the TPS during its 2020 BWC rollout. Dynamics in Halifax and Montreal likewise suggest this sensemaking evolution, which contrast with the earlier CPS case (2017-2019).

The conclusion recaps how the two continuums help better understand the complexity of police leaders sensemaking of PAITI. It identifies the complementarity of the three empirical chapters and underlines AI in policing pose immediate challenges to democratic policing. It discusses policy recommendations, power, and pinpoint areas of PAITI research that could be explored to better our understanding of police AI policy.

Chapter 1: The Politics of AI – The Case of Canadian Policing

This chapter presents a conceptual framework of analysis of PAITI policy rooted in a constructivist ontology of policing. It leverages social construction of technology texts and traditional police sociology to study how AI is approached and understood by police leaders. It argues sensemaking provides a processual analysis of how sworn members continuously translate and simplify in a way that makes sense to them the unique position of the police within society. This constructivist framework is complemented by means of the bounded rationality argument, which allows to flesh out the psychological mechanisms that contribute to how police actors digest abundant information and make sense of uncertainty in their environments.

Drawing from these theoretical grounds, this dissertation argues against the idea that police leaders make sense of PAITI based on purely rational thinking. Rather, sensemaking of PAITI is influenced by how police leaders use their foreground ideational abilities (Schmidt 2008) to translate the impact of these innovations on the place of police in society (transformation, surveillance), state-police-citizen relationships (accountability), and the reaction of procuring these technologies for various stakeholders. In other words, facing complex challenges, police leaders use inferential shortcuts to simplify how they make sense of PAITI.

What is developed here is an assumption-based model to explore how the police simplifies PAITI according to its preferences. It is rooted in political science, STS, and police sociology literature on how the police traditionally approaches innovations and organizational changes. I argue this simplification process is centred on (1) the impact of technologies on traditional policing (enhancement versus transformation), and (2) the type of surveillance capacities they enhance (direct or indirect). I introduce these simplifications under the form of the *change* and *surveillance* continuums. Coupled with accountability, budgetary, and public perception considerations, these are central features of police leaders sensemaking as political actors.

Concretely, my argument is that police leaders favor PAITI which *enhance* traditional police work and develop *indirect* surveillance capacities. This means PAITI touch the very fundamentals of democratic policing. PAITI could make the police less

visible to the public but empowered with unprecedent capacity to surveil citizens. This puts in question the very nature of police restraint and complicates the ability of the public to keep law enforcement accountable. If improperly regulated, the turn to AI in policing will distance the police from the communities they serve. This embeddedness has consequences for the nature of our democratic societies. It means policing civilians instead of protecting them. No previous police technological innovation has had such a potentially overwhelmingly disruptive impact on the scope of police power.

Section I of this chapter clarifies what can be learned from the study of PAITI. The contentious nature and continuous academic and public attention to law enforcement makes it is a prime field to study policy actors dynamic sensemaking of the challenges AI pose to regulators. This is notably true for our understanding of the intertwined nature of bias and privacy concerns when it comes to big data, governments, and surveillance technologies. Within police policy, PAITI help us examine how traditional police accountability mechanisms hold in contrast with other categories of police innovations.

Section II details the conceptual framework of this research. It introduces the transformation and surveillance continuums, speaking to police leaders' translations of PAITI, and how their preferences are influenced by environmental factors and other stakeholders sensemaking. Note that while this is structured within the boundaries of political science, it draws from multiple disciplines, including political science, public policy, police sociology, and criminology. This interdisciplinarity is intended as a contribution to the field of political science as a discipline that can borrow from other fields of study to explore changing forms of power relations such as policing.

Section III dives into traditional police sociology literature and organizational sensemaking. It debunks the myth of a monolithic police culture and examines how anti-police movements influence leaders sensemaking of PAITI. Section IV looks at the interest of studying PAITI policy in Canada. It explores what can be learned from USA experiences with PAITI, underlying the similarities and differences of law enforcement in both countries. Section V details the technologies selected as case studies for this project and other methodological considerations.

I – What can we learn from the study of PAITI?

Police technological, or technical (Buerger 1993; King 2000), innovations contrast with administrative, programmatic, or strategic innovations as they depend on the procurement or use of new pieces of capital equipment by police services (Braga and Weisburg 2019a). Examples in the past 20 years include the acquisition of equipment such as various non-lethal weapons, crime mapping software, and transportable personal breathalyzers. In contrast, administrative, programmatic, and strategic innovation build and redistribute from resources already in police services hands. Administrative innovations operate changes to how police services prepare and account for their daily operations. Programmatic innovations aim to achieve targeted results by redistributing resources of a service with novel operational methods. As for strategic innovations, which some scholars categorize as radical innovations (Damanpour 1991), they refer to fundamental changes in the overall philosophy of an organization (Moore et al. 1997), for instance the turn to Community Oriented Policing in the 1990s (Bayley 1994; Arias and Ungar 2012; Wisler and Onwudiwe 2009; Fournier-Simard 2019).

These categories are not mutually exclusive, and a single project can simultaneously represent multiple levels of police innovation. For instance, procuring a Conducted Energy Weapon (CEW), more commonly known as a TASER, is first a technological innovation in that it requires the procurement of new pieces of capital equipment. Second, it represents a programmatic innovation, as it can be framed as contributing to Law Enforcement Officers (LEO) firearm use reduction tool. Adopting TASERs can even be a component of strategic innovations. In fact, Axon, the company who developed and commercialized the TASER, claims in its slogan its mission is to help police services "Make the Bullet Obsolete", and revolutionized policing by equipping the police with a wide range of groundbreaking technologies (Axon 2020; Smith 2020).

As a result, technological innovations theoretically inform the study of other police innovations and vice versa. Yet while all innovations share the goal to increase police capacity, technological ones are discernable as they rely on the procurement of new capacities, whereas others redistribute resources. Because of this, the former are the subject of predetermined procurement processes centred around local police board's approval and oversight. In North America, these boards are composed by politicians. Technological

innovations are therefore by nature and in a more traditional sense of the term, more *political* (Braga and Weisburg 2019a; Silverman 2006). If local boards and political leaders (i.e. the mayor's office in major USA cities) are often consulted or informed of other innovations, accountability mechanisms are from a procedural standpoint not as systematic as it is in the case of procurements.

From a police policy perspective, this project therefore allows to examine whether traditional police accountability mechanisms for procurement and policy making are adapted to PAITI. Accountability processes are key features of police power in democratic contexts. To put it in Weberian terms, democratic policing implies a monopoly on legitimate violence, but its scope is limited. Just as police leaders, their political masters are seldom equipped with the technical capacities to understand AI induced police innovations. This could lead to a hands-off approach, with consequences on the nature of police surveillance and the embeddedness of police services. But politicians might also be sensible to public concerns over privacy implications of dragnet surveillance practices, and what it means for the nature of police-citizens relations. Police boards are typically where citizens or groups typically raise their concerns on PAITI. We will for instance review in chapter 2 an inquiry launched by the Montreal police board on SPVM ALPR practices following voiced citizens and journalist concerns.

Accountability mechanisms do not take such a standard format[8] across other policy fields, be it at the local or national levels. Comparability of institutions and accountability structures across North America makes municipal policing a prime locale to contrast how actors in different communities are making sense of the challenges posed by the fourth industrial revolution of AI. On this point, an added insight of this project is that it helps us understand sensemaking of AI policy at the local level. This allows to develop social scientists' understandings of concrete implications of the AI turn on our democratic societies, whereas much research on AI—especially in Canada—focuses on larger scale debates.

This project also informs on the nature of these challenges across AI policy fields, and how actors make sense of them. For instance, crafting policy on AI often means

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[8] The composition of police board varies from one city to the other, but not the nature of the political overview of police services.

wagging enhanced technical capacity at the cost of individuals privacy. What's more, Eubanks teaches us that when it comes to AI, privacy and bias concerns are often intertwined. This is true in other policy fields such as health care and welfare, but neither has received as continuous public, political and academic attention as police AI policy. Policing is as such a prime field to learn how policy actors are making sense of these challenges, and how interactions between them dynamically impacts this ongoing sensemaking. Within policing, the actors interacting include political masters, the public, police membership, and their leaders. This project allows to explore their dynamic interactions. Police leaders sensemaking of PAITI will for instance be influenced if police boards regularly express concerns on privacy implications of PAITI.

PAITI risk in the long run to embed police services within the urban infrastructure. This means a police less visible to the public but empowered with unprecedent capacity to surveil citizens. This amplification of surveillance resonates across AI policy fields: be it in law enforcement, healthcare, housing, banking, or elsewhere, AI relies on the big data collection of individual private information. If improperly regulated, the turn to AI therefore has potentially overwhelming disruptive impact on democratic civil and privacy rights. This dissertation explores these implications within the field of policing.

1. Defining Police AI Technological Innovations (PAITI)

I define *Police AI Technological Innovations* (PAITI) as the procurement or use of a new piece of capital equipment that uses algorithms and AI to enhance – and potentially transform – police decision-making practices. These innovations, often material, but necessarily immaterial in that they cannot function without algorithmic intervention, have been made possible by progress in the rapidly growing field of artificial intelligence and deep learning in the last decade or so. AI technological innovations enable police services to inform their daily operations by gathering, processing, and analyzing an amount of data that would have been unthinkable just a few years ago, potentially including vast amount of private citizen information (Joh 2014; 2016a; Brayne 2017; Crump 2016). As such, PAITI could completely transform citizen-police power balance, raise numerous privacy concerns and other conceivable infringement of civil rights, and risk unaccountable policing. Moreover, similar to other police innovations, PAITI can overlap and open the door to further police strategic, administrative, programmatic or non-AI technological

innovations, the impact of which must also be pondered. These dynamics will be developed in the following paragraphs and throughout this theoretical chapter.

One example of PAITI is *automatic licence plate readers* (ALPR),[9] which are cameras, either static or mounted on patrol cars, that take two pictures of every car that they encounter – one of the licence plates and one of the cars themselves – recording day, time, and GPS coordinates. ALPR data can provide maps of the distribution of cars throughout patrolled areas can feed information on individuals' travel patterns, and automatically flag road safety violations such as unrenewed licence plates or stolen vehicles (Lum et al. 2011). This decade-old technology increases monitoring capacities of police services by automatically gathering large amount of identifiable citizen data. One element underlined by this dissertation is that the programmatic objectives of ALPR technology vastly fluctuate between police services. In some cases, ALPR are used strictly for road safety prevention. In others, ALPR are used for investigative work and crime suppression in high-criminality neighbourhoods. ALPR data management policies also vary considerably between police services.

A second example is *predictive policing* (PP), sometimes referred to as *forecasting policing software* (FPS) (Crawford and Schultz 2014; Perry 2013), which use algorithmic formulas to generate estimates of future crimes locations (Moses and Chan 2018), pinpoint targeted areas for police intervention (Beck and McCue 2009), or identify plausible victims or perpetrators of crimes (Dupont et al., 2018). In some cases, such software can even help solve past crimes (Lum and Isaac 2016). The logic of utilization behind PP is to reallocate police resources based on AI-informed forecasting of criminology trends and targeted programmatic objectives. PP algorithms necessitate significantly larger amount of data gathering and extraction than ALPR technology. However, contrary to the latter, this data is in most instances non-identifiable. Predictive policing programs are considerably less common than ALPR, because of the complexity of developing trustworthy algorithms and data quality threshold most police services do not meet. In contrast, ALPR are "off the shelf" products, meaning it is a mature form of AI that can be purchased and implemented with relative ease by police services.

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[9] ALPR are also named by some providers simply as LPRs. Alternatively, in England they are called Automatic Number Plate Readers (ANPR).

Police technological innovation also takes the form of *body-worn cameras* (BWC), which are wearable audio, video, or photographic recording equipment typically worn on the torso of patrol officers (Meyer and Tanner 2017). Footage collected by BWC can notably be used as police training material or as court evidence (Palmer 2016). Of the three technologies here introduced and that will be studied throughout this dissertation, BWC is the most established.[10] This innovation has rapidly spread across the USA as a tool for police accountability following Michael Brown's death in Ferguson, Missouri, in August 2014 (Bud 2016). Recently, police services in Canada have additionally promoted BWC as evidence-gathering tools (Axon 2020b). As a result of this rapid growth in usage, there is a rich interdisciplinary literature on the impacts of BWC on evidence-gathering and police-citizen relations (Laming 2019; 2016; Ariel, Farrar, and Sutherland 2015; Ariel et al. 2016; A Braga et al. 2018; White 2014; Voigt et al. 2017).

To be clear, BWC hardware are not considered themselves PAITI as their standard operations do not require algorithmic interventions. However, ongoing development in BWC technology are such that the technology is becoming dependent on AI intervention to reach its full potential. Manufacturers sell BWC in packages including AI-induced software components intervening both during data gathering and processing. In terms of the data gathering dimensions of the technology, previous BWC products included non-AI automation, for instance triggering cameras as soon as patrol car emergency lights were switched on. More recent BWC models can be equipped with advanced mechanisms that incorporate AI generated gunshot detection systems to start recording automatically (Dombkowski 2019). The complementary nature of AI and BWC technologies is likewise prevalent at the evidence processing level. One prevalent critic of non-AI induced BWC systems was that administratively, drafting reports and transcriptions of footage was time-consuming, keeping LEO away from their primary patrolling duties. This is one of the reasons the SPVM decided not to move forward with BWC after its 2016–2019 pilot project (SPVM 2019). Today, BWC are sold with sound and voice recognition software which allow for time efficiencies of eight to one in automatic detection of meaningful events and textual transcription of BWC footage (Axon 2020c). From an investigative standpoint, object recognition algorithms additionally help officers rapidly scan through

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[10] This is true for the USA. In Canada, while all technologies are rare, it is the ALPR that is the most established.

hours of footage to locate objects of interest – for example an orange gardener hat or a blue handbag. These tools are crucial for efficiency-seeking and financially strained police services.

Figure 1.1 Classification of PAITI Included in this Project

	ALPR	PP	BWC
Logic of utilization	Increased monitoring	Forecasting crime trends & resource allocation	Accountability; Civilizing effect; Evidence Gathering
Data Gathered	Yes	Yes	Yes
Identifiable Data	Yes	No	Yes
Place of AI in Innovation	Essential	Essential	Complementary
Implementation	Off the shelves	Complex, not available for all (data quality thresholds)	Off the shelves, but complex/expensive data management

This is to say BWC and associated evidence record management systems that are sold today cannot fulfill minimal organizational expectations without some forms of algorithmic intervention at different parts of the process. Still, a conceptual distinction of note must be made to underline that AI is complementary to BWC (although arguably essential), whereas AI it is fundamental to ALPR or PP. See Figure 1.1 for a condense comparison of basic features of ALPR, PP, and BWC. Nonetheless, BWC are already becoming more and more integrated and dependent on algorithmic intervention. The categorization of this innovation as a PAITI can also be justified by the potential disruptive nature of this technology. The transformative impact for policing of BWC enhanced by AI could be exponential. In the near future, AI will continue to be integrated to BWC, for instance, to detect in real time weapons on suspects or suspicious voice patterns. Perhaps even more controversial is the fact Axon, which dominates the BWC market, planned on incorporating facial recognition software to their services (Joh 2017a) before revisiting its policy (Axon Ethics Board, 2019b) amidst heated academic critics (Joh 2017a; Crawford 2019) and media reporting (Jackman 2020; Chokshi 2019; Lohr 2018). In the meantime, the integration of algorithmic intervention to BWC hardware and data management has transformed what the innovation looked like a decade ago. Conceptually,

most recent BWC packages already fit the nominal definition this project posits as a police AI technological innovation: cameras equipped with basic algorithms that learn to recognize gunshots or doors slamming impacts police decision-making practices, as the decision to start recording is made by a sound recognition algorithm.

Figure 1.2 Classification of Different PAITI Currently on Market

	DAS	GDS	Virtual Reality	Stringrays	DNA Phenotyping	Facial Rec.
Logic of utilization	Antiterrorist operations	Gun Violence Reaction & Investigation	Mental Health Training	Tracking cellphones	Solving old crimes	Multiple
Data Gathered	Yes					
Identifiable Data	Yes	No	Yes	Yes	Yes	Yes
Place of AI in Innovation	Complementary	Essential				
Implementation	Available but complex (many agencies need to collaborate)	Off the shelves / Available for all				

Other PAITI developed in recent years, as detailed in Figure 1.2, include Gunshot Detection Systems (GDS) (Choi, et al. 2014), Domain Awareness Systems (DAS) or *Dashboards* (Crump, 2016), robots (Joh 2016b), virtual reality training software (Frank, Helms, and Voor 2000), *stingray* cellphone surveillance systems (Joh 2017a), DNA aided computerized sketches (Tracy and Morgan 2000)*,* facial recognition software (Joh 2017b), and many other products or services. There is therefore no shortage of police AI technological innovations available for services to choose from, and most technologies impact both sides of the transformation and surveillance continuums. These PAITI have in common that they leverage algorithmic intervention to impact police decision-making. Yet, they each carry their particular implications for policing. For instance, ALPR and PP mostly enhance traditional policing and mostly indirect surveillance practices, while BWC implements direct identifiable surveillance of citizens and creates a visible barrier that transforms the relationship between citizens and the police (Ready and Young 2015; Meyer and Tanner 2017), the magnitude of which is contested by certain critical scholars

(Palmer 2016; Louis, Saulnier, and Walby 2019). These dynamics will be further introduced in the case selection part of this chapter, as well as in their dedicated empirical chapters.

II – Making Sense of PAITI

1. Sensemaking

Introduced to the field of policing by Janet Chan (Chan 1996; 1997; 2007; 2001), sensemaking is an ongoing process that refers to how members of organizations decipher and simplify their particular position within society in a way that commonly makes sense to them. Conceptually, it provides a processual analysis of how actors translate changes in their environments, and links structural elements external to actors with their habitus. Bourdieu's hallmark concept of *habitus* refers to the set of dispositions (physical, psychological, and emotional) an actor has acquired through group and individual socialization (Bourdieu and Passeron 1970; Bourdieu 1980). Chan uses Bourdieu's concept of *habitus* to conceptualize the characteristics of *police culture*: "For policing, the habitus incorporates various dimensions of cultural knowledge, including unexamined assumptions, accepted definitions, tried-and-true methods, shared values, as well as bodily display and physical deportment" (Chan 2007, 324). Especially in disruptive times, organizational leaders play a key role in sensemaking, acting as *sensegivers*. Because of their *symbolic* and *political capital*, the way they initially make sense of "what is going on" creates an environment that structures their world and that of their organization. The burst of available police AI technological innovations corresponds to a disruptive time. It generates uncertainty that actors must *translate* (Campbell 2004; Sanders et al. 2015) through their interpretation of the world. As sensegivers, the way police leaders' approach, define, and simplify these changes is central to understand how police organizations as a whole will adapt.[11]

Sensemaking has been developed by scholars in the field of Constructive Institutionalism (CI), which itself finds its genesis in New Institutionalist (NI) approaches. NI proposes to examine structural and cultural power dynamics to help explain how

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[11] A literature review of sensemaking and police culture in its Canadian context will be presented in Part IV of this chapter.

institutions, rules or policies emerge, work, and evolve within given contexts. These approaches posit institutions to be in stable equilibria once they have emerged, which is explained by fixed preferences for Rational Choice Institutionalism, self-reinforcing paths for Historical Institutionalism, or cultural norms for Sociological Institutionalism (SI) (Campbell 2004). Sometimes touted as the fourth NI, CI can be understood as complementary to one or more of the three new institutionalisms, which provide background information. SI and CI are particularly compatible, as both emphasize ideas and discourses, although they are more dynamic and central in the latter. CI builds from the sociological view of institutions of NI by providing analytical tools that help understand actors' ability to change or maintain institutions within which they operate. Both suggest a similar broad definition of institutions adopted here "as codified systems of ideas and the practices they sustain" (Hay 2008, 58). This includes not only formal rules but also norms and symbolic frames that guide human action (Campbell 1998), which are the object of political struggles (Blyth 2002). Actors are therefore not overwhelmingly restricted by sticky, constraining institutions; they are key players in institutional maintenance or change (Hay 2008). CI indeed posits institutions as simultaneously constraining and constructed by actors, which are therefore recognized more agency than in the three old NI.

The cognitive (or psychological) processes actors undergo to understand their environment is a central concern of CI. Operationalized here with the concept of sensemaking, it is a key component of the political struggle over institutions. Because it is a temporal and relational concept, sensemaking can be examined at any stage of the policy process, from when a problem arises and begs a solution to the feedback loop arising from its implementation. It allows unveiling different dimensions of discourses, including ideas (what is said), context (where, when, how, and why it was said), and agency (who said what to whom). CI further segregates ideas by type (cognitive, normative, foreground, background), level of generality (policy, programmatic, philosophical), power relations among actors, and the context in which these ideas are communicated (Schmidt 2011).[12]

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[12] Note Schmidt uses the term discursive institutionalism, not CI. Others use a similar concept of ideational institutionalism. In his "Constructive Institutionalism" Oxford handbook of political institutions entry, Colin Hay argues for the use of CI, as it implies a distinct ontology. This is consistent with Hall and Taylor' (1996) famous work distinguishing rational choice institutionalism, sociological institutionalism, and historical institutionalism.

Different types of ideas will distinctly influence sensemaking, and there are almost as many categorizations of ideas as there are constructivist scholars. Campbell (2004) distinguishes *normative* ideas, which are value or identity-based, with *cognitive* ideas, which specify cause-and-effect relationships. Schmidt (2008; 2011) argues agents are first equipped of *background ideational abilities* that they use to make sense of their world, and *foreground discursive abilities*, which correspond to the logic of communication enabling agents to envision and deliberating institutional changes from within, enabling them to maintain or change them (Mehta 2011). This distinction between foreground and background ideas is also present in Campbell's work (2004), which distinguishes four types of ideas. First, *paradigms* are elite cognitive assumptions that constrain the realistic range of possible policies to be decided upon. Second, *public sentiments* equate to Katzenstein's (1996) "collectively shared expectations", or normative assumptions that constrain the range of socially acceptable policies for the general public. Both these categories of ideas are background assumptions, or ideational abilities in Schmidt's terms. On the foreground side are, third, *programs* or policies being decided, which are cognitive ideas. Fourth, *frames* are normative ideas that enables decision makers to legitimize said programs to the public.

Campbell (2004) then suggests conceptualizing key policy makers as *brokers* who have to juggle between these ideas to decide, justify and enact policies. Conceptualized as such*,* we can imagine police leaders as *brokers* particularly swayed by background ideas of public sentiment and paradigms. This intuition is rooted in the increasingly contentious police-citizen relations in recent years, as well as the controversial dimensions of policing in the era of AI.

One can think police leaders' habitus, which is here generically referred to as police culture, serves as background ideational abilities. It gives police leaders a reference as to what policing fundamentally is, and how citizen-police-state relations should look like. Police leaders then interpret (use foreground discursive abilities) police AI technological innovation in terms of how it would impact these conceptions they have about policing. Part of the interest of this dissertation is in examining which aspect(s) of this police culture influence the way police leaders envision and problematize AI technological innovations. In other words, how does the vision of the world of key police leaders influence how they

make sense of AI in policing. It is to help understand the communication logic that derives from ideas, structures and agencies, and to flesh out the interaction between background and foreground abilities, that I use the hereby introduced concept of sensemaking.

CI helps appreciate that police leaders must continuously translate and simplify the ongoing disruptions of PAITI into understandings that make sense to them. Yet, it does not provide a systematic analytical leverage of the different factors that interact, contribute, and distort these sensemaking exercises from a psychological standpoint. For this project, I build from this constructivist framework and complement this analysis by means of the bounded rationality argument. This will allow to flesh out the heuristics that contribute to how police actors digest abundant information and make sense of uncertainty.

2. Bounded Rationality

According to Craig Parsons (2007), distinct logics of explanation can help build arguments in policy and political research. Parsons develops a compelling typology that maps the different types of explanatory arguments in our field, and how they can work together. The four logics of explanation he identifies are: ideational, psychological, structural, and institutional. First, ideational and psychological explanations advance a logic-of-interpretation that focuses on how individual action is the result of one's interpretation of what is realistic and/or what is desirable. With ideational explanations, this calculus is historically contingent. As per psychological explanations, they "reflect hardwired cognitive processes" (Béland 2019, 3). Second, structural and institutional explanations advance a logic-of-position that focuses on how individual action is the result of one' environment, constraints, and incentives. With structural explanations, this calculus is impacted by material considerations. As per institutional explanations, it is the results of ones' interpretation of history.

A theoretical innovation from this dissertation is to use this typology to combine ideational and psychological explanation specifically in the context of police policy making. From this perspective, the first step to undertake is to understand that ideational and psychological processes are distinct explanatory factors. Then, we can assess how they interact to shape individual and collective action. Yet, we also need to recognize that the

interaction of explanatory factors can be at time intertwined.[13] In fact, assessing the respective roles, contingent weight, and potential relationship of two logics of explanation is a valuable empirical question (Béland 2019: 4). The ideational explanations (CI) dimension of this project was introduced in the previous section. The current section presents the psychological explanation it is intertwined with, namely bounded rationality.

Bounded rationality is an argument, not a model (Zahariadis 2016). It is a useful complementary analytical tool that will help systematize the analysis of how Canadian police policy leaders make sense of different PAITI. Its fundamental premise is that conflict resolution and rational problem-solving is limited by human rationality, which is goal-intended (Simon 1976). Policy leaders are first limited by individual psychological[14] capacities: they have partial attention spans and must base their decision on the evidence that they have access to. Organizational factors additionally limit information gathering, and scanning the environment for insights is costly. Even the greatest experts in a field must use analytical shortcuts and sparsely focus their attention, in turn reinforcing lasting biases or human inference.

Information is therefore processed unavoidably in a distorted way. Yet, leaders draw from this information to make decisions. As a result, "[t]he logically problematic inferences that people commonly draw from the uncertain information they have leads human decision-making to diverge significantly from rational choice postulates" (Weyland 2005, 282). This stance of bounded rationality scholars does not mean to be read as a condemnation of rational choice theory or rationality as an objective. Simply, for bounded rationality (and CI scholars alike), rationality is important, but it is embedded in broad information processing and interpretative assessments, or sensemaking. It recognizes the role played by ambiguity in policy making and helps explain decisions that cannot be fully grasped by rational choice models. It also underlines empirical observations of what actually transpires during policy processes.

Another distortion of outcomes can come from the composition of policy deciders, especially if committees taking decisions are too homogenous or bring the same incomplete

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[13] Padamsee (2009 427) develops the concept of "interdependence" of explanatory factors, when two factors are so intertwined that their impact on policy decisions is dependent on their mutual imbrication.

[14] Bounded rationality scholars tend to favour the use of the word "cognitive" over "psychological" capacities. In line with the typology developed by Parsons (2007), the later term has been favoured for clarity purposes.

information to the table. Discussing pension reform diffusion amidst Latin American welfare states in the 1990s, Kurt Weyland (2005, 283) notes that "(…) limited size and relative homogeneity of the reform teams allowed the problematic inferences and judgments that various members derived through psychological heuristics to reinforce rather than counterbalance each other." In certain organizations, there is therefore a risk of a cumulation of distortion, especially if the decision-making processes are not public.

On this, police organizations are typically composed of individuals with homogenous backgrounds and experiences, and as a group are recognized for being notoriously secretive. This is especially true in North America, where the archetypal police chief is a sworn police officer who was formatted steadily while he (or in a growing number of occasions she) came up the organizational ladder. Importantly, once selected, the new chief typically names allies (almost exclusively sworn members) at key leadership positions, ensuring cohesiveness. Such leadership selection processes differ from most European countries, where many police administrations recruit leaders amidst advance graduate studies and public administration programs. This civilian presence at leadership positions resonates throughout lower levels of the organizations. In contrast, North American civilian presence is mostly limited to peripheric functions (Brodeur and Monjardet 2003). As such, there is a clear potential for North American policing to convey the sort of cumulation of distortion bounded rationality scholars have described elsewhere.

Moving on, bounded rationality scholars suggest individuals that intend to make rational decisions but are limited in their ability to do so follow similar patterns. Weyland (2007) for instance suggests three recurrent patterns of distortion. First, *availability* refers to the importance of easily available information. When making a decision, leaders will be drawn to vivid events and easily obtainable information, which may skew their decisions. Second, the inferential shortcut of *representativeness*, which is when short time success is overestimated or mistaken for durable proof, influencing policy adoption. Third, inferential stickiness or *anchoring*, where the initial value of policies limits the range of future modifications, as leaders will attribute an undue weight to initial value. I contend that in a risk-averse institution such as are police services, anchoring is especially dragging when the initial value has negative connotations.

Weyland's (2006; 2007) work assesses specifically policy diffusion, but the inferential shortcuts of availability, representativeness, and anchoring can lead to overextrapolation of information at different moments of the policy cycle. Likewise, as it speaks to human cognitive shortcuts that are not field-specific, it has value across different groups of policy-makers. In a police universe, availability could take the form of police leaders reacting to a particularly publicized crime to adopt certain policies. Likewise, they could overly draw from their neighbourly cities instead of doing comprehensive analyses of distant cases. As for representativeness, it can go both ways. For example, limited positive information on PP led to the Vancouver Police Department (VPD) adoption of the technology. In another case, limited ambiguous information led to the SPVM termination of the BWC pilot project. Finally, anchoring could help explain why setbacks during early phases of technical implementations might delay the desire of leaders to advance to further stages even years later.[15]

3. Transformation & Surveillance Continuums

To reiterate, sensemaking provides a processual analysis of how sworn members continuously translate and simplify in a way that makes sense to them the unique position of the police within society. Because of their symbolic and political capital, police leaders play an important role in this ongoing construction of police culture, acting as sensegivers. Examining how they approach, define, and simplify PAITI is central to understand how police organizations as a whole will adapt to the AI turn in policing. However, these ideational constructs are distorted, which is where bounded rationality helps us systematize the analysis of police leaders sensemaking. To frame it using Parsons' (2007) terminology, this is how the psychological logic of explanation that is bounded rationality complements the ideational logic associated to constructivism. This allows digging into the inferential distortions that account for the limits to human and organizational rationality.

Probed with the first research question of this dissertation on police leaders sensemaking of PAITI, most LEO would argue it is based on rationally calculated needs and crime statistics analysis. The police values and perceives itself as processing relevant

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[15] In Chapter 4 on BWC, I argue that the careful approach of the SPVM on the technology is in part linked to the M-IRIS project, a mobile data-entry system established between 2012 and 2015 that faced many setbacks.

information in a systematic, unbiased way.[16] Yet CI teaches us police leaders sensemaking of PAITI is rooted in preconceptions of what policing fundamentally is, and how citizen-police-state relations should look like. As per the bounded rationality argument, it teaches us individual and organizational decision making is limited by distortions proper to human rationality.

Drawing from these theoretical grounds, this dissertation argues against the idea that police leaders make sense of PAITI based on purely rational thinking. Rather, sensemaking of PAITI is influenced by how police leaders use their foreground ideational abilities to translate the impact of these innovations on the place of police in society (transformation, surveillance), state-police-citizen relationships (accountability), and the reaction of procuring these technologies for various stakeholders. In other words, facing complex challenges, police leaders use inferential shortcuts to simplify how they make sense of PAITI.

Here I develop an assumption-based model to explore how the police simplifies PAITI according to its preferences. It is rooted in STS and police sociology literature on how the police traditionally approaches innovations and organizational changes. I argue this simplification process is centred on (1) the impact of technologies on traditional policing (enhancement versus transformation), and (2) the type of surveillance capacities they enhance (direct or indirect). I introduce these simplifications under the form of two distinct, complementary continuums, which are portrayed in Figure 1.3.

On a first continuum, I argue that police leaders facing complex decisions regarding police AI technologies first make sense of them through a simplification process centred on the impact of technologies on traditional policing. Innovation that *enhances* what is valued by police culture as "real" police work by making it more efficient and systematic will be more likely to be adopted than innovation that fundamentally *transform* the nature

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[16] This is part of what distinguished them, in their perspective, from other social actors – i.e. politicians (Bittner 1970; Monjardet 1994; Brodeur 1984). This is a traditional finding of studies on police culture; a literature which will be further fleshed out in its Canadian context later in this theoretical chapter. It is analytically and normatively enticing for the policy process to be portrayed as rational. However, such an assumption is both unrealistic and insufficient to explain decision-making (Simon 1976). As James March (1976) underlines, policy goals can often be opaque, contentious or irrational, which does not prohibit policies to be made. Organizations too can be impervious, and different levels of policy deciders themselves might not fully grasp processes they are a part of. This is especially the case in police services, which are characterized by rapid turnovers and continual structural reorganizations (Brodeur 2010).

of police work. This is because it could lead to cultural clashes within the organization or with the public, which leaders tend to avoid.[17]

The relation between transformation and enhancement can be visualized on a continuum. As most innovations trigger both phenomena, the distinction indicates which PAITI tend toward which end. Importantly, what matters here is not the actual transformative impact of innovations on policing, but its perception by key police leaders and policy makers. On this, Brayne (2017) has argued in a paper on big data policing that the biggest transformations to policing are not necessarily those perceived as such within services.

Figure 1.3 Change and Surveillance Continuums

	Preferred Outcome		**Repudiated Outcome**
Change Continuum	Amplification	«-»	Transformation
Surveillance Continuum	Non-Identifiable	«-»	Identifiable

On a second continuum, an innovation that develops police surveillance capacities in a way that is *visible* to the public and habilitates the police to identify individuals *directly* is less likely to be favoured by police leaders. Citizens and their representatives too have preferences, which influences police leaders sensemaking of PAITI. Studies demonstrate citizens are more prone to contest surveillance apparatus if they are directly concerned (Merola et al. 2019).[18] This is especially true of ALPR. Chapter 2 will explain communities tend to accept police surveillance uses if directed at recovering stolen vehicles or wanted criminals, but are considerably less favorable to ALPR if they are likely to impact "innocent" members of the community, or them directly (Merola et al. 2014; Lum et al. 2010;).

What would be favoured, reversely, is an innovation that develops police surveillance capacities in a way that is *not visible* to the public and that habilitates the police to identify trends *without directly* identifying individuals. Both cases enhance traditional police work, but organization leaders preferences are also subject to *identity construction phenomena*. This concept refers to how individuals have personal motivation to protect the

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[17] Both types of clashes will be discussed throughout this dissertation, and introduced in a few paragraphs.
[18] Leaders are not necessarily aware of this academic literature. Yet, it stands to reason that individuals are more likely to be wary of privacy implications if they are directly concerned by PAITI.

reputation of the institution they are apart of if it is threatened. Because of public and political concern regarding citizen surveillance, police leaders are expected to intend to avoid a public backlash and as such favour technologies that increase police surveillance capacities while limiting potential backlashes. This argument is in line with Joh (2018) intuition that AI will lead to a greater *embeddedness* of police services in urban infrastructure, where they will be less visible but more informed on citizens, an important development for our democratic societies.[19]

Leaders preference for PAITI that enhance traditional policing and indirect surveillance aims to limit cultural clashes both within the organization and with the public. Internally, this includes quarrels with union representatives and members over innovations. In the 1990s, North-American police agencies engaged with "Computer-Statistics" (COMPSTAT) programmatic innovations. These statistical programs were praised for the rationalization of law enforcement it encouraged. But from some LEO perspectives, it made police leaders overly focused on quantifiable results of decreased crime statistics at the cost of community engagement and comprehensive assessments of citizen needs. It disengaged[20] many active officers from organizational goals (see Willis et al. 2007; Silverman 2006; Eterno and Silverman 2006). Many 2020s police leaders were young officers during the COMPSTAT years. Building from their own experiences, one can assume they will want to avoid such internal grudges with the AI turn. Hence, thinking internally, they will tend to favour policies and PAITI that enhance LEO work, not transform them as COMPSTAT did during their own year on the *beat*.

Cultural clashes leaders will tend to avoid externally includes quarrels with protest groups and the general public. One can suspect police leaders are sensible to the delicate space they occupy within society. The police are the armed arm of the state; the one entity entitled to legally use means illegal to other members of society. The capacity to use force (both physical and surveillance) is in fact what Brodeur (2010) posits as the main

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[19] For Joh (2018), this trend leads to a blurring of the line between private security and policing. Not only is the police less visible, but it actively seeks this. At the same time, private security forces are becoming more and more professional, and trying to look like LEO. This tendency to embed the police and professionalize private security begs academic attention. It is out of the scope of this project, but is a dynamic to keep in mind, especially in Chapter 3 on PP.

[20] Fictional character Jimmy McNulty immortalizes the disengagement of many officers due to the unintended negative sides of COMPSTAT in Season 3 of HBO's cult series The Wire.

descriptive feature of law enforcement. But this power is not unlimited, it is conditional to political and citizen oversight. Outside perceptions and accusations of abuse of this power impact the legitimacy of the police. One police brutality case can lead citizens to questions the legitimacy of all police uses of force (and thereof police power).

The murder of George Floyd by Minneapolis police office Dereck Chauvin led to contestations of the fundamentals of policing in the US, with at its core the "defund the police" movement.[21] This is an extreme example, but police leaders are regularly faced in media and public discourses to calls to reduce their power because of accusations of brutality, bias, and lack of professionalism.[22] Understandably, such pressures mark the mind of a leader, and why he or she would be warry of additional negative public perception a PAITI adoption could create.

Figure 1.4 Inferential Shortcuts in PAITI Decision-Making

	ALPR	PP	BWC
Organizational dynamics (Change Continuum)	Amplification	Amplification	Transformation
Characteristics of the information (Surveillance Continuum)	Simple technology/ Identifiable data	Complex technology/ Non-identifiable data	Simple technology / Identifiable data
Policy Culture (# of actors involved, complexity of implementation)	Simple, Case dependent	Complex	Contentious, political
Diffusion effect	Limited	Limited	Important
Risks	Cash cow criticism, surveillance	Civil rights & privacy critics (limited examples)	Cost, ad hoc utilization of footage

Police leaders sensemaking of PAITI is therefore marked by constant public debates about policing in the 21st century. This is especially true for controversial technologies such as BWC. As such, if PAITI are translated through a simplification process centred on two continuums, other factors contribute to their sensemaking exercise. Figure 1.4 generalized the inferential shortcuts police leaders refer to when making decisions on PAITI. "Organizational dynamics" and "Characteristics of the information" are versions of the

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[21] The event and its consequences are further discussed later in this Chapter, as well as throughout this PhD dissertation. It happened during the virtual fieldwork and was amply discussed in LEO interviews.

[22] The lack of professionalism accusation has notably been raised in recent years in terms of how some police services have dealt with sexual assault cases.

transformation and surveillance continuum in bounded rationality lexicon. The latter also incorporates diffusion effects and policy culture, which are further categories of interpretative cues police leaders are translating when making policy decisions. Finally, risks, which could be a subsection of another line, has its own because of the various nature of hazards to consider, the extremely risk-averse nature of police services, and the contentious nature of police-citizen relations in recent years.

4. Technological Systems & The Engineer-Sociologist

The transformation and surveillance continuums help appreciate the cognitive shortcuts key police policy actors take to make sense of the different, multiplying and complex innovative technologies available to them. This study of police policy making would be incomplete without a discussion of the environment in which sensemaking operates. To this end, the literature on the social construction of technology is particularly well suited for this project on PAITI (Hughes 1983; Bijker 1995; Bijker, et al. 2012). This branch of constructivism examines *technological systems* and their components, including technologies themselves, various organizations that are part of the systems (for instance banks, manufacturing firm, and customers), scientific and academic components, legislation and regulatory components, and finally resources necessary to the conduct of the systems. Technological systems and their complex components "are both socially constructed and society shaping" (Bijker et al. 2012), as system builders and the specific problems they are attempting to solve have huge influence in how technological systems develop and implements.

Emerging Police AI technological systems, which as we will see in the next section respond to problems still undefined, are shaping the future role of police in society. Police leaders and other stakeholders will play a key role in building these systems. Yet, the meanings and importance attributed by builders are subject to further contestation and construction by others within a technological system. Bijker (1995) use the concept of *technological frame* to illustrate ways in which relevant social groups have different degrees of interaction, and attribute various meanings to similar elements. The construction of these frames is the result of social processes that can sometimes lead and structure meaning confrontations between social groups – what Mehta (2011) refers to as *power struggles*. These *controversies* are powerful tools of investigation to unveil the socially

constructed nature of technological systems (Callon 2012; Pinch and Bijker 2012) – what pragmatic sociologist would call *tests* (Barthe et al., 2013; Moreau de Bellaing, 2009).

In fact, like any policy process, the acquisition of police AI technological innovations is a *negotiation* (Fiorino 1988) that involves many actors, including police leaders and lower ranks, political authorities and their representatives, politicians, various government agencies, civil society, private companies selling these products and services, the media, and, fundamentally, the general public. This means police leaders not only have to make sense of the many police technological innovation available to them, but also take into consideration how they will be received by other actors involved in their acquisition. Therefore, this dissertation will map the acting components of different police AI technological systems. This implies accounting for, as will be described in the methodology section, more than just police leaders and political elites. It includes groups such as government officials, private actors, civil society advocates, academics, and others. This non-exhaustive list of relevant actors to the system varies from jurisdiction to jurisdiction. The list notably depends on the salience of the PAITI.

Within the rich social construction of technology literature, Thomas P. Hugues' three steps technological system approach (Hughes 1983; Bijker et al. 2012) equips us with analytical tools that structure our understandings of complex social constructions. First, *the technological and the social are analytically linked*, as the development of technologies simultaneously generates economic, political and historical changes that are interconnected. Second, it refuses to segregate the *analysis of the micro and the macro*, as the priorities of one lab are linked to national and sometimes international realities. Third, *technological issues are simultaneously organizational, economic, and political*. Taken together, these steps invite the researcher to look jointly at system builders and the society they inherit from and shape. It avoids using analytical dichotomies foreign to those developing technological systems the researcher examines,[23] or depicting system builders as isolated from society (Pinch and Bijker 2012).

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[23] For instance, this informed my decision to define police AI technological innovation in terms of capital equipment and decision-making. Scholars of AI ethics and philosophers often put abstract criteria linked at the center of their analyses, which certainly provides useful normative insights. However, those conceptualizations are hardly digestible for police leaders and most members of the technological system. For more on this, please refer to my ontological and epistemological stances in Section V.

Building on the work of Hugues (1983), Michel Callon (2012) refuses for instance to depict a phase of technical/scientific purity detached from the rest of the technological system. He uses the image of an *engineer-sociologist* to describe how developers in laboratories from the get-go envision the concrete social impacts of what they are developing. I argue this image especially speak to researchers in the fields of AI and deep learning. The Montreal Declaration for a Responsible Development of Artificial Intelligence (MDAI) was for instance developed by researchers in the field, instead of being drafted by legislators. The public notoriety of select influential AI researchers such as Yoshua Bengio in Montreal also exposes the blurry boundaries between labs where technologies are developed, and society as a whole. The role of *engineer-sociologists* is perhaps enhanced today because of how quickly innovation developed in laboratories can transition into the so-called real world. The development of electric grid systems needed multiple intermediaries and decades of concerted efforts to be fully implemented (Hughes 1983), whereas advances in the field of AI can rapidly reach their targeted public. For instance, the Montreal start-up Transit App was founded in 2012 and is now available in 206 cities located on all continents.[24] This is also true for police technological innovations, which the rapid expansion of BWC across the USA within years attests for.

Hugues' technological system approach helps conceptualize the relationship between system developers and their clients. Indeed, Hugues posits that potential clients of new technologies have their roles assigned by system developers, which constructs the power relations between actors (Bijker 1995; Bijker et al. 2012). I argue this tilted role assignment construction is an integral part of police AI technological innovation systems. Conducting observation during private markets conferences on police AI innovations, Brayne (2017, 996) expected naturally that municipal police services would present a list of needs to developers and ask them how their software could help them. This would correspond to an expected procurement process for any government level, where needs come before solutions. However, she notes an inverted pattern, where developers pitch their platforms – often developed in military contexts – and ask if police services could be interested in adapting it to their local realities.

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[24] See: www.transitapp.com for a full list of cities and services. For an early look on back-end data implications of the Transit App see Brakewood et al. (2017).

This is a classic example of how policy solutions often precede problems (Kingdon 1984). What Brayne is describing here is a situation where system developers are assigning the needs and role of local police services: "instead of filling analytic gaps or technical voids identified by law enforcement, software representatives helped create new kinds of institutional demand" (2017, 996). This construction can lead to tilted power dynamics. For instance, Joh (2017a) denounces the "undue influence" of Axon, which dominates the BWC in the USA. There, she decries the powerlessness of medium and small size cities. The situation of quasi-monopoly of Axon puts it in a position of power versus budget strained cities that are compelled to accept the multinationals modalities, proprietary conditions, and prices. Municipal police services are, therefore, left with limited input into the characteristics of the products they are buying from this juggernaut; instead of adapting Axon's cameras to their local need, they adapt their local needs to Axon's generic services.

5. Constructing Problems & Solutions

Role assignment can be connected to another dimension of the study of AI in various policy fields: the uncertain, novel, unnegotiated impact of AI on our societies. In policing and elsewhere, AI is an open slate. Depending on one's stance, AI can be perceived as a great solution to many social issues, or a potential threat to social equilibrium (Bundage and et al. 2018; Dafoe 2018; Chauvet 2018). Leveraging the concept of sensemaking allows to contextualize how AI is processed by police actors, the dynamics of which can be informed by the rich literature on problem definition.

If many take problems for granted and focus on latter moments of the policy cycle, scholars of problem definition look at the power struggle over the definition given to collective purposes and policy problems (Mehta 2011). The way problems are outlined impacts the appropriate policy options available to policy-makers (Rein and Schön 1977). Take the example of answering the question: what is the greatest local police policy challenge of our era? One reasonable response is the lack of funding of local police services. The policy solution to this problem would likely include the use of automation in decision-making; PAITI would play a key role in efficiency and cost-saving policies. Another response, equally defendable, could be linked to privacy concerns of citizens worried by the new surveillance capacities already accumulated by police services. The

policy solution to this problem would aim to put procurement and use-policy constraints on further acquisition of the same technologies. The way problems are formulated is therefore key to understand what policy solutions will be prescribed: if there is no problem there is no need for a policy solution (Kingdon 1984).

This simplified depiction is illustrative of how the new availability of police AI technological innovation is a disruptive time where policy decisions and solutions must respond to problems which have not yet been fully grasped and defined by actors. The public philosophies regarding PAITI are in open contest, and neither appear close to reaching the *zeitgeist*, a moment when a set of assumptions are widely shared to a point when they are not open to criticism[25] (Mehta 2011, 40). It is therefore a great opportunity to dive into police actors sensemaking when it comes to AI in their field of practice. The way they delineate the problems that need solutions will be key to understand their stances during further steps of the policy process. This idea is similar to that of bounded rationality scholars, which posit that "process affects content affects outputs" (Simon 1976). This means information previously gathered biases further gathering, another way of stating people choose what and when they want to learn (Lupia and McCubbins 1998). Policy deciders will ascertain distinctive lessons from similar set of information, depending on the problem they are assessing. This is to say rationality and information gathering is important, but it is embedded in broader processes and constructions. This uncertainty must therefore be accounted for when considering PAITI sensemaking.

Not only is the problem of AI undefined and ambiguous, it is also the object of a political struggle. Mehta (2011, 34) suggests that "problem definition is a contested process among players with varying levels of power and persuasiveness." This allows accounting for diversity of view and power struggles over problem definition. One alternative explanation is that problem definition is elite driven, which recognizes the role of power differentials in defining collective purposes, but does not account for much diversity of views. Another explanation focuses on the "social psyche of the public" (Gamson 1990). This intriguing yet abstract framework leaves limited space for actors' influence or diversity of views. Neither does it provide an explanation as to why some specific social problems become political problems over others, something Mehta's attention on

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[25] One could argue, for instance, that the public nature of health care in Canada corresponds to a *zeitgeist*.

persuasiveness provides. For Mehta (2011), actors constantly redefine problems and, because of this constructed nature, commitments are fluid and malleable. Problems that are defined in a way that suggests a solution that is socially acceptable (Campbell 2004), that is viable in terms of policy, politics, and administration (Hall 1989), and that link efficiently the "politics" and "problem" stream in a digestible manner (Kingdon 1984) tend to succeed. In some cases, such strategies might not be conscious (Berger and Luckmann 1966). In other cases, solutions precede problems, as policy entrepreneurs redefine problems specifically to persuade other actors and meet their preferred policy solutions (Kingdon 1984). Either perspective might well be the case for police leaders, or a bit of both as they are not mutually exclusive.

To be sure, this project is not about problem definition per se. Yet the sensemaking necessary to make decisions on PAITI for police organizations includes similar processes. Problems, just like PAITI, are social constructions that are part of actors sensemaking. The impact of AI is not yet fully understood, while decisions are made based on critically limited information. In other words, problems that AI responds to or creates are still contested. Mehta's contribution that problems are constantly redefined and digested into solutions that are socially acceptable by policy leaders is a pertinent analytical tool. It encapsulates the ambiguity proper to sensemaking and bounded rationality dimensions of this project.

III – The Politics of Policing

One of the teachings of the social construction of technology school is that technology cannot be separated analytically from its cultural, social, economic, and political make-up. Similarly, "(…) police innovation is shaped, altered and impeded by the cultural, organizational and social contexts in which it operates" (Sanders et al. 2015, 724). Understanding the political environment proper to police sensemaking of PAITI entails an interdisciplinary approach that notably reviews police sociology literature. This will markedly include the presentation of select traditional police sociology concepts; an argument underlying the non-monolithic nature of police culture; an exposé of the literature on organizational sensemaking in law enforcement; and a discussion of police discrimination both theoretically and in light of recent events.

1. Police Sociology

Despite a relative lack of attentiveness and appreciation from political scientists, policing is fundamentally political. My argument on the risk that PAITI lead to police embeddedness resonates with early police sociology debates, which presented two opposing views on this core regalian institution, namely the instrumentality and the insularity schools. The former conceptualizes the police as the states' armed force it uses to control its inner *delinquents*, *enemies* or *strangers*, depending on the writer (Jobard 2012). Some push this interpretation to say that the police is the tool used by the dominants of the society to maintain their status (Reiner 1985), although this does not make consensus within the proponents of the instrumentality perspective (Brodeur 1994). On the other hand, the insularity perspectives present the police as an organization with its own interests, instruments and ends.

Renown *Université de Montréal* (UdeM) criminologist Jean-Paul Brodeur terminates this false opposition between instrumentality and insularity by arguing convincingly that the interaction of these two dynamics is a central characteristic of the institution. Namely, balancing variations between the two help explain the uniqueness of every police organization (*Ibid*). PAITI, and the lessen police-citizen interactions they could enhance, however risk tilting 21st century toward insularity, and with that the power balance so central to the Weberian modern state.

This type of discrepancy is typical to Brodeur's work. He notably played a central role in promoting the study of *high policing* in the 1980s. Until that point, Anglo-Saxon literature had focused on *lower policing*,[26] often considering it as a distinct organization. Using the French police as an example, Brodeur (2010, 512) demonstrates the historical links between low and high policing (see Manning 2012 for a summary). The absence of clear distinctions between high and low policing underline the limited analytical savviness in attempting to study both separately, especially given North American homogenous career paths. Monjardet (1996) extends this analysis with the concept of *hierarchical inversion* unique to the police: organizational priorities are dictated by what street-level officers report. Moreover, the higher a sworn member is promoted within an organization,

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[26] Early scholars were focused on lower, street-level policing, or the patrol. Organizational and leadership dynamics were less important.

the less individual discretion they can exert – a fundamental dimension of police sensemaking.

Low policing often does not carry much initiative, and mostly reacts to ongoing events. Taken together, Brodeur and Monjardet move away from the "smack-on-head" crime response dimensions of policing. They explore the real black box high policing is, notably discussing data collection and informants. By doing so, they underline the idea of a police that holds a fundamentally political role. The interconnection between high and low policing creates a fundamental discrepancy in the sense that the police is visible or invisible depending on circumstances, locations, and protagonists (Manning 2012). High policing is less visible, and henceforth harder to hold accountable. With PAITI, the police is becoming less visible, but increasingly equipped with police surveillance capacities. This raises questions on the nature of democratic policing, regarding police restraint and limited intervention in citizens lives.

The question of force is yet another unavoidable element of any police sociology theoretical framework. Bittner (1970) theorizes restraint characterizes and legitimizes the officers' use of force, in a sense that a *good* police action occurs when the officer uses the minimal degree of force requested to end a problematic situation (Brodeur 1994, 464). For Brodeur, it is the *capacity* to use force that marks the police's unique status. This *restrained capacity* to use force is the essence of *police discretion*, which is a fundamental and valued dimension of policing (Monjardet 1996). This is in part influenced by his emphasis on high policing, which contributes to his argument that it is not force, but the *capacity* or *threat* (Manning 2012) of the potential use of this force that is the core of policing.

Discussing conceptually the use of force in policing enlightens our understanding of PAITI. Brodeur (2010) noted that the credibility of the police *threat* depends among many criteria on the quality of intelligence agencies in any given state. Leveraging AI promises to exponentially increase this threat, which promises to change the nature of surveillance in society (Brayne 2017; Crump 2016; Joh 2016a; Chokshi 2019; Lyon 2015). Yet this project finds that the police are treating PAITI like any other technology. This is perhaps because the daily functions and tasks of LEO will likely not be drastically altered by PAITI. Their prized police discretion will notably be maintained. On the other hand,

citizens' freedoms will be drastically impacted: PAITI are normalizing their constant widespread surveillance, creating a state of *perpetual lineups* (Joh 2017b; 2014; 2016a).

This succinct review of classical police sociology evidence how PAITI poses fundamental political questions. As mentioned in the introduction to this dissertation, the police enact the state monopoly of legitimate force over a given territory. The police are agents of the state who are authorized to legally use means illegal to the rest of society. They do so in order to sustain the established sociopolitical order (Brodeur 2010, 139). While this definition of policing is consensual, the understanding of how police make sense of their role in society is not. The next section dives into the concept of police culture, which as we will see is loosely defined in political science and criminology literature.

2. Police Culture

Police culture is an important component of police leaders sensemaking exercises. Introduced earlier, Chan's definition of police culture stands as follows: "For policing, the habitus incorporates various dimensions of cultural knowledge, including unexamined assumptions, accepted definitions, tried-and-true methods, shared values, as well as bodily display and physical deportment" (Chan 2007, 324). To be sure, this does not refer to descriptive occupational features of law enforcement such as *police discretion*. Rather, police culture refers to an ensemble of traits and values proper to sworn members of police organizations that are conceptualized as shared at diverse degrees by all (Monjardet 1994).

Many studies have described features of police culture such as *crime-fighting mindset* (Bittner, 1974; Herbert, 1996), *us versus them mentality* (Drummond, 1976; Niederhoffer, 1967), *danger* (Van Maanen, 1978), *loyalty/solidarity* (Crank 2004; Monjardet 1994; Van Maanen 1978; Brown 1988; Drummond 1976), *cynicism* (Reiner, 1985), *intellectual conservatism* (Monjardet 1994; Monjardet and Gorgeon 1993; Monjardet and Ocqueteau 1997), or *efficiency* (Crank 2004; Brodeur and Monjardet 2003). Others have attempted to link these descriptive features together in *codes* (Reuss-Ianni 1983) or *normative orders* (Herbert 1998). Likewise, Crank (2004) endeavoured into the *aesthetic*s of police culture by describing themes such as *warlike metaphors*, *uncertainty*, *outsider mentality*, *personal accountability*, and *ritualistic sacrifices*. In most of these works, this homogenous culture is highly influenced by lower policing, assuming "street cops everywhere tend to share a common culture because they respond to similar

audiences everywhere" (Crank 2004, 26). This literature has been the object of much criticism for its inability to interconnect the different features of police culture, and as a result "the concept of police culture in the criminological literature is loosely defined" (Paoline and Gau 2017 citing Chan 1996, 111).

In fact, the very idea that policing operates within a transcending monolithic police culture is debated. French police sociology ethnographic work noted a plurality of opinions, values and attitudes among members of police services (Monjardet 1994; 1996), contesting earlier uniform conceptualization of police culture (see Westley 1970). Anglo-Saxon scholars followed suit on this manifestation of cultural heterogeneity with various methodologies (Worden 1995; Cochran and Bromley 2003; Paoline 2004). Nonetheless politicians, police leaders and criminal-justice commentators still validate the notion of a monolithic police culture, which is more often than not associated with negative traits. Paoline & Gau (2017) note that in the USA, the President's Task Force on 21st Century Policing (2015) suggested *the* police culture had to be changed in order to build trust between citizens and police services. Such an approach leaves little place for a heterogenous understanding of police cultures and their interconnections. It also potentially alienates sworn members who share the desire for change in policing of the taskforce, but still adhere to values proper to *the* police culture.

This project firmly stands with scholars who contested the traditional idea of the police as a single homogenous group (Chan 1996; Paoline 2006; Monjardet 1996; Jobard and Maillard 2015). PAITI will be made sense of heterogeneously because there is a diversity of police cultures between and within each organization (i.e. patrol, civilians, IT) that operate simultaneously, and influence unequally different members (Manning 2005). Of course, core contingents of sworn members in each organization adhere to traditional versions of law enforcement and *the* police culture, and the aforementioned values remain influent within police organizations. Overestimating cultural homogeneity is nevertheless counterproductive. By recognizing police cultural heterogeneity politicians and police administrations have the opportunity to use "officers who are not culture carriers, and identified as skilled 'craftsman' by their patrol peers (Bayley and Bittner 1984), as part of their field training and formal socialization efforts" (Paoline and Gau 2017, 22). Such pointed strategy can accelerate changes the Presidential Task force was aiming toward,

notably in terms of bias awareness training (President's Task Force on 21st Century Policing. 2015; Fridell 2017; Fridell and Lim 2016).

To summarize, the idea of a monolithic police culture shared by all members is empirically unfounded. There is a diversity of police cultures within each organization. Yet, a contingent of any organization adheres to a certain set of values associated with traditional police culture (i.e. us versus them mentality, crime-fighting mentality, loyalty, conservatism). The size, level of adhesion, and influence of this group vary between organizations. Recognizing this variability will allow to better analyze the fluctuation in sensemaking of PAITI between and within Canadian municipal police services.

3. Sensemaking in Organizations

The auspice of police culture as a non-monolithic concept opens the door to a deeper engagement with social constructionist claims on organizational sensemaking. Social constructionists study the "social, political, and cultural processes" that influence how individuals make sense of their environment (Hannigan 1995, 30). Structural context and material realities shape actors' sensemaking of organizational change (Gubrium and Holstein 2008). Given the malleability of police culture, Chan (2007, 325) argues sensemaking provides a "processual analysis" of how officers translate changes in policing into shared understandings. It is what allows services to negotiate unsettling times: "Organizational change (…) can create a sense of uncertainty and disruption, so that sensemaking is crucial for the ability of organizational members to 'move on' and for organizations to continue to function" (Chan 2007, 328). This is to say organizational sensemaking, in particular in the field of policing, is "triggered by ambiguity," an emotion that by nature bounds the decision-making of police actors. As Weick (1995, 54) puts it, "when you are lost any old map will do." Studying sensemaking within organization is therefore especially valuable in times of uncertainty, and while sensemaking is ongoing, shocks and interruptions correspond to opportunities for readjustments of organizational sensemaking.

The integration of PAITI corresponds to such a time. For instance, the perception of facial recognition technology—and AI in general—within Canadian policing was greatly influenced by the controversy that followed New York Times reporting on widespread usage of Clearview AI systems by police forces across North America in the

first trimester of 2020.[27] Likewise, the wide adoption of BWC in the USA followed controversial police killings and anti-police riots in 2012 (Bud 2016). Additionally, a finding specific to this research is that the integration of ALPR technology in Montreal was greatly influenced by vandalism against this technology in Western Canada and France.

More than simple interpretation, sensemaking refers to how actors read situations and construct tangible meaning from subjectiveness. Faced with disruptions, members of organizations need to figure out "What is the new game?" or "What's the story here?" (Weick et al. 2005, 410; Chan 2007, 325). By making sense of changes in their environment, actors are continuously constructing the environment that will in turn constrain their future sensemaking exercises. For Weick, this equates to sensemaking being "the feedstock for institutionalization" (1995, 36). It is also why the evolution of sensemaking is never radical – just like Bourdieu's habitus (Weick et al. 2005). This is especially true with conservative institutions like the police.

If there is always a space for members of an organization to mistrust accepted frameworks, some aspects of police culture are stubborn. This complicates the task for reformers (Chan et al. 2003). Sensemaking is after all a social process where competing interpretations with different sources of legitimacy are in negotiation over a narrative. Stories (Shearing and Ericson 1991) and storytelling (Kurtz and Upton 2017) have long played an important role in policing. Appropriation of shared experiences and stories is essential to the sense of belonging of sworn members. In the end, sensemaking is driven more by plausibility than by accuracy, and as such a story compatible with existing narratives tends to have more influence, hence the stubbornness of elements of police culture.

In terms of the role of technology in organizational sensemaking, many studies have treated the social and technical impacts of technology distinctly. Yet, technology simultaneously enacts both symbolic and material dimensions (Sanders and Henderson 2013). An innovation alone does not have a social role until it is adopted, and the impact of technology on social life depends on various sociocultural factors (Sanders et al. 2015; Moses and Chan 2018). Interpretative framing conflicts between groups can

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[27] See the New York Times online open Opinion section, subsection "The Privacy Project" for articles published mostly in the last trimester of 2019 until February 2020.

lead to significant difficulties in technological change and adoption (Chan 2007). In policing, the way a technology is interpreted or framed by the police influence future (and is influenced by past) technological innovations. Over time, scholars have noted a growing reliance on technology by police actors (Chan 2007). There is a belief among police circles that efficiency and police accountability necessarily passes by continuous innovation (Manning 2008). However, this has not been the object of much empirical analysis (Griffith 2014).

One study that remarks itself is that of Sanders et al. (2015). This research looks at intelligence led policing (ILP) reforms in Canada. ILP refers to the principle that with proper data limited resources can be deployed more efficiently to reduce crime on a given territory (Taylor et al. 2007). Sanders and her colleagues first finding relates to the nature of police culture in Canada. They confirm the secretive attitude of Canadian police forces toward the general public. More significantly, they demonstrate this lack of information sharing extends between and even within organizations. Even more than LEO, crime analysts are particularly inclined to information hoarding, which limits the potential for efficient ILP reform. This first finding confirms that there is no such thing as a monolithic universal police culture, as the authors empirically describe the coexistence of various police cultures (notably analyst and patrol cultures) within a single organization.

Sanders et al. second finding relates to their empirical description of the sensemaking exercise of ILP reform within different police cultures. What they find is that the rhetoric supporting ILP adoption internally is not centred on it as a crime-fighting strategy. Rather, police leaders have translated and adopted defensively ILP as a toll to quantify police practices. In other words, ILP were framed as a protective measure that aims to help the police demonstrate their accountability.

Admittedly, ILP is an organizational reform and not a technology per se, but it fits in the large universe of police innovation. Sanders et al. findings directly tap into the interaction of police cultures, sensemaking, and innovation in a Canadian context. Chronologically, many of the police leaders that have to make decisions on PAITI today experienced ILP reforms firsthand. As we know, these sensegivers are particularly influential in time of uncertainty (Gioia and Chittipeddi 1991). Retrospect is a core aspect of sensegiving, and the translations and experiences of these actors during contentious ILP

reforms might help better understand dynamics proper to early generations of PAITI. The translation of ILP into a language of police accountability is intriguing given the various ethical concerns arisen by the integration of AI in policing. Adding to this the current context of contentions police-citizen relations, it was not surprising that different police interviewees apart of this project translated PAITI into similar accountability frames. It confirms that, in order to study police innovations, it is imperative to be attentive to the social, organizational and cultural environment in which they operate.

4. Theories of Police Bias & Canadian Policing

Discussion of police misbehaviour is a hallmark of police sociology and criminology. Studying sensemaking of PAITI requires attention to this rich field. Early scholars and ethnographic work first uncovered the mechanisms of police corruption, in relationship to the concept of *street-level bureaucracy* (Lipsky 1980). Today, police misbehaviour research is centred around various forms of police bias as misuses of police power.

Scholars outside of the criminology and sociology fields have actively participated in the academic conversation on police bias (Jobard and Maillard 2015). Critical theorists, social movements, and media commentators often portray that the police systematically persecute certain minorities, be it racial, sexual, religious or other (Chammah 2016; Souhami 2014). The transnational BLM mobilization is representative of this sensitivity. Ideologically motivated reporting of outlets such as the *New York Times* amplifies this phenomenon (Serwer 2019).

Waddington et al. (2004) were among the first to assess the accuracy of this perception in England. What was noted is that there is often an over-representation of black individuals controlled by the police, but there is no excess when considering the number of people effectively ran into. The situation therefore has deeper roots: law enforcement was directed and more present in minority heavy neighborhoods. This needs to be accounted for by PAITI policy makers to avoid AI perpetuating historic biases with the "imprimatur of impartiality" (Barocas and Selbst 2016, 673).

Jobard explains that, above the simple fact of controlling individuals, where discrimination appears is in the *differentiated treatment* officers have toward specific social groups (Jobard et al. 2012). This behaviour is the result of on-field racial attitudes, which are in part, as Monjardet & Gorgeon (1993) noted, the result of professional socialization

within the police world. Furthermore, racism is not the exclusive prerogative of lower policing. In particular, Jobard (2006) explains that the judicial system, associated with high policing, has technicalities that bring instances of *de facto* discrimination based on ethnic backgrounds of accused individuals. For instance, western judges will rather give firm sentences to non-citizens, as they fear they could escape to their country of origin if they are given civil sentences. This matters for our study of PAITI policy: AI has potentially accentuated this phenomenon, as exemplified by ProPublica research on risk assessment software bias at bail hearing (Angwin et al. 2016).

In North America questions related to the relationship between police forces and minority groups have become particularly salient in recent years (Cochran and Warren 2012). Under the auspices of Marxism and critical race theories (Bakan and Dua 2014), anti-racism activists, scholars, and journalists have brought the concepts of "institutional" or "systemic" racism at the forefront of public debate. Their argument is that minorities may face discrimination in wide spheres of society because of legacies inherited from past systems of institutionalized racism (Elias and Feagin 2016). Such theories are rooted in the temporal proximity of systems of racial segregation, administrative continuations, and traumatic legacies of slavery.

The interest of these theories for this research is that proponents of these divisive[28] theories have brought forward a fundamentally anti-police agenda, in which race replaces socioeconomic disparities (Wacquant 2001) as the sole source of police discrimination (Mutsaers 2018). Solutions advanced often promote drastic police and political reforms, including the "defund the police" movement.[29] Such efforts have however led to limited results given the continued centrality of the police as we know it in our democracies. The monopoly of legitimate violence on a given territory it enacts is after all what Weber (2020) posits as the state's defining feature.

In the USA, PAITI have often been framed as alternative means to improve police-citizen relations. BWC in particular were promoted in terms of police accountability; a cure-all solution to rising racial tensions (Palmer 2016). Unfortunately, while some

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[28] Seib (2020) argues this clouds any meaningful debate on how to fix the denounced situations.
[29] Other theories less known to the general public are often more nuanced. See for instance Jobard's research portrait of causes of police biases (2006; 2012; Jobard and Maillard 2015).

scholars do find a positive impact of the technology on police misbehaviour as a whole (Ready & Young, 2015), the evidence on BWC reducing police-minority tensions is cloudy at best (Ariel et al. 2016; Louis et al. 2019; Voigt et al. 2017; Yokum, et al. 2017). PAITI and other innovations are context dependent. The quality of the relationship between the police and its citizens impacts their implementation.

Police reform in a time of distrust with the public is impeded by what some have dubbed "the trust dilemma." To be innovative and improve its efficiency, a government agency has to convince the public beforehand of its ability to perform. When the public has a negative perception of their police "the political fallout from illegitimate police actions can seriously impede the ability of police departments to engage innovative crime control tactics" (Braga and Weisburg 2019b, 345). Yet without that same innovation, the organization will potentially not be able to perform at the same level, that is the trust dilemma. Traditional research focused on corruption scandals, but evidence of police bias, especially when highly mediatized, fits the *illegitimate* category and is expected to have the same impact on PAITI policies.

From a sensemaking perspective, polarization accentuates the *identity construction phenomena*, where if an institution's reputation is threatened, individuals have a personal motivation to protect it. This often takes the form of the "bad apple" theory, where police misbehaviour is portrayed as the result of individual responsibility, and not wider institutional problems (Jobard and Maillard 2015). This discourse was certainly noted in my interviews with LEO working on both sides of the border.

Theories of police biases and anti-police movements influence how the police understands its role in society. In turn, it impacts how they make sense of PAITI. Part of the interest of this project is to determine in which direction. In the USA, this context lead to PAITI being often framed as alternative means to improve police-citizen relations, most noticeably BWC. This was in sort a self-defense mechanism from police organizations. In Canada, interviewed LEO almost systematically identified in contradiction to their USA counterparts.[30] They make sense of their relations with citizens as different than police-

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[30] Perhaps this is an extension of the identity construction phenomena, coupled with a dose of Canadian chauvinism. Yet Canadian policing has historic and documented biased practices. In recent years, events and public inquiry reports in Ontario (Government of Ontario 2007), Manitoba (Marcoux 2020), and Quebec (Viens 2019) have underlined the differentiated treatment of indigenous populations by Canadian

citizens interactions south of the border. This project seeks to determine whether this difference impacts their sensemaking of PAITI policies.

IV – Why Study Canadian PAITI policy

1. Canadian Policing

There are multiple reasons why Canadian municipalities represent intriguing settings of police policy making and sensemaking of AI. First, there is no federal funding of local police services in Canada, which allows to better isolate local factors. Second, Canadian municipal police services have a tradition of greater independence than other Peelian police forces (Lentz & Chaires, 2007; Puddister & Riddell, 2012). This undoubtedly influence police hierarchies sensemaking and enhances the risks of unchecked increased police surveillance capacities. Third, contemporaneity of the debate. We are at a time in Canada where most individual understandings of PAITI are unsettled, and the adoption of various police AI technologies are regular issues of public discussion. Fourth, research on police AI policy in Canadian cities has remained largely untapped.

First, there is no federal funding of local police services in Canada. This is unique among countries with Peelian police models, including the United Kingdom (UK), the USA, Australia, and New Zealand. I see this as an opportunity to isolate the role of key local actors and stakeholders, as it avoids the "distortion of adoption" caused by federal subsidies (Harmon 2015). Canadian police services are placed in a bigger budget constraint than those that have access to external funding to adopt PAITI. This is accentuated by findings suggesting fiscal pressures tend to notably target law and order spending.

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police services (Palmater 2016). Historically, the North-Western Mounted Police (NWMP – the ancestor of the RCMP) was exclusively composed of Anglo-Saxon protestants. The force was directly controlled by Ottawa, and modelled after the Irish Mounted Constabulary, whose main purpose was to hunt down anti-British rule dissidents. The public objective of the NWMP was to maintain law in order in Canada's west. The private objective of this semi-military organization was the surveillance and sometime forceful control of all minorities that did not fit into the Family Compact's model of public order: especially "Indian" and Métis populations, but also continental European immigrants and USA settlers. In turn, the basic, unstated purpose of the NWMP was to keep Canada British, an objective zealously followed by its constables. This inherently political objective was perpetuated at a lesser extent by the RCMP, its original *police property* being mostly organized labor movements, indigenous groups, and French Canadians (Penner: 1979). The RCMP's roots are noteworthy considering its ongoing difficulties to act on issues of police bias. It certainly resonates with scholars who note using USA examples the various ways legacies of discriminatory policing reverberates in modern law enforcement (Go 2018).

As such, we can expect Canadian police services to be particularly cost sensitive in their considerations of AI innovations. So far, police services have mostly initiated limited pilot projects for selected technologies. Many police services are adopting a "wait-and-see" approach anticipating proof of viability by early adopters (Laming, 2019).

Second, we have seen earlier that in traditional police sociology, a central concept is that police services are to be independent enough from political masters as to avoid instrumentalization, but still accountable to them. In Canada, the scale is heavily tilted toward police independence rather than instrumentalization. To illustrate, you typically do not see Canadian mayors at the centre of anti-crime strategies, which is commonly the case in the USA. This is notably because of the historical roots of the RCMP as a racist and politicized instrument of Canadian western expansionism (Mann and Lee 1979).

 This makes the accountability precedents drawn from American cases potentially less applicable, as Canadian police services are less inclined to be submitted to political and public oversight than, for instance, in the USA. This opens questions on the space occupied by political leaders and local stakeholders. Moreover, notably to maintain their aura of independence, Canadian police services are particularly conscious of their public image (D'Ombrain 1999), and wary of controversies such as the ones in Seattle, Oakland, or San Diego (see next subsection). Examples of Canadian municipalities will therefore help develop our PAITI case studies by allowing tapping into traditional police literature. Notably, it allows to examine how police conceptions on citizenry-police-state relationships influence actors sensemaking.

Third, Canada is at a stage where actors are familiar with PAITI but have not settled their thoughts on them. None of the technologies here examined are widely established across the country, and individuals, stakeholders, and organizations are generally not fixed on how to make sense of them. This flux, and the fact these technologies are regularly issues of public discussions, make it an interesting time to tap into actors sensemaking. This contrasts with the USA, where perceptions are more established. For instance, there is a consensus south of the border that BWC is a desirable technology, which is not yet the case in Canada (Laming 2019).

Fourth, research on police AI policy in Canadian cities has remained largely untapped. Laming (2019) provides an example, where he targets one technology (BWC)

compared between cities and focuses specifically on causes of adoption or non-adoption. To reiterate, adoption is not what this project is about. I look at how actors make sense of different technologies; if adoption matters it is in informing how actors might change how they make sense of technologies once they are more familiar with them. For each PAITI, multiple services will be examined to explore sensemaking in different environments. Right before moving to PAITI case selection and other methodological issues, the following section presents a literature review of AI policy and PAITI implementation in the USA.

2. Overcoming the "Killer-Robot Syndrome" in PAITI Literature

Here I have defined PAITI as the procurement or use of new pieces of capital equipment that uses algorithms and artificial intelligence to enhance – and potentially transform – police practice. PAITI noticeably impact police discretionary decision-making. These innovations, often material, but necessarily immaterial in that they cannot function without algorithms, have been made possible by progress in the rapidly growing field of artificial intelligence and deep learning in the last decade or so.

In terms of existing scholarship, this project contributes to literature on police policy, AI policy, and their interaction at the local level. The scientific community is only beginning to understand the multilayered sociological, economic, and technical impacts of AI on our democratic societies. The inherent uncertainties of rapidly developing technologies led many social scientists studying AI to focus on abstract and long-term considerations, such as comparing the conceptual differences of AI national strategies. As for the many western governments that inquired into the disruptive nature of AI, they focused their attention to macro level ethical and moral dilemmas such as potential job losses caused by AI, and the relationship between private and public stakeholders (Cath et al., 2018).

Early literature on AI in criminal justice has certainly not been spared by these trends. Many texts are prone to what I label the "killer-robot syndrome." By this, I refer to how prospective work on PAITI has overly focused on hypothetical questions of moral or philosophical nature with limited short or middle term implications. In particular, scholars have attributed an unjustified attention to the prospect of police killer robots, questioning whether it would be ethical for the police to be equipped with armed robots that could

eventually make life and death decisions. The underlying question here is who would be morally responsible for "deaths-by-robots" (Bundage and et al. 2018). Killer-robot conversations are ingrained in larger philosophical debates on how AI will impact societies in a "profoundly" transformative way.

If these questions matter, the hitch is that it is often the one criminal justice consideration brought up amidst larger storylines. Scholars prone to the killer-robot syndrome are usually involved in abstract "AI for Good" debates. They do not have a particular research interest in PAITI or even policing. While this is by no means a disqualification, it creates a distortion of the attention toward these abstract issues within larger audiences, as these narratives are pushed by influential research centres such as the Future of Humanity Institute of Oxford University. Killer-robot syndrome texts certainly raise intriguing prospects, but they have limited implications for challenges police policy-makers are facing in the immediate future. Such prospective technologies are out of the scope of this dissertation.

Our knowledge of the implications for local government of PAITI is especially sparse, despite the fact they are often the primary jurisdiction dealing with the impacts of innovation (Lauriault 2018), as well as primary vectors of innovative policies (Beaudet and Shearmur 2019). When scholarly attention has emerged, it has overwhelmingly focused on the USA, either on the impact of new surveillance technologies on the fourth amendment (Joh 2007; Renan 2016; Talai 2014), or on police AI technological innovation procurement process of large cities on the Pacific Coast (Crump, 2016). This certainly has introduced useful policy and ethical questions, notably linked to measurement, proprietary information, privacy, safeguards, and bias (Calo 2017; Crawford and Calo 2016; Joh 2017b; 2007; 2014). For instance, Joh (2017a) has convincingly argued nondisclosure statements, market domination, and the shielding of proprietary information, combine to place large technology companies in a positional advantage that limit the choices of local governments as well as their ability to properly regulate the technologies they purchase. Brayne (2017) makes similar remarks on the directionality of private companies/police services relationships. Other noteworthy contributions include surveys of ALPR location, which have been found to overly target poor neighborhoods (Renan 2016, 1059).

A large part of this US-centric literature has to do with the distortions caused by the federal government subsidies to police services wanting to adopt specific PAITI (Harmon 2015). The Obama administration reacted to successive publicized shootings of mostly black youth by police officers in the early to mid-2010s by funding police purchases of BWC, an opportunity taken upon by thousands of services (Bud 2016; Laming 2019). While federal funds influenced the type of technologies municipal police services equipped themselves with, it did not provide guidance on how to use these technologies appropriately. Nor did it require to have local government input or oversight. Catherine Crump's (2016) examination of PAITI policies (or absence of) in three large Pacific Coast cities exposes how this led to a range of shortcomings in political oversight of police surveillance practices. Local politicians were quick to accept that their police services took money from the federal government but were rarely involved in ethical questions such as use policies of the purchased capital equipment.

Seattle is the first city where Crump (2016) identifies deficiencies in the procurement and implementation of PAITI. In 2017, the municipal council adopted an ordinance ensuring police surveillance procurement and use policies would continuously be held in check by political authorities and public oversight. This followed popular backlash against the Seattle Police Department (SPD) lack of transparency and perceived dishonesty in the procurement and deployment of large-scale surveillance technology. Because of the controversy, not only has the SPD forestalled the deployment of surveillance technologies, but it was also pressured to give a drone it had purchased to the Los Angeles Police Department (LAPD).

In Oakland, the procurement of a DAS in 2011, a technology developed to combat terrorist threats by aggregating public safety providers data, was presented to the municipal council. There the problem was elected local representative did not understand the nature of the technology they were approving. They were simply happy to accept federal subsidies. Two years later, in a post-Snowden era, media reports and popular backlash led the city to develop a privacy policy and limit the use of the DAS to the port area.

As for police services in San Diego, they had developed a facial recognition software without informing municipal authorities or developing use policies. This led to a comprehensive report by the EFF, and national media attention (Maass 2019). Only after a

public outcry did the local police services develop a use policy that notably states that authorities must erase merely all individual data within 24 hours.

These early adopter cases certainly impact how actors in other municipalities think about these new technologies. Even policy scholars that focus on internal determinants of policy adoption recognize that the knowledge of other policy experiences matters at a minimum (Berry and Berry 2018). It is safe to assume that municipalities and police services, regardless of what technology they are considering, want to avoid such popular backlashes. We can assume that most police services now accept they are expected to consult, develop use policies, and secure political approval, prior to adoption of a PAITI. Yet, in the USA, the continuous flow of money from the federal government for specific technologies make it harder to isolate the role of local actors and their sensemaking exercise. This project will build from this difficulty, as well as the controversial features of early adopters, to examine how key institutional actors and stakeholders within municipalities and local police services in Canada have been engaging and making sense of these innovative technologies.

One note on the use of USA examples throughout this literature review. Theories of systemic biases and movements such as BLM have influenced popular perception of policing in Canada. So do American police television programs: despite their rarity in Canada, *Live-PD* has normalized the use of BWC for the public. Thus, such imported cultural dynamics contribute to PAITI sensemaking. USA cases are also valid comparison points because municipal policing and procurement are structured similarly in both countries. Private companies that operate in the commercialization of PAITI usually have a unique North American division. Additionally, over two thirds of citizens in both countries are primarily serviced by a municipal agency.

In terms of differences, there are only about 300 services in Canada. This is mostly due to RCMP, *Sûreté du Québec* (SQ), and Ontario Provincial Police (OPP) contract policing. In contrast, there are over 18,000 agencies in the USA, over half of which are composed of less than 10 sworn LEO. The policing universe in the USA is therefore considerably more complex than the Canadian one. Crime rates are also significantly lower in Canada (Griffith 2014). In sum, the examples of PAITI implementation in the USA have to be taken in light of differences and similarities of law enforcement in both countries.

V – Studying PAITI

PAITI trigger fundamental political questions about police power, which political scientists have cared about since Weber. They impact the type of society we aspire to develop into. The increased capacity to surveil citizens PAITI allow puts in jeopardy the very nature of police restraint. Said surveillance is now conducted behind computer screens, an embeddedness that complicates the ability of the public to keep its police services accountable. PAITI reduce the cost of surveillance, make the police invisible to the public, and empower the police with tools that traditional accountability mechanisms are not equipped to overview. This quaver safeguards of democratic policing that are cost, visibility, and oversight. The AI turn in law enforcement therefore undoubtably is worth the attention of political scientists, as it has profound implications for our democratic societies (Joh 2020). The rule of law in a democratic society is protected and enforced by the police, but such power can only be guaranteed if the police act with restrain and is held accountable for its action by political masters.

The PAITI hereby studied have noteworthy implications for the two principles of democratic policing that are restraint and accountability. In addition, they each bring a specific contribution to the theoretical framework of this project.

The ALPR chapter emphasizes environmental factors, temporality and sensemaking. It helps answer the question of whether dragnet surveillance (of police, government, or private entities) is compatible with democratic principles and citizens' rights to privacy. It studies actors sensemaking of the PAITI and its implications over a 10-year period following implementation, contrasting two cases.

The PP chapter develops links between the social impact of AI literature and police sociology. It notably elucidates the concept of algorithmic inexplicability and how it fundamentally contradicts the democratic principle of police accountability. The chapter looks at actors sensemaking of a PAITI that is not yet established, examining in which ways individuals and groups differently translate and are impacted by the AI turn in law enforcement.

As for BWC, it allows to isolate AI in the study of police sensemaking of innovations and emphasizes the dynamic nature of sensemaking of PAITI. As cases of adoption and studies have multiplied, it has put into question early translation of BWC.

The chapter explores how this evolution, external cases, socio-political contexts and other stakeholders sensemaking, mutually influence actors' translations of BWC.

Taken together, studying ALPR, PP, and BWC will contribute to our understanding of police sensemaking of PAITI, and by extension what policies can successfully capture the benefits of AI in ways that avoid downfalls for democratic policing.

1. *Automatic Licence Plate Readers*

ALPR technologies within Canadian municipal police forces are mostly mounted. In terms of the change continuum, they amplify traditional policing: patrol cars mounted with ALPR are now able to run drastically more plates than if done manually. The caveat here is that individual officers are given less discretion—or decision-making—in the selection of suspiciousness, as AI now automatically flags irregular plates instead of individual officers spotting a suspicious car and running the plate manually. On the surveillance continuum, ALPR correspond to dragnet surveillance practices, meaning they collect data on everyone rather than only individuals under suspicion (Brayne 2017; Crump 2016). The technology is used as an example by Joh (2018) when referring to how the use of AI leads to an increased embeddedness of police organization within urban infrastructures. ALPR allow services to increase their knowledge of individual citizens' whereabouts without their explicit consent. While scholars and privacy advocates alike deplore this considerable change in police surveillance practice (Lyon 2015), it is generally not perceived as a direct, individualized, form of police surveillance.

My expectation is that the combination of amplification (rather than transformation) of traditional policing and indirectness (rather than directness) of surveillance will mean most key police institutional actors have a positive outlook of ALPR. Uncontroversial despite its dragnet surveillance practice, this technology should not be a central preoccupation of most stakeholders. I suspect this is in part because this technology provides a unique solution to a range of distinct problems. First, the inefficiency of manually typing in each plate encountered by police officers. Second, the social perception of traffic stops racial biases and associated police-citizen confrontations.

The SPVM program will be the base subject matter for our case study of ALPR. ALPR systems have been mounted on 30 SPVM's cars as early as 2011. The service renewed the experience in 2019 but did not expand it. The SPVM does not have the

reputation of being especially proactive in terms of technological adoption,[31] making this early implementation an intriguing entry point. There have been limited public discussions, and no legal contestation, of ALPR use in Montreal. Nor are there many reports by local privacy groups, Quebec privacy commissions, or published use policies. The contrast is glaring with the extensive research and public attention granted to the SPVM BWC pilot project.

There are exceptions to the uncontentious nature of ALPR technology. One of the most striking controversy surrounding this PAITI can be found in BC, during the same period as Montreal. This study reveals it was the result of a particular context of tensions between federal and provincial governments over RCMP contract policing negotiations. Other factors including thorough investigative journalism and the 2010 Vancouver Olympics also played a role in the salience of ALPR policy in BC. This led to significant use-policy changes, which are now considerably more restrictive than those of Montreal.

Likewise, the programmatic objectives of ALPR technology can vastly fluctuate between police services. In Montreal and BC municipalities, ALPR are used strictly for road safety prevention. In Los Angeles, ALPR are used for investigative work and crime suppression in high-criminality neighbourhoods. The chapter on ALPR technology will notably contribute to our understanding of how environmental factors intercede to influence actors sensemaking of technology, including use-policy, technological reinvention, and programmatic dimensions.

2. Predictive Policing

On the surveillance continuum, PP is not direct nor visible to the general public. On the transformation continuum, it is a combination of both: it makes traditional crime mapping more efficient but transforms it by risk-level assessments based on data sometimes irrelevant to policing. This goes considerably further than first generation crime mapping software that provided digital versions of "dots on the map" police strategies.

PP use by police services is considerably less common than ALPR and BWC. Integrating such PAITI is a complex operation that is conditional to the development of

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[31] Interview with Benoit Dupont, Montreal*, October 2020. Interviews 6, Montreal*, June 2020; Interview 34, British Colombia*, November 2020. *Indicates the location (city, province, or state) of the interviewee. All interviews except the first one with Marc Parent (February 2020) were virtual.

trustworthy algorithms and data quality threshold most police services do not meet, especially at the municipal level. As a result, it is the only of the three PAITI here studied where police-academic partnerships and researchers play an active role in implementation. These matter as it led to the drafting of few select documents disclosing the sensemaking of academics and rankings LEO in terms familiar with those of university Ethics Review Boards (ERB). This is notably the case with the VPD, the entry point into PP for this research. There, starting in 2016, a breaking and entering (B&E) PP program was launched in collaboration with scholars from various institutions including Simon Fraser University.

Similar to ALPR, this technology should not be a central preoccupation of most stakeholders. The limited information and to an extent prospective nature of PP means many actors do not necessarily have a set mind on the technology. Yet, because PP amplifies some aspect of traditional policing and does not enhance direct surveillance, key police institutional actors generally make sense positively of this technology. The complexity of establishing PP and the value police officers put in their individual expertise lead me to expect actors within the policing world to translate PP into categories that fit their organizational culture.

Such sensemaking has been noted by Sanders et al. (2015) in their study of Canadian police services ILP reforms, which are distantly related to PP. As a reminder, this project noted police hierarchies translated software aimed at increasing police efficiency into their own lexicon of police accountability. Socially constructed problems and solutions are malleable and can evolve along the steps of the policy process. From a theoretical standpoint, selecting PP will be particularly helpful to develop this project discussions on complexity, ambiguity, fairness, and algorithmic biases.

3. Body-Worn Cameras

As for BWC, it visibly impacts patrolling. Most models are installed on officers' torsos. Depending on use-policies, LEO must inform citizens they are being recorded. Recent models activate automatically at different probes. Citizen-police relationships are therefore necessarily influenced by BWC. The mere presence of the hardware creates a *double*

médiatique barrier,[32] as citizens recording of police work with personal devices has also become common practice (Meyer and Tanner 2017).

What citizens are perhaps not as aware of is that, in recent years, BWC hardware have been equipped with different targeted forms of AI. The most widespread use of BWC AI is linked to video assessment and annotation processes, notably to help generate automatically reports of police-citizen encounters (Axon 2020c). This automation of data gathering and records management is aimed at freeing police officers' time to perform other functions (Dupont et al. 2018). It is one of the prime benefits of AI put forward by the Axon Signal advertisement which introduced this dissertation.

Some authors debate the value of BWC[33] (Ariel et al. 2016; Coudert et al. 2015; Laming, 2016; Ready and Young 2015), claiming it challenges the power relation between street-level officers and their superiors, is too expensive, and makes Community-Oriented Policing (COP) impossible. Others consider BWC balance the power relationship in favour of officers, as it limits the number of costly police misbehavior complaints. Efficiency gains in the judicial process and consistency of evidence collection are other arguments often brought forward in favour of the technology (Axon 2020b; Louis et al. 2019).

Thus, the academic literature is divided on the impact of BWC, and what it means for police power. The main subjects of contention are police-citizen relations, judicial efficiencies, and budgetary savviness of such a major investment for a police service. A review of the important scholarly literature on BWC will be presented in Chapter 4. It will notably underline how one of the missing pieces of this literature is analyses of sensemaking of BWC as PAITI.

In terms of the second continuum, images produced by BWC can help identify individuals, making it direct, visible forms of surveillance. BWC is the most debated PAITI on the Canadian market.[34] Especially for BWC, the position of actors on procurement should rely on what type of problems they seek to find solutions to and be environment dependent.[35] The first major Canadian police service to adopt BWC was the CPS. They did

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[32] *Double médiatique* refers to both actors in this relation being equipped by recording devices that mediate their interactions. The BWC for LEO, and personal devices for citizens.

[33] See Laming (2016) for an overview of the arguments for and against BWC. These will also be reviewed in Chapter 4.

[34] That is, until facial recognition software become more common.

[35] On BWC as "A solution in search of a problem" see Palmer (2016, 138).

so in the first half of 2019 and serve as an entry point for the analysis of this innovation. There, timing, budget availability, conservatism, and high levels of public trust in the police combined to create an environment of consensual, collective, positive sensemaking of BWC. The non-adoption case of the SPVM, and policy dimensions across Canada will also be touched upon. Most noticeably, in Toronto the TPS adopted BWC apart of police reform that followed social protest against the police, in 2020. As a result, it dedicated special attention to BWC as PAITI, highlighting the political and contentious dimensions to police integration of AI.

4. Methodological Issues

Methodologically, this research presents drawbacks relative to the tensions between depth and breadth. With this project, I do not pretend to conduct in-depth ethnographic work of PAITI. Neither do I pretend to study all instances of their utilization by Canadian municipal police forces. Sacrifices and decisions were made, as is the case with all methodologies. My argument about the challenges that AI poses on policing and its implications on our democratic societies means that, to understand police AI policy, I spent less time trying to explain the causes of the emergence of particular PAITI. Alternatively, I spent more time developing a framework that accounts for a contextualized understanding of innovations in policing to enlighten our understanding of the unique effects of AI on police decision-making and surveillance practices.

Similarly, my argument led me to considerations that might appear strange for someone who does not understand the police primarily as a political actor. As will be evident by now, this project is grounded on a wide range of literature that, together, recognize police sensemaking of technological innovations as moments of political struggle over what powers will the police behold in our democratic societies. Perhaps this seems a bit distant from the concrete policy implications that this project evaluates. Yet without a complex, political, and sociological understanding of what it means to police at the time of the "fourth industrial revolution," studying PAITI would be incomplete. At least from a contextual constructionist perspective.

In the same vein, the disciplinary grounds on which this project builds are multiple. Public policy, police sociology, and criminology contribute to provide a comprehensive template to study the politics of PAITI. This interdisciplinarity is intended as a contribution

to the field of political science as a discipline that can borrow from other fields of study to explore changing forms of power relations in society. Discussion of the policing and AI nexus is about power and the role of the state, two things that political scientists care a lot about. Thus, while the present work may not read as a traditional political science dissertation, it addresses key issues that political scientists have studied since Weber.

In terms of methods, this research relies mainly on interviews, as well as the analysis of primary and secondary sources—mostly textual but also video. The broad objective of my investigation is to examine how police policy leaders and other key stakeholders make sense of PAITI, and what this means for our democratic societies. I argue police leaders favor PAITI which *enhance* traditional police work, and develop *indirect* surveillance capacities. The turn to AI in policing could therefore make the police less visible to the public but empowered with unprecedent capacity to surveil citizens. This has deep implications for police-citizen relations and more broadly the nature and scope of government surveillance in the era of AI.

A mostly virtual fieldwork was conducted between March and October 2020. It involved 73 interviews and 71 interviewees.[36] A total of 32 sworn or retired LEO were interviewed across 17 police services. Out of that number, 26 were members of 11 Canadian police services. Another six interviewees are BWC or ALPR users or administrators in as many USA police services. They were included to complement data on these technologies which are still sparsely used in Canada. Because I approach this research with an interpretative, contextual constructionist perspective (Loseke and Best 2003), spatial and temporal widening helps better understand the contexts I study, and as such is pertinent to this investigation.

As for non-police stakeholders, 17 are political or social actors, 9 work or study AI, and 13 are engineer-sociologists working within private PAITI companies that have police services as clients (they prefer the term *partners*). Political and social actors helped complement contextual and environmental dimensions proper to the cities where PAITI are used. They were particularly helpful in Calgary, where ideology plays a significant role in BWC policy. AI specialists were interviewed to help underline what policy dimensions

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[36] The numbers do not match perfectly as not all interviews were one-on-one. Namely, three interviews were with two individuals simultaneously, and four follow-up interviews were conducted.

and considerations are unique to policing, and what is common to other fields where AI has a disruptive role. As for engineer-sociologists, they are directly in contact with police leaders in charge of PAITI and often work with services over many years. Their input allowed for a unique perspective on police PAITI sensemaking.

Semi-structured interviews were centred on actors sensemaking exercises. Police interviewees were initially asked to mention the technologies they used on the daily, if AI and technology influenced their diurnal functions, and how they made sense of ongoing evolutions linked to PAITI. Then, sensemaking questions on ALPR, BWC, and PP were asked, unless it had been brought forward earlier by them. This was followed if it applies by specific probes about context dependent documents, cases, or use-policies. Interviews concluded by open-ended questions on how actors perceived policing had and would evolve in the previous and following 10 years, notably in light of our discussions on PAITI. Non-police interviews similarly focused on actors' sensemaking. They were generally policy oriented and centred on PAITI. They were adapted by category of actors in that they each brought a specific complementary contextual perspective, but the core "How do you make sense of" questions remained stable. Interviews lasted between 27 and 132 minutes, for an average of about an hour. All but four were recorded.

Interviews were transcribed via automatic transcription software, revised in their entirety by hand, and anonymized. This is considerably more time efficient than doing transcriptions by hand. Two excel sheets were created to condense interview data, one for police and one for non-police actors. It summarized actors' position and notable quotes for each PAITI, which documents were discussed (and whether I or the interviewee brought it forward), and different themes such as urban/rural divide, defund the police, other. These two sheets helped streamline the analysis of interview data, contrast positions, and highlight trends.

The fieldwork and interviews will further be discussed throughout empirical chapters. Taken together, the interviews explored how different actors make sense of PAITI, and what it means (to them) for policing. The idea is not to determine why actors make sense of things in a particular way, if this is rational, or even if they are being fully honest in their assessment. There might be good reasons for the police not to be fully rational nor honest, and the *identity construction phenomena* tell us individuals tend to

protect their institution if they perceive it is threatened. Policing as we know it was certainly threatened in June 2020, and still is. As such, from a constructivist perspective, the fact that interviewees are at times not fully truthful (if there is such a thing a truth) is not a problem but an area to investigate. It is an integral and insightful part of sensemaking. The modest end goal of interviews is to gain some analytical leverage into understanding a particular context and set of policy challenges for modern policing.

In terms of the corpus, central evidence of police institutional logic behind PAITI policy were police press-conference releases; published internal reports notably on pilot projects[37]; use-policy guidelines; police commission video and written debates on specific PAITI; and promotional material produced internally. The latter was particularly helpful with PP and the VPD. The SPVM also granted me access to internal documents and use statistics pertaining to its ALPR program. A variety of municipal and provincial documents pertaining to pilot projects, privacy assessments, and use-policy guidelines were also consulted. Combined, these documents give use a representative view of how the police make sense of PAITI.

News reporting on police PAITI adoption, and private providers website or promotion documents, additionally informed in the sensemaking of these other stakeholders. Police services are political entities wary of their public image; the way they are portrayed in the media matters to how they make sense of their role in society.[38] As for private PAITI providers, their websites shows how they perceive what will work in convincing police services to purchase their products. A dozen websites were consulted, selected based on companies who are active with Canadian police services both in selling products, such as Axon and Motorola, or conducting research, such as Thalès.

Finally, selected documents from think tanks, privacy advocacy groups, and police unions were examined, and often discussed in interviews. For instance, the Fraternité des policiers et des policières de Montréal (FPPM) produced in 2019 a document on the future of policing which gives a union perspective on how AI will impact police work. Likewise,

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[37] Some police services refer to pilot projects as Proof of Concepts (POC), including the CPS.

[38] It is notable how most news report on PAITI consulted repeated closely the police press releases on each technology. This is less true for BWC which represent salient issues in public debate, as such journalist sensemaking exercises are more developed on these issues. The way police leaders make sense of PAITI therefore has an influence on how the public does, and sensemaking exercises of these technologies are still at an early stage.

the University of Toronto CitizenLab produced a comprehensive report from a legal perspective of PP in Canada in August 2020.

As a whole, desk research on both specific cases and the social, political, and cultural contexts in which they develop allows to give a voice to selected documents from the perspective of a precise research project (Bowen 2009). Document analysis helped prepare and interpret interviews, as these research methods complement each other. Interviews are key because of the limits of document analysis when dealing with institutional documents. Policy texts are often written by a multitude of authors, which limits the ability of the researcher to display patterns of discourse creation (Gottweis 2012, 225). They are also set at a specific time and represent one moment of sensemaking which might have evolved since then. Moreover, without interviewee insight into the sensemaking exercise that led to the textual data production, the researcher faces the challenge of providing interpretations that are analytically comprehensible and account for the complexity of the socially constructed reality (Leipold & Winkel, 2017). This is not to state that these documents are irrelevant. On the contrary, they bring important analytical insight because the institutional story plays a role in individual sensemaking, and the contrast between both is precisely what is analytically insightful.

Documents can be seen as reference points to how services publicize and intend initially to use PAITI. Most were produced in early moments of PAITI adoption or pilot projects. In contrast, interviews happen at a later point in time. Combined, document collection and interviews allow to tap into the initial official logic behind different PAITI, but also how, as with any innovation, their use and sensemaking evolve in terms unexpected to initiators.

For example, today ALPR are promoted in SPVM press releases and by its members as a road safety technology. Interviews with two of its key proponents of the early 2010s however indicate that its intended original scope was greater and centred on crime prevention. In Chapter 2, I suggest other uses were abandoned because they cost too much strain on traditional police functions, and that anti-radar vandalism in Western Canada led Quebec police services to be extremely careful in their implementation of all radar technologies.

One note on conducting research during a pandemic. Initially, in-person interviews in Montreal, Calgary, and Vancouver were scheduled for the spring of 2020. Only one occurred. From March 13th onward, the entirety of the research project was online. The pandemic caused many strains on police services in its initial months, slowing down the recruitment process until June. This was particularly damaging in Vancouver and Calgary, where initial engagements could not be kept. In comparison, in Montreal, notably because research requests follow more established rules and were at an advanced stage, I was given large-scale access including to personnel at all levels and internal documents. The SPVM security screen was however delayed.

To compensate limited access in Vancouver and Calgary, I sought to widen the net of police actors to be interviewed. About half of police and non-police actors reached out to were interviewed for the project. On a bright note, the fact most actors were now working from home and comfortable using platforms such as Zoom facilitated this widening, both in and out of services. For instance, five LEO working in rural environments were interviewed for this project, which was not initially planned for. This virtual fieldwork limited the possibility of observational research, ride-along, and informal discussions. While this does represent an analytical hole in my research, these were complementary tools that were meant to be used in an ad hoc manner, notably during police conferences. One ride-along opportunity opened up when a lead ALPR specialist at the SPVM was temporarily moved back to the streets for COVID-related reasons. However, McGill University at that point did not permit in-person research.

Widening your range of interviewees is hard to systematize, especially when the research barely started before needing to be adapted to a pandemic. This complicated a project already in itself based on a sometime eclectic, non-traditional literature (at least for a Political Science PhD). A research project, just like reality and contexts, is socially constructed. The way I conducted this project and analyzed its data might not match how you would have. As such, this project does not pretend to settle the academic and public discussion on PAITI in Canada and elsewhere. Simply, my claim is that the framework I am presenting here illuminates some commonalities in the form of continuums that in part guide how police policy leaders make sense of PAITI. Hopefully, future police policy leaders and academics might find this contribution a useful starting point to understand and

develop credible hypotheses on future emerging PAITI, and how they could impact police-citizen relations.

Chapter 2: Automatic Licence Plate Readers

This first empirical chapter of this dissertation focuses on *Automatic licence plate readers* (ALPR), which refer to cameras, either static or mounted on patrol cars, that take two pictures of every car that they encounter—one of the licence plate and one of the car itself—recording the date, time, and GPS coordinates. ALPR data can provide maps of the distribution of cars throughout patrolled areas, feed information on individuals' travel patterns, and automatically flag road safety violations such as unrenewed licence plates or stolen vehicles.

This dissertation looks at the dynamic sensemaking exercises that police leaders continuously make on PAITI; it does not solely focus on the moment of adoption. As these can evolve across time, ALPR are an important case for this study: it is the only AI application that has been widely used by law enforcement across Canada for over a decade. This dissertation further invites us to examine how PAITI impact the very principles of democratic policing. Here again ALPR bring an important contribution to our research. Despite installing the exact same machine, ALPR were made sense of as a threat to democratic principles by actors in BC, which was not the case in Montreal. This chapter will notably examine the roots and particularities of such differentiated translations, how it evolved across time, and policy implications 10 years later.

Section I presents a literature review on ALPR, notably discussing how the mass data collected by ALPR can be leverage for other AI-induced policing functions which will be reviewed and discussed throughout this chapter. ALPR data management policies and programmatic objectives vary considerably between police services. In many USA cases, ALPR have been re-invented to be used for investigative work and crime suppression in high-criminality neighbourhoods. In Canada, ALPR are mostly used for road safety. This underlines that understanding how a Police AI Technological Innovation (PAITI) is leveraged by a service requires a comprehensive analysis of both the technical capacities of the technology, and the context within which it operates. Leaders' sensemaking of the technological is after all not separated from the social.

Section II reviews methodological consideration. Of the three PAITI studied by this dissertation, this chapter is the one for which the corpus and set of interviewees are the most extensive.

Section III emphasizes the interactions between technical capacities, context, and sensemaking, by contrasting the Montreal and BC cases. In the latter, ALPR were perceived as a threat to the balance of power between the public and the police. As such, their use-policies have been limited. In Montreal, even though the city council was looking into ALPR in the summer of 2020, the public has been generally indifferent to the PAITI. This underlines that technology is the product of the environment in which it operates and is socially constructed by the actors with which it interacts.

Section IV presents a theoretical discussion of technological frames and organizational sensemaking. The main contribution of this dissertation is to explore how local police leaders and other key policy actors make sense of different, multiplying, and complex PAITI. This dissertation suggests police leaders sensemaking of PAITI is centred on (1) the impact of technologies on traditional policing (enhancement versus transformation), and (2) the type of surveillance capacities they enhance (direct or indirect). Concretely, my argument is that police leaders favor PAITI which *enhance* traditional police work and develop *indirect* surveillance capacities. From a technical standpoint, ALPR could represent such an innovation. The PAITI is generally made sense of as an indirect form of surveillance. Yet, in terms of the change continuum, the dominant technological frame of technical efficiency can translate the same PAITI in different contexts as an enhancement or as a transformation. Running plates might not be considered "real" police work by some, and for others it might be perceived as a transformative limitation to police discretion.

Section V summarizes the lessons drawn from this first empirical chapter.

I – Literature Review

1. Impacting Crime: Efficient but Ineffective?

The technology behind ALPR predates that of PP and BWC by several decades. Licence plate reader technologies started appearing in Europe in the late 1980s. In 2006, all police services in England were already equipped with the technology (PA Consulting Group 2006). ALPR processing powers have exponentially increased compared to these early versions. By the time Canadian police services started considering them in the late 2000s, they were able to read almost all plates encountered by a patrol car, including at high speeds on the highway (Grielack et al., 2014). In terms of AI, ALPR are Object Recognition algorithms. This is the same category of AI as FR. The latter is less mature than the former, but it is also considerably more complex (Dupont et al., 2018).

A recurring theme in the literature on ALPR is how understudied it is considering its wide use by police agencies in Continental Europe and North America (Byrn and Marx 2013). The rapid adoption of ALPR technology at the end of the 2000s was not accompanied by proper outcome evaluation and community assessments (Koper et al. 2009). Many early studies have focused on technical dimensions of ALPR, such as system errors, speed and accuracy in scanning licence plates, ability to detect stolen automobiles, or comparisons of different ALPR providers. As a result, police leaders charged with making decisions on ALPR have little non-technical information on these technologies. Some of the holes in the literature include their impact on police discretion, and how these novel surveillance practices are perceived by public opinion (Merola and Lum 2014).

However, questions that relate to the concrete impacts of ALPR on the persecution of crimes have been investigated. Different authors have examined whether this PAITI statistically increases the recoveries of stolen vehicles, the rapidity of these recoveries, and the number of arrests linked to car thefts. Likewise, the literature covers the impact of ALPR on the persecution of non-car-theft-related major crimes, for instance the seizure of drugs or contraband (Koper et al., 2015, 41). The plurality of this research has used randomized controlled experiments. Different tests evaluate the effectiveness of ALPR in apprehending illegal drivers, the recovery of stolen vehicles, or even crime deterrence (Lum et al. 2011; Taylor et al. 2012).

Often, although not necessarily formulated as such, the underlying question behind these experiments is one of efficiency versus effectiveness. This is a classic police innovation dilemma, and a necessary element to consider in the evaluation of PAITI. Ideally, an innovation should make police officers more efficient in their daily tasks, and the service as a whole more effective in their crime reduction objectives. In terms of efficiency, there is no debate in the literature as to whether ALPR enhance agents' capacities. Not only does it allow officers to read considerably more plates than if done manually, but readers can also process licence plates at high speeds and at night, which was not previously possible (Hubbard 2008).

In terms of effectiveness, the literature is not as unanimous. From an organizational perspective, Byrn and Marx (2013) regret that ALPR divert human resources away from crime prevention and into crime persecution. They also argue the privacy concern ALPR can raise decreases trust in the police, making it an ineffective policing practice. Without criticizing the logic of utilization of the PAITI, Lum et al. (2011) conclude, using a place-based block randomized experiment, that ALPR uses in hot spots do not generate any general or crime-specific deterrent effect. Taylor et al. (2012) agree, but find officers are more efficient in locating circulating stolen vehicles, arresting car theft perpetrators, and recovering stolen vehicles.[39]

Part of these mixed findings on the effectiveness of ALPR is due to the limited insight that can be leveraged from such experiments. The effectiveness of road safety measures can only be measured in the long run. Just like ongoing continuous efforts to thwart drunk driving, or seatbelt wearing campaigns, the impact of ALPR is rarely immediate. The objective of this PAITI is, in part, to make people who used to drive illegally fear the possibility of being caught. Previously, unless they were committing driving violations, they could circulate illegally in virtual immunity.[40] The technology works in conjunction with overlapping road safety campaigns, different radar technologies, and policies drastically increasing the consequences of the targeted misconduct.[41] It is

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[39] Taylor et al. (2012) also demonstrate the deterring impact of a visible anti-car theft unit within hot spots, whose presence one day was associated with less car theft two weeks later. This is a comforting finding for partisans of traditional "boots on the ground" police work.

[40] Interview 8, Montreal, October 2020.

[41] Interview 14A, Montreal, October 2020.

therefore challenging to isolate the impact of ALPR technologies in experimental environments. Regardless, experimental results do underline the academic debates on the effectiveness of ALPR in terms of crime persecution and deterrence.

Another limit of this (mostly) experimental research on ALPR is that it focuses on narrow use-cases, which results in incomplete measurements of effectiveness. In particular, research has centred on ALPR as tools to check licence plates against lists of stolen vehicles, or, in some cases, open warrants for major crimes (Lum et al. 2010). However, this measure of effectiveness is only one of the many reasons to implement ALPR. The logic of adoption behind uptake of ALPR technologies is significantly different between countries.

In the USA, a first objective is to boost efficiency by automating the distracting, subjective, and tedious process of manually checking licence plates encountered during a patrol. ALPR have also been adopted there with a clear secondary objective of developing records of vehicles sightings to help intelligence collection, investigations and various analysis functions (Roberts and Casanova 2012).

In France, ALPR were adopted mostly to help with the management of urban traffic, notably quicker tolls at entrances of large cities, and savings in the operational management of priority lanes for emergency and public transport vehicles. Another distinction in this case is they have mostly been fixed instead of mounted. Moreover, instead of being under the jurisdiction of the police, they are under that of the ministry of transport (SÉTRA 2013).

As for England, the first widespread adopter of ALPR, early adoption followed terrorist attacks in Northern Ireland (late 1990s) and London (2004). In an interview with a Vancouver Police Department technologist, the agent argued the most striking difference between ALPR and other technological adoption in England versus Canada is that in the former, it was systematically legitimized following an antiterrorist rhetoric.[42]

The logic behind PAITI adoption, including what entity retains control over the technology, impacts how police and citizens perceive the innovation initially and bounds policy and re-innovation dynamics. This chapter will notably examine Canadian police services' logic of ALPR policy across time, and how it impacts actors' sensemaking. The

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[42] Interview 33, British Columbia, October 2020.

next section reviews literature on ALPR community support and trust, which, as we will see, greatly depends on how police services use the technology.

2. Community Support & Trust

Police leaders faced with PAITI policy decisions need to consider how implementing an innovation will impact police-community relations. On the one hand, ALPR could increase the trust in the police if it leads to enhanced crime control, road safety, and the recovery of stolen vehicles. On the other hand, the increased surveillance capacities they entail may heighten community concerns about police tracking individuals' movements and data security questions, negatively impacting confidence toward the police. A high level of trust from its population may provide a form of social capital that impacts citizens' willingness to let police services experiment with innovative technologies (Merola and Lum 2014). This reserve of goodwill can additionally be helpful down the line if citizens disagree with some policy decisions, or if technological implementations hit roadblocks (Tyler 1990; Sunshine and Tyler 2003).

Unfortunately, only a limited number of studies have explored how PAITI impact trust and public opinion. The one exception is the BWC literature, where findings suggest only limited reduction in use-of-force incidents, and an increase in LEO being assaulted (Ariel et al., 2016b).[43] BWC likely have a distinct impact on public perception because their implementation often follows controversial events and aims to foster police accountability, whereas ALPR' ends are generally limited to traffic enforcement (or are credibly presented as such).

One group of scholars from George Mason University has produced survey-based experimental research specifically on ALPR and public opinion. Merola et al. (2014) find a striking 80% level of support for ALPR technology when scanning for stolen cars, wanted criminals, or registered sex offenders. They explain this can be due to the perception that automated plate checks are similar to manual ones. The innovation is an *enhancement* of police functions and not a *transformation*, to translate into the terms of this dissertation. Contributing factors to this high support level includes the fact that, in their scenario, there was no data being stored, and that the experiment was conducted in a community where

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[43] A complete literature review on BWC, including on public perception, is presented in Chapter 5.

police trust was high. Merola et al. (2019) additionally find that over a third of respondents had never heard of ALPR technology prior to their survey, and that only one out of ten knew if their local police department currently used the technology. Citizens trust the technology even if they do not know much about it.

This might not be bad news for law enforcement: respondents who were prompted with short mentions of ALPR functions had significantly lower levels of trust toward the police than their control group. Throughout experiments, the group of scholars find support levels drastically reduced once data is stored, and if the technology is used to check for vehicles with unpaid tickets or parking violations (Merola et al. 2014; Lum et al. 2010; Merola et al. 2019). These findings raise issues which merit consideration for agencies when formulating ALPR policy. The community might strongly support uses directed at recovering stolen vehicles or wanted criminals, but the tables might turn considerably if the PAITI appears likely to impact "innocent" members of the community, or them personally.

Race plays a major role in the trust level toward ALPR (Merola et al. 2019). The average white citizen might not have the same ability to appreciate the potential invasive dimensions of ALPR. Disparate treatment during roadside stops is a persistent concern of minority citizens, and a prime source of police-citizen conflicts. As such, enhancing patrolling police capacity might be particularly feared by these communities (Tyler 2005). This indicates police leaders might need to consider the potential collateral damage of ALPR use for police-minority relations when making sense of this PAITI. This being said, it could be mitigated if ALPR are promoted as a tool to reduce police bias in roadside checks.

3. Policy Dimensions

That nearly 90% of survey respondents in 2019 did not know if their local police used ALPR is perhaps unsurprising considering how infrequently media and police services discuss PAITI policy. Many experts expect community members to be more informed and develop textured opinions on AI (in policing and in other policy fields) in upcoming years (Merola et al. 2019). Issues related to data privacy and AI ethics are starting to surface in public debates. How they impact surveillance and policing will rapidly become hard to ignore. The trend could come from communities whose economies rely on technology

sector jobs. San Francisco was the first major city to ban FR, and much debate over AI ethics emerged in Quebec following the MDAI. Neither should we expect PAITI to be received similarly across communities. Within Canada alone, red light and speed cameras provoked protests and vandalism in some jurisdictions (e.g., in Hamilton, Toronto, and Edmonton) but were smoothly implemented elsewhere (notably, across Quebec).[44]

In the case of ALPR, the diversion of the technology from a road safety prevention measure into a more invasive tool rises policy questions. Geospatial data taken from ALPR can contain sufficient information to build detailed profiles of individuals and be greatly useful for investigations (IACP 2009).[45] The negative side of this is that it might lead individuals to choose to alter certain behaviours that might not be illegal but might be unpopular or embarrassing. This can even be seen as a free speech violation, as some could decide not to go to a protest if they know police cars will scan nearby plates (regardless of intent, but simply as a result of police presence). ALPR data could also be misused or erroneous, with potential consequences for individuals and for police legitimacy, which only get amplified the longer the data continues to be stored. One Calgary resident, for instance, expressed that she stopped going to downtown Calgary when she heard the local parking agency was using the technology (Postmedia News 07/15/2014).

Different institutional watchdogs have assessed the privacy implications of ALPR. In Canada, the Information and Privacy Commissioner of Ontario (IPCO) has completed the most thorough assessment of this innovation. The report presents a comment representative of regulators' privacy and freedom concerns:

> Without adequate controls, [A]LPR systems can enable surveillance and profiling when collecting information such as the date, time and geolocation of vehicles. Such surveillance may reveal other sensitive personal information about individuals, such as their appointment at a doctor's office or participation in a political protest. Individuals may censor their activities when they are aware of being watched and feel inhibited from participating in lawful activities such as protesting peacefully or advocating for societal change. An improperly configured [A]LPR system has the potential to cause

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[44] Interview 9, Montreal, October 2020.

[45] At least one interviewee (Interview 57, New Jersey, 2020) for this project regularly uses ALPR data collected by different police services as part of building suspects profiles. This is very uncommon in Canada, mostly because of data suppression policies. This will be further explored in the empirical section of this Chapter.

        unintended consequences, such as a chilling effect on freedom of speech and association (IPCO 2017, 3).

There is no doubt from the IPCO's perspective that ALPR present an intrusion on privacy with significant implications on individual rights and freedoms. The report concludes that privacy risks can be mitigated with adequate controls, including data suppression policies. However, as with many other privacy assessments on ALPR (President's Task Force on 21st Century Policing. 2015; Cohen et al. 2007; Denham 2012; Axon Ethics Board 2019b), there are no specifics on what these policies should look like.[46] The report is also not precise in terms of what errors and misuses look like, and what their consequences would be.

        The Electronic Frontier Foundation (EFF) does present such examples.[47] In terms of errors, the EFF document different instances where police services drew their weapons during roadside stops of ordinary citizens suspected of grave criminal activities due to ALPR malfunctions (Novak 2020; Crockford 2014).[48] In terms of misuses, the EFF argue ALPR are not only a powerful surveillance technology with concrete consequences on citizen privacy rights, but also that the technology can be misdirected towards entire communities (EFF 2017). The EFF notably points to debatable uses of ALPR to target Muslim communities in New York and Birmingham (Goldman and Apuzzo 2012; Lewis 2010), although their evidence is in both cases mostly circumstantial.

        The EFF's report on the Oakland Police Department (OPD) is more robust (Maass and Gillula 2015). They demonstrate that the police disproportionately deployed ALPR in

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[46] In contrast, the California State Auditor produced a report on data privacy implications of law enforcement ALPR use in California (Howle 2020). The detailed report gives concrete examples of questionable data uses by California police agencies, most notably the Los Angeles Police Department (LAPD). The details of this report will be reviewed in the empirical section of this chapter, as its publication had repercussion in Montreal.

[47] Among major privacy advocacy groups which have studied ALPR in the USA, the EFF has produced particularly comprehensive work. The organization certainly has a militant voice, but its credible work as an online surveillance think tank has been continuous in terms of monitoring police use of the technology in the USA since the early 2010s. Their reports and warnings match those produced by the Axon Ethic Board (Axon Ethics Board 2019b). Both organizations agree police ALPR uses risk disproportionately impacting low-income individuals, and long-term tracking of innocent drivers. That two organizations that occupy opposing segments of this PAITI' technological system come to identical conclusions is, arguably, a proof they are both serious in their demarche.

[48] The EFF often seeks to draw media and political attention to certain aspects of technology policy by exposing isolated police technological abuses. These are hard to make theoretical generalizations from. Yet, at times this leads to concrete changes such as a U.S. Ninth Circuit Court of Appeals judgement limiting the ability of LEO to stop individuals based on ALPR data alone (EFF 2017). This judgement does not apply everywhere, however.

low-income, majority non-white communities. This report, based on data obtained from the OPD, is reflective of how AI may lead to a confirmation bias, where police officers who expect to detect crime will tend to find it more if an algorithm sends them to a specific locale (Fry 2018). The risk here is a feedback loop resulting in the continued over-policing of marginalized populations (Dupont et al., 2018).

The current review of literature underlines three policy dimensions that will be explored in the empirical section of this chapter: oversight, the nature of the hotlist, and data storage.

In terms of oversight, in the USA, ALPR data collection, compilation and use data is vastly unregulated, both for police services and private actors (Axon Ethics Board, 2019b). The power balance is different in Canada, where a right to a degree of privacy in public spaces (including on roads) is recognized, which is not the case south of the border. As a result, the location, time and date linked to a specific licence plate is considered personal information (ICPO 2017).

Concretely, this means any police ALPR deployment in Canada is conditional upon the completion of a privacy impact assessment, either internal or external. This has had concrete implications on ALPR policies in Canada. For instance, one element that repeatedly came up in privacy assessments is the risks of having a machine record personal information of a citizen, and potentially even distribute fines. The ICPO notes all police services in Canada have answered this concern by ensuring ALPR hits are manually confirmed by patrolling officers.

The second policy dimension has to do with the nature of ALPR data collected. The previous section on trust and legitimacy reviewed research that concludes that what is included on ALPR hotlists[49] has a direct impact on public perception. As a reminder, if ALPR are used for "real" crimes such a car theft, they will be overwhelmingly supported by communities. This support will be lessened considerably if they appear likely to impact "innocent" members of the community or impact them personally, for instance by including unpaid parking violation in ALPR hotlists. Note that the experimental research

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[49] Hotlists refers here to what type of infractions trigger ALPR alerts. Hotlist can be narrow, and only include major offenses such as stolen vehicles, wanted criminals, and kidnapping alerts. They can also include a wider range of infractions, including unrenewed license plates.

on which these findings are based does not discuss ALPR checks for unrenewed licence plates. This matters in our case as it is one of the most common uses of ALPR technology by police services in Canada.[50] I will explain in the empirical section that for most LEO, these correspond to important misbehaviours, whereas the public tends to perceive them as minor offences.

A third and central policy area to examine is data storage. In the Merola et al. (2019) experiment, positive feelings toward police services were reduced by nearly 10 percentage points when respondents were told the police would keep all data for six months, regardless of the nature of hotlists. This intuition is not unfounded, as the longer data is stored the more vulnerable it is to misuses, data breaches, and privacy invasions (Tsukayama 2020; EFF 2017; Crump 2016). This should certainly impact police leaders sensemaking of ALPR, both in their potential and risks, especially if we consider most services preserve data considerably longer than six months (American Civil Liberties Union 2013). For instance, the SPVM (2020) conserves all data, including non-hits, for five years. Policies vary widely between Canadian jurisdictions. In contrast, in Ottawa (Ottawa Police Service 2020) and in BC (Government of British Columbia 2019), non-hits are automatically deleted. The empirical section of this chapter will notably examine the environmental factors that contribute to this variance.

4. Re-inventing PAITI

The moment of adoption of a new technology is often perceived by police services as proof of their progressiveness (Haggerty, 2004). It is part of what makes innovations so powerful within organizations (Manning 2008). An important literature (and set of concepts) attempts to explain the rapidity of innovation diffusion across police agencies (DeGarmo, 2012; Weisburd & Lum, 2005). Others focus on what factors make services more likely to adopt specific technologies, such as organizational size and budgetary considerations (Darroch and Mazerolle 2013; Morabito 2010).

However, police scholars rarely study how innovations are re-invented by actors on the field in the years following the moment of adoption. The way innovations are used by LEO does not follow precise, pre-established rules. The objective set by police leaders and

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[50] For instance, this is true both in Montreal (Interview 7, Montreal, October 2020) and British Columbia (Interview 27, British Columbia, May 2020).

technology providers when implementing a technology never encompasses the totality of the impact of innovations on police action. These are only realized once they are used by officers in the field, which should be understood as "moments of creativity" (Amicelle, 2019).

If technology alters police organizations – think of the arrival of the patrol car – their uses are also determined by existing structures and how actors make sense of them (Chan, 2007; Willis & Mastrofski, 2011). Some scholars believe innovations are designed to support traditional police practices (Lum et al. 2016). Another perspective suggests elements of a traditional police culture leads street-level officers to adopt innovations in ways that are consistent with reactive policing approaches, which are characterized by incident-based, response-oriented models of law enforcement (Chan, 2003; Manning, 2008, p. 251; E. A. Paoline, 2003; Willis & Mastrofski, 2011). This is because LEO are often the most directly impacted by changes, and as such are expected to more commonly resist technological innovations that challenge traditional approaches (Manning, 2003, p. 136). This is especially true of innovations that reduce their prized police discretion, are time consuming, or complexify their daily work (Chan et al. 2001). The question therefore becomes whether ALPR fit into what officers consider to be "real" police work. They will be resisted if they are not made sense of this way and contradict the technological frames of LEO (Lum et al. 2016).

It is important when reviewing ALPR uses in Canada to reject a deterministic view of innovation (Rogers, 2003). Technology is not separate from the social structures within which it operates. From a constructivist perspective, the way technology is used is shaped by how actors make sense of it within the social, political and cultural environment in which they evolve (Manning 2008). Because of this influence of contexts, it is expected that interpretations of ALPR will vary across time and place, and that their uses are susceptible to *improvisation* (Sanders et al. 2015). Early scholars studying ALPR expected its impact on law enforcement to be one that would grow in varied areas of police decision-making (Haggerty & Ericson, 1997, 2000; Reiner, 1985). As we have seen, most agencies have, however, relied on this technology for limited purposes, such as traffic control or retrieving stolen vehicles (Lum et al. 2016). This sign of limited "re-invention" (Rogers

2003)—i.e., how actors use an innovation for functions different than its original implementation goals—is in itself an intriguing element to explore.

One research team has examined the processes through which ALPR are re-invented by actors, and how much is due to technological versus environmental factors. Willis et al. (2018) argue that from a technical standpoint, ALPR are prone to re-invention, particularly along two pathways. First, the innovation has a low level of complexity. Because it is easy to use, delivers readily observable results, and is a straightforward strategy to capture data, experts' expectations are that it would favour re-invention (Ansari et al. 2010). Second, the nature of ALPR produces data that can then be used for multiple purposes, whereas TASERs, for instance, have more limited potential uses.

It is therefore mostly environmental factors that explain which jurisdictions have developed novel uses for ALPR systems and the data they produce. First, to be useful for investigators, ALPR data needs to be comprehensive and built on an extensive network of both mobile and fixed readers. A few dozen machines spread across a large metropolitan area will provide partial data with limited investigative value. Second, ALPR re-invention needs to be encouraged by upper management "buy in", all the way up to the police chief. The authors note it tends to be easier to get all the leadership on the same page and demonstrate this using the example of a smaller service in the New York area (Willis et al. 2018).

When environmental and technological factors converge, Willis and colleagues (2018) find three uses of the technology that go further than what initial implementers and technological developers have envisioned. The first is real time rapid response, where all ALPR on a territory are mobilized to retrieve a specific car. This is especially useful to respond to kidnappings[51] where time is of the essence. Second, ALPR have been used as investigative leads in some cases to determine crime patterns. Third, investigators have used ALPR to corroborate alibis of victims or suspects. In part, this empirical chapter will determine whether these evolutions in ALPR uses are present in Canada. Such questions in this context have never been the subject of an academic analysis.

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[51] In Canada and in the USA, these are coded AMBER alert, in memory of Amber Hargerman, kidnaped and killed in 1996 in Arlington, Texas.

The paper by Willis et al. (2018) demonstrates that relying on the perceptions of police leaders, managers, and criminal investigators to understand PAITI sensemaking is well established in innovation research. To understand and explain ALPR re-invention, we must explore both technological and environmental factors, as well as the organizations and individuals that operate them.

II – Studying ALPR

Of the three PAITI studied by this dissertation, this chapter on ALPR is the one for which the corpus and set of interviewees are the most extensive. This contrasts with and compensates for the limited academic literature on the technology. One of my strategies throughout the research was contacting retired sworn members for interviews. My hypothesis was that they might be more open to answering my questions than active-duty members: they have more free time and they do not have anything to lose professionally by participating in my study. Moreover, they have the benefit of distance from their time in policing, while still having useful contacts inside police services that might serve as entry points.

In Montreal, an interview with Marc Parent, director of the SPVM between 2010 and 2015—the period during which the ALPR program was launched—helped pave the way to a research partnership with his former police service. It led to an exploratory interview with the two LEO in charge of the daily operation of the SPVM ALPR program, in March 2020. Following this meeting, I drafted a detailed official research request that listed documents and actors that would be helpful for my study. A security check and project approval by the SPVM research division followed. The approval process was initially supposed to take up to two months but, in the end, took close to seven months because of the COVID-19 pandemic. I was required to have all SPVM members sign a consent form prior to interviews, something the McGill ERB had already requested. Additionally, I had to share the consent form with the head of the SPVM research department. This last request was added to my SPVM consent form, and I made sure to underline to all interviewees that the consent form would be shared this way.[52]

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[52] Another precaution taken, as a reminder, was never to use the name of the interviewee during the recording or in transcripts, regardless of the selected confidentiality option.

Both the research division and road safety section in charge of ALPR were enthusiastic about this project. The SPVM had never received a request from a researcher about this program. Throughout the process, I at times received phone calls from members of the ALPR team to see if I was getting all the information I needed. Interviews outside of the road safety section were generally set up by a captain assigned to sponsor my research project.[53] This let other members know this project was approved by upper management, and is how research is typically conducted within the organization. A few interviews with SPVM members were also organized through personal connections. Overall, this is by far the most access I obtained for any aspect of this dissertation, both in terms of internal data and interviewees.

Initially, unsuccessful attempts were made to access the field. One of these early attempts was through contacts at UdeM's *Centre international de criminologie comparée* (CICC). This was surprising given the not-so-distant proximity between the SPVM and the CICC. Later in the process, after I obtained access, I questioned actors both at the CICC and the SPVM about their relationship over time. The answers were useful in my understanding of the changing environment in which ALPR policy developed a decade ago versus today.[54]

Part of my early difficulties led me to extend my search for ALPR data. ALPR use in BC presented a strong secondary case study as the environment, policies, and discourses around the technology were in stark contrast with that of Montreal. I only understood this after multiple interviews and in-depth document analysis. It is noteworthy to mention that I took the opportunity of interviews on PP in Vancouver to ask questions on ALPR. Contrasting how actors make sense of different PAITI is an integral part of my approach. Initially, I expected Calgary to act as a secondary example of ALPR deployment. However, most ALPR in Calgary are static instead of vehicle-mounted. As a result, their impact on patrolling is indirect.[55]

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[53] Note the captain sponsoring this project has experience with academic collaborations. He had notably worked previously with a professor I have good relations with. Not all captains are so inclined and habituated to external research.

[54] These insights are discussed in the empirical part of this chapter.

[55] Another option considered was in Saskatchewan, but there was not enough data to make it a secondary case in itself. This being said, ALPR use policies and media reports from Saskatchewan will be used as comparison points in the empirical part of this chapter. Moreover, the province will be used as a secondary case in the PP chapter.

In the end, initial difficulties in Montreal and limited access to police services in the early months of the pandemic led me to systematically collect publicly available ALPR data from cases across Canada. This made the access to SPVM internal documents and interviewees in the fall of 2020 even more welcome: at that point I had overdue questions related to policy differences between cases.

The internal SPVM documents cover all periods of the ALPR program and help paint a clear picture of its operations since 2011. A total of 35 pertinent documents were analyzed. This corpus featured training documents, use policies, memorandums (*Notes de service*), internal briefs (*Argumentaire*s), information on communications strategy, a 2020 presentation deck given by the SPVM to the *Commission de la sécurité publique de Montréal* (CSPM),[56] and documents from Genetec (the Montreal-based private company that sold the ALPR), including the complete manager training documents.[57] I also accessed statistics of utilization of each of the 30 ALPR devices between 2011 and the third trimester of 2020, as well as aggregated infractions data.[58]

Most documents cover the initial launch (2010–2012) and the renewal period (2019–2021).[59] Only one—particularly insightful—document covers the time in between: a brief debating the utility of augmenting the number of ALPR in service. In addition, multiple media reports as well as SPVM and city press releases cover the launch and renewal periods. These allow me to note some significant sensemaking evolutions over time. Municipal council motions from 2011, 2019, and 2020, and the Request for Information (RFI)[60] from 2010, also speak to how sensemaking of ALPR has evolved over the years.

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[56] The deck was shared in its original PowerPoint format, with additional notes written by a member of the team to help the commander giving the presentation.

[57] I am not authorized to share any additional information on the internal SPVM documents I accessed.

[58] There are some missing years, but sufficient information to paint an overall picture of statistical trends throughout the period.

[59] The decision to renew was made in 2019, but the new hardware was not installed until 2020–2021. In between, the Howle (2020) report had repercussions in Montreal, leading to policy changes that will impact how the new ALPR will be used.

[60] RFIs refer to public call for tenders produced by police services. Giving the contact between services and potential providers during the tendering process is both limited and confidential, it is the main way of communicating between police and private stakeholders. Importantly, it is an official document where police services express their technological needs – and in some cases logic of interest. This helped contrast expected needs with actual uses during interviews. Nuances and unwritten dynamics at play behind RFI are not apparent to the uninitiated, as such interviews with rankings LEO and engineer-sociologist specialized in tendering enlightened the significance of these documents. Unfortunately, very few RFI were obtainable.

Additional contextual documents inform the study of ALPR in Montreal. These documents will help distinguish what pertains directly to ALPR policy, in opposition to what can be associated to the environment in which it operates. For instance, reports on the BWC pilot project (SPVM 2019), racial profiling (Armony et al. 2019), and the M-IRIS computerized data entry program (Joannette 2013) will help learn more about PAITI policies at the SPVM. Additionally, the provincial government produced studies on the public acceptability of radar technologies in Quebec (SOM 2013; 2016; MTQ 2010). Finally, both the SPVM (2020) and the FPPM[61] (Dupont et al., 2018) published memorandums on the theme of the "Future of Policing," which provide great insight on how both institutions expect AI to transform policing in upcoming years. The recent adoption of a digital data charter in Montreal,[62] and the call by the *Ligue des droits et libertés* (2020) for a moratorium on ALPR technology will also be analyzed.

In addition, the corpus for this chapter includes comparison with use policies, privacy commissioner assessments, and news articles on ALPR elsewhere in Canada, notably in Saskatchewan, Ottawa, Calgary, and BC. The lattermost case is particularly well documented, with multiple articles by a group of activists in the early days of ALPR in Canada. Their work led, notably, to both provincial and federal privacy assessments, drastic limitations in ALPR data conservation policy, and an academic publication (Parsons et al., 2013). Two interviews with actors privy to these developments (one on the police side, one with a member of the activist group) complements this data. Finally, the California State Auditor published a report on data privacy implications of law enforcement ALPR use in California (Howle 2020). The details of this report will be analyzed in the empirical section of this chapter, as its publication had repercussions in Montreal.

Specific to the Montreal case, I interviewed Marc Parent and Fady Dagher,[63] respectively director and deputy director of the SPVM when the ALPR program was

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In other cases, when a technology is developed internally, such as with PP in the VPD, there are no RFI produced. Different RFI were collected throughout this project, but the SPVM 2010 one is the only one concerning a central case for this dissertation.

[61] As a reminder: *Fraternité des policiers et policières de Montréal*, i.e the police union.

[62] Drafted and published originally by the City of Montreal Laboratoire d'innovation urbaine et service des technologies de l'information (2020). This document is meant to be iterative and change over the years following technological developments.

[63] Both directors agreed for their names to be used given the political and public nature of their position. These are hallmark names in Quebec policing circles, notably in terms of academic collaborations.

launched in 2011. The latter is currently the director of the *Service de Police de l'Agglomération de Longueuil* (SPAL). Both left the SPVM about half a decade ago.

In total, 10 active members of the SPVM were interviewed. Two captains questioned to determine what place their ALPR devices took within their precincts. One had a valuable experience in developing technological training for LEO, acquired during a leadership mandate with the M-IRIS program. Two *Agents de quartier en sécurité routière* (AQSR), which are daily ALPR users, were interviewed. One brought the invaluable perspective of being an ALPR user continuously since the beginning of the program. A response team LEO and an analyst were also interviewed to examine how different actors with no connection with the ALPR program made sense of this PAITI.[64] Finally, the four permanent members of the central road safety section of the SPVM were interviewed (both formally and informally).[65] This is the division in charge of the ALPR program from a management standpoint. Two of the four had used ALPR before being assigned to desk duties.

Non-SPVM actors in Montreal interviewed include a city councillor sitting on the CSPM, which approved the renewal of the ALPR program in 2019. He also oversaw the response of the police service to a June 2020 city council motion regarding the ALPR program and data privacy. Multiple engineer sociologists[66] with experience in Montreal were interviewed, including one with 20 years of experience in RFI, and more than 10 years working directly with the SPVM. A city prosecutor working closely with the SPVM, two members of the IT team at the city of Montreal (which serves the police), a retired police officer now working in technological crimes in the private sector, and AI specialists, both in academia and the private sector, complemented the sample specific to Montreal.

In BC, LEO in three different services were interviewed. One individual was active during the implementation phase of ALPR in the province, roughly during the same period as Montreal. Another leads the ALPR program of its police service, including its extensive

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[64] The eleventh member interviewed required his/her role not to be disclosed.

[65] The central road safety section of the SPVM is composed of four agents assigned to desk duties. The field agents apart of the road safety section (*Agents de quartier en sécurité routière*) are assigned to specific precinct instead of the central section.

[66] Michel Callon (2012) uses the image of an *engineer-sociologist* to describe how developers in laboratories from the get-go envision the concrete social impacts of what they are developing. I argue in chapter 1 this image especially speak to researchers in the fields of AI and deep learning.

training program (which contrasts with that of the SPVM). Three others were ranking sworn members of different services with important PAITI policy roles, including one who had experienced ALPR implementation in the UK before transferring to BC. In addition, a provincial political actor directly involved with ALPR data management, two civil society activists critical of this technology, four engineer sociologists with local experience (including a retired BC LEO), and a federal government privacy officer involved in ALPR privacy assessments in the past participated in this research. Finally, Christopher Parsons, a surveillance expert directly involved in the denunciation and modification of ALPR data conservation policies between 2009 and 2013 in BC was interviewed.

The non-random sampling further included three engineer sociologists with considerable experience with ALPR technology, although not in Montreal or Vancouver. These actors were selected based on relevance for this research project and contributed to the technological dimensions of this research. Twelve LEO outside of these cases also discussed their experience with ALPR. One officer in New Jersey explained how useful data can be for investigative work.[67] Another officer regularly used a combination of mounted and fixed ALPR in car theft retrieval programs in Los Angeles.[68] In contrast, a LEO in New Orleans explained his ALPR had not been turned on for months because of the high crime rates in his sector.[69] In Ontario, an officer expressed his wish that he could have used an ALPR at an interprovincial bridge during an Amber alert in the neighbouring province, instead of manually typing in all entering plates for hours.[70] A retired officer explained how he saw ALPR' impact on policing in a similar way as personalized breathalyzers: a game changer, of which you only appreciate the value if you had experienced the old, manual way of working.[71]

All interview data was coded by themes in an *Excel* sheet to underline recurring sentiments, actors, and sensemaking exercises. The selection of interviewees for the sample was purposive and did not aim at theoretical generalizability. Outside of Montreal, interviews within the policing world were mostly obtained via Facebook Messenger or

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[67] Interview 57, New Jersey, 2020.
[68] Interview 58, Los Angeles, 2020.
[69] Interview 52, New Orleans 2020.
[70] Interview 53, Ontario, 2020.
[71] Interview 49, Quebec, July 2020.

personal contacts. Non-police interviews were secured through a combination of cold phone calls, emails, and LinkedIn messages. The latter were especially helpful with individuals in the private sector. In all categories of actors, the answer rate was about fifty percent.

The FPPM refused to give me an interview, which one expert hypothesized was because of prudence as collective agreement negotiations were imminent.[72] Technologists in police services not studied as principal cases in this project likewise did not respond as positively to interview requests, especially in Ontario. The focus on a Quebec and two Western Canadian services might explain this lack of interest. More disappointing was that nobody at Genetec accepted to be interviewed. The company has a reputation of being a tightly closed book and refusing any external collaboration. This is true for researchers, foreign corporations, and peer North American businesses.[73] As one interviewee puts it, "they do not play well with anybody else… if they need to work with you, they will buy you out."[74] The Genetec website was one of eight ALPR providers' websites coded (by products, clienteles, active markets) for this project. This desk research underlined the multiple uses of this technology both in law enforcement and private security, as well as how unregulated its uses are across jurisdictions—especially for non-state actors.

Documents that compose the corpus of this chapter (i.e., memorandums, briefs) were regularly discussed during the interviews. This helped understand how police and non-police actors make sense of different documents, and how it influences their perception of PAITI. For instance, it underlined that LEO give particular attention to reports from auditors general (Howle 2020; Joannette 2013) but attribute limited significance to statements of values such as the MDAI. While most documents were collected prior to interviews, some were analyzed after being mentioned by actors as influencing their sensemaking. One example is government studies on the public acceptability of radar technologies in Quebec.

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[72] Interview with Benoit Dupont, Montreal, May 2020.
[73] In an informal conversation with a ranking employee of Genetec, this appears to stem from the president and founder of Genetec, Pierre Racz, for whom protection of patents is crucial. The company notably refuses to collaborate with Chinese hardware providers (in particular Hikvision as early as 2016) for fear their software would not be protected (Honovich 2018). This is mostly celebrated by surveillance information experts, whilst unfortunate for social scientists that wish to research this rare leading software security provider based in Canada.
[74] Interview 66, September 2020.

III – Road Safety First or Just Road Safety?

A decade after its introduction, the organizational sensemaking of ALPR can still evolve. This section relates how early sensemaking of ALPR, development in other jurisdictions, and changing local context impact how police leaders translate ALPR today. This underlines the dynamic nature of sensemaking, which continuously evolves across space, time, and actors' interactions.

The *Société de l'assurance automobile du Québec* (SAAQ) introduced ALPR technologies in *La Belle Province*. At the time, the provincial entity was looking for ways to lower the number of irregular drivers[75] on Quebec streets, which is associated with a higher number of accidents and deaths (SAAQ 2010). Following promising results from research with the SQ in 2008, the SAAQ launched a second ALPR pilot project with the SPVM in 2009. As an incentive, the SAAQ covered 50% of hardware purchasing costs.[76] For the SPVM, this initiative was welcomed given the period when it emerged:

> The implementation was facilitated by budgets coming from the SAAQ… We [the SPVM management] had dubbed them "road safety years," so we were precisely looking for this type of technology when they approached us. It enabled us to orient the interventions of our policemen and policewomen so that some could become specialized in road safety, both in the traffic section, as well as within neighborhood precincts.[77] [78]

For further context, 2009 was just a few years after the successful end of the "Quebec Biker War."[79] Crime rates in Montreal were at all-time lows, and police services province-wide were refocusing their efforts on prevention, including road safety. The timing was therefore ideal for the SPVM, and the rare provincial government financial incentive certainly

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[75] Irregular drivers correspond to individuals driving without a valid driving licence and/or a valid licence plate.

[76] *Entente 2010-2012 Concernant le système de reconnaissance de plaques d'immatriculation*. Stakeholders: SAAQ & SPVM, 2010, 9.

[77] Interview 5, Montreal, May 2020.

[78] As a reminder, close to half of the interviews conducted as part of this project were in French. The cited content was translated by the researcher, not a professional translator. This includes all interviewees from Montreal, as well as a few interviews elsewhere in Canada. The latter cases will be indicated when cited.

[79] The Quebec Biker War opposed the Hells Angels to the Rock Machine/Outlaws from 1994 to 2002. It led to 150 deaths including nine civilians. 156 Hells Angels and collaborators were arrested in 2009 as part of the operation *Stratégie Hells Angels Rayon Québec* or *SharQc*. This is the largest and most successful anti-gang operation in Canadian history. Police infiltrator Alex Caine's (2015) series of books on his experience speak to the violence of the war, which led to strong police persecution and rare level of coordination between agencies.

helped. At the time, ALPR were common in the UK, but this PAITI had barely emerged in North America. In Canada, the only other jurisdiction where services were testing the technology at the time was BC.

In Montreal, the pilot project was successful enough that, in 2010, the SPVM decided to implement a permanent ALPR program equipped with 30 machines. This number maximized the initial funding available from the SAAQ and has not changed since. This was part of a national campaign by the SAAQ, based on the aforementioned pilot projects with the SQ and SPVM; in 2010 alone, the SAAQ signed agreements with 19 agencies, representing about two-thirds of the police services on its territory (SAAQ 2010, 68). Following an RFI, the service contract was given to Genetec, over other companies including Groupe Techna, which had provided the ALPR for the pilot project. In total, the implementation of the program is evaluated to have cost $1.8 million, including $1.1 million for Genetec (Ville de Montréal 2011). In 2019, the program was renewed through a direct contract with Genetec (Ville de Montréal 2019, 3). The Montreal-based company, during this period, had become one of the most successful surveillance technology providers in the world.[80] Because of technical and COVID-related complications, most of the 30 upgraded Genetec ALPR were reinstalled in early 2021; almost a year later than scheduled.

A note on the SAAQ: this provincial entity is responsible for ensuring the Highway Safety Code, the Automobile Insurance Act, and other road safety laws are respected in Quebec. It is also in charge of road safety campaigns and the compensation of road accident victims. The fact that this organization took the lead on ALPR technologies in the province impacted how this PAITI has been integrated and made sense of by the SPVM. This is especially the case since, as former director Marc Parent recalls, it is an active partner during the first years of the program:

> One of the elements to consider with this project was that we had partners that provided the hardware and looked, on the statistical level, at the tangible outcomes of the program. Sometimes, they questioned the returns of the program [pause, thinks] and even the *good faith* of our users, because they thought we could do better. It really became an issue with regards to our

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[80] Interview 66, September 2020.

organizational capacity to ensure our police officers were able to use ALPR to their full effectiveness.[81]

This involvement contrasts with many PAITI policy cases in the United States, where the federal government gives grants but plays virtually no role in implementation or regulation (Harmon 2015; Crump 2016). The difference was only temporary, though. Once the program was well established, the SAAQ stepped back. It is now a distant partner of the SPVM with regards to the ALPR program. In 2019, the agreement renewal was made at the initiative of the municipal police. One person active in this process mentioned the SAAQ had not liaised with the ALPR program in over a year. This even complicated the signature of the agreement[82]. This being said, the SAAQ still plays a key role by providing most of the data that feeds the ALPR.

Nevertheless, the initial role played by the SAAQ has had lasting impacts on how the ALPR system made sense of within the SPVM. Since the beginning of the program, ALPR have been under the authority of the team responsible for road safety, which has changed names over the years and is now called the *Section Sécurité routière*. For the service, the program requires fairly limited regular involvement: a single analyst is charged with the daily operations of the program, among other tasks. When needed, a senior analyst, and an assistant to the section captain, can help with internal, media or academic requests. All three are sworn, and two have used ALPR in patrol before their transfer to administrative duties.

Within precincts, ALPR are assigned in priority to AQSR, whose daily tasks are predominantly linked to road safety. Most precincts have only one AQSR, except for those close to strategic points such as bridges or highways. Very few non-AQSR agents use ALPR on a regular basis, something multiple police leaders have expressed a wish to change.[83]

SPVM leaders suspect that the SAAQ limited its involvement in later periods of the ALPR program because it considered that it had met its initial objectives. A former captain of the road safety program discussed the impact of the measure:

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[81] Interview with Marc Parent, Montreal, February 2020.
[82] Interview 10, Montreal, October 2020.
[83] Interview 14A, Montreal, October 2020; Interview 13, Montreal, November 2020; Interview 14B, Montreal, October 2020.

> What the ALPR created is an increase in the perception of risk for delinquents. At the beginning we would catch people that had been driving illegally for four, five, even six years… Understand that previous to that point, police officers did not have the tools to control everybody on the streets. So, if they drove safely, they would never get checked. And checks on average in Quebec are every ten to fifteen years, so the risk was limited… In two or three years of ALPR *and radars*, we noted a significant decrease in alerts to an extent that today, you have to be *diehard* to be driving without a licence.[84]

For this captain, the success of ALPR is not measured in terms of how many *delinquents* are caught, but in its dissuasive power. He also notes that the technology works hand in hand with other radar technology and an increase of the fines associated with illegal driving activities. This also means that it is hard to measure the return on investments of ALPR statistically, something different internal documents also note. Then again, given their low costs, and that they bring in more in fines that they cost in management, this is a problem that the captain was "able to live with."

Perhaps even more significantly, the previous quote underlines the rapidity in which radar PAITI led to a change in individual habits. This dimension should not be underestimated. Awareness campaigns tend to take a long time to impact individual behaviours: many still forget to "buckle up" despite decades of such campaigns (Williams et al., 2000). This is not unique to road safety; public health campaigns face the same challenge of finding valid measurements to assess long-running initiatives (Abroms and Maibach 2008). Yet, in this case, results came rapidly. This has been noted by its daily users, which had to adapt how they used their ALPR:

> I have been using it since the genesis of the project… the system has not changed much since. [One difference is] today there are way less alerts, the *cleanup* of the cars on the road was done. There are way less delinquents on the roads… Now I get maybe 20 alerts per shift, it really does not ring that much, way less than at the beginning… I could only use it parked. I tried to do just this for a certain part of my shift. Today it is a *complementary* tool to my other tasks, I look at other things while it is on, it is no longer my main task or focus of attention.[85]

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[84] Interview 9, Montreal, October 2020.
[85] Interview 12, Montreal, October 2020.

Statistical use data confirms the experience of this AQSR. While not all years of the program have been accounted for, they show almost 9000 tickets were issued in the second semester of 2011 versus 3200 to 4900 a semester in 2015 and 2018. The use of the expression *cleaning up* in the previous quote, while speaking to traditional police lingo, tends to show that the AQSR considered the essential objectives of the ALPR to have been reached. Here, the (perhaps unexpected) consequence of the perceived success of the innovation is that the PAITI is no longer considered a necessity. As a result, another element noted by this interviewee is that there is not as much enthusiasm around the ALPR as in its early stages. This dimension comes up in a rare document from the period between the 2009-2011 implementation and 2019-2021 renewal. A memorandum explains to upper management that agents in the field are not asking for more ALPR, notably because they note a significant decrease in infractions linked to expired licences and vehicle registrations.

From a theoretical perspective, the evolution of how this road safety agent uses ALPR across time speaks to the continuous social construction of technologies. As with any other technological innovations, PAITI can only be fully grasped once they come into contact with, and are translated by, their users on the field. The way police practitioners and leaders discuss and make sense of PAITI similarly evolves over time, as technologies become ingrained in daily policing operations.

1. Sensemaking Evolutions & Re-invention

The evolution of police innovation sensemaking is not only the result of police leaders and LEO' experiences. Social construction of technology literature teaches us it can also reflect changes in the sociopolitical context in which technologies operate. A press release from 2011 announcing a local precinct would get one of the first ALPR concludes with: "Be compliant, the ALPR is watching you!" (SPVM 2011).[86] Aside from this surprising punch line, the SPVM press release uses this innovation to project an aura of progressivism to the public. This is a common feature of how police services have historically portrayed technological innovations (Braga and Weisburg 2019b). Yet, in 2021, a police service publicizing dragnet surveillance tools to its citizens would be a risky communications

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[86] This particular post was not available in English, it was translated from French.

strategy. Public sensibilities to privacy considerations, big data, and state surveillance, albeit arguably still embryonic, have become more acute since then. This exemplifies how public perception of PAITI has changed, and how this in turn impacts leaders sensemaking.

More generally, and of interest for this project, the moments of adoption (2010–2011) and renewal (2019–2020) offer pertinent timestamps of how key police policy leaders evolved in their sensemaking of ALPR within the SPVM. An element of continuity that was fundamental for police leaders in 2011 (and still is today) is that the technology would not be used to turn the police service into a revenue stream:

> It was always on our mind not to become a *cash cow* for the city. We were in favour, therefore, but with certain regulations… [I argued] against automatic tickets, and instead to give 48 hours to citizens to get their papers in order.[87]

While this suggestion was rejected, such concerns resonate with many police policy leaders both in 2011[88] and 2019.[89] Revenue-generating opportunities rarely come up as part of the rationale for ALPR deployment among police actors. Both in interviews and in written sources, they systematically de-emphasize this dimension of PAITI. Evidently, police leaders are conscious of public opinion and want to avoid being perceived as adopting innovations *against* its population. To put in Weberian terms, they want to make sure their enactment of the state monopoly on the use of violence remains legitimate in the eyes of those on who this power is applied.

This sensibility can lead to noticeable policy changes. In the case of ALPR, for instance, it caused an important evolution linked to vehicle seizures. Following media criticism, agents are now asked, when possible, to have citizens park their illegally circulating vehicle until it is properly registered instead of having it towed. Data confirm the impact of this policy change. In the first years of the program, around 800 cars a semester[90] were seized by the SPVM. By 2015, this number ranged between 140 and 190. This reduction is twice as large as the corresponding drop in tickets.[91] Asked about it, one

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[87] Interview with Fady Dagher, Longueuil, May 2020.
[88] Interview with Marc Parent, Montreal, February 2020.
[89] Interview 14A, Montreal, October 2020.
[90] The SPVM data is based on two semesters each year, the first ranging from January to June, the second from July to December.
[91] SPVM - Section Sécurité routière. Unpublished documents, 2011-2019.

captain made sense of this policy change by stating it allowed the service to emphasize the preventive dimensions of ALPR instead of its punitive consequences.

This mindful approach towards citizen perception of police technology extends to all radar technologies' deployment across Quebec. The agent responsible for the deployment of fixed photo radar ("speed cameras") in Montreal explains:

> The link we see between both is automation. As soon as you have something that is automatic, the acceptability rate in the general population drops significantly. The ALPR has remained… 100% controlled by the police, which gives a lot of legitimacy to the tool. As a result, [in Quebec] we did not get vandalism like we saw in France and in the West [of Canada] … We kept radars associated with policing… and made sure this police work is not widespread, but targeted, reduced, focused on road safety.[92]

Indeed, in most jurisdictions outside of North America, non-police authorities play a central role in ALPR deployment. In Quebec, the SAAQ does not play a role in the daily management of ALPR programs. Its role is limited to database management.[93] In part this is for legal reasons: even if the offence is caught through automated processes, according to current laws, a sworn officer has to sign off on any ticket.

Still, vandalism events in other jurisdictions impacted the development of radar policing strategies in Quebec. The assessment of actors in Quebec was that non-police entities should not be associated with enforcement. As such, for radar to be accepted as road safety tools, they had to be kept in the hands of the police. The involvement of the MTQ is limited to ensuring radar technologies are used parsimoniously, and in specific locations only: where roadside stops are dangerous (near a bridge for instance), school zones, or near roadwork. In addition, fixed radar locations must be visibly announced in advance.

Overall, continuous efforts by the SPVM to ensure ALPR would not become a tool to tax citizens, but remain a road safety measure, are apparent. Deployment restraint is clearly present in and around Montreal in comparison with most other North American metropolises. Photo radar use is rare, visibly announced, and located in areas that most would recognize as prone to accidents. Financially, it has not become a central source of

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[92] Interview 9, Montreal, October 2020.

[93] This is because individuals renew their licenses (driving, plates) with the SAAQ, not the SPVM. The role of the SAAQ is therefore merely to ensure police services have up to date lists on irregular drivers.

revenues as it has in other Canadian cities, in particular Calgary. There, radar tools represent 10% of the over $400 million budget of the police, and 70% of its revenues (Potkins 2019). This is eight times greater than the $5 million in revenues ALPR raise every year in Montreal, a city twice as big (Normandin 2019). It is minor considering the $680 million annual budget of the SPVM (Iskander 2020). Money still matters for non-police actors, though. A technologist lit up enthusiastically when asked about the technology, stating that in 30 years working in IT for police services, ALPR programs have been unique because it is a rare project that did not cost the cities he worked for.[94] Likewise, both the councilman interviewed,[95] and media articles, underlined the financial returns of ALPR when justifying their renewal.

One element of discontinuity in actors' sensemaking between 2011 and 2019 is related to their projections of ALPR data uses. Here, in contrast with the continuity of leaders wanting to avoid becoming revenue generators, we see an evolution between the implementation and renewal periods. In 2011, road safety is one among many features which are used by leaders to explain the interest of this innovation. Other ALPR uses mentioned include the ability to aggregate data into criminality trends and the use of ALPR for various investigative purposes. However, actors' interviews, press releases, and news articles from the 2019 renewal period all point to a simpler understanding of ALPR. Whereas ALPR are multifaceted instruments in 2011, in 2019 they have become road safety tools first and foremost.

This limited expansion of ALPR's roles—indeed, its more single-focus use—is recognized by many SPVM members, often with some level of disappointment. This does not mean, however, that SPVM policy leaders abandoned the idea of re-inventing this PAITI. One such change happened in 2018, following a visit from managers of the Denmark National Police ALPR program:

> Two officers from Denmark visited us in 2018. They had 48 cars with ALPR, and over 50 fixed ALPR at strategic locations on their territory, such as city borders and main streets. They were here to learn from us, because we had an ALPR program for longer, but in the end we learned from them… We did not use to enter any searches on the list aside from SAAQ lists. Talking with them gave use the idea to do a test with our detectives. We made a list of serious

[94] Interview 17, Montreal, November 2020.
[95] Interview 16, Montreal, March 2020.

crimes for which one could add a licence plate to ALPR hit lists… and we spread the good word within the service… It is good at times to question your own practices and improve yourself.[96]

The story does not indicate why the Danish police selected the SPVM as a comparison point, but a probable incentive was that they visited the headquarters of Genetec at the same time. The list referred to by this senior analyst was shared with members of the service a few weeks after this visit. The memorandum (*Note de service*) indicates who can request to add licence plates to ALPR databases, and for what crimes. Vehicles of interest linked with Amber alerts, sexual assault cases, suicidal disappearances, murders, intimate-partner violence and other significant events can be added to some or all 30 SPVM ALPR.

This underlines that technologies are continuously being socially constructed by their users, as a decade after the first ALPR were tested in Montreal, the service is still exploring new possibilities for their use. In addition, both in terms of scope and procedure, the note appears to follow most recommendations by Canadian privacy commissioners over the years. This is representative of how PAITI policy dimensions are now better mastered by the organization. For instance, only ranking sworn members can make addition requests,[97] the list of crimes is specific, targeted alerts have unique colour codes,[98] and a strict three-month deadline is established for the removal of alerts[99]. Hit list additions must also be accompanied by details and instructions given by the investigator, including a preferred approach for the LEO.[100]

Actors within the team presented different perspectives on the impact of the note on daily operations. Aside from an email to all members of the service, no efforts were made to publicize the measure. For one member of the team, the new policy is not used

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[96] Interview 13, Montreal, November 2020.
[97] In emergency situations, for instance suicidal drivers, police information operators at the call center can also add licenses to the database (SPVM - Section Sécurité routière. Unpublished documents, 2018).
[98] For instance, orange is associated to Amber alerts. Red was already taken for expired license plates and registration, perhaps another legacy of the program being initiated by the SAAQ.
[99] The deadline is one month if the request comes from sworn non-SPVM members.
[100] The investigator could request an immediate approach by the officer, for example in cases of suicidal drivers or Amber alerts. In other cases, the investigator might not want the car to be intercepted and is only looking for information on a suspect.

enough by detectives.[101] Another mentioned it was drafted for targeted needs, and as such they were not expecting more than a few requests a year.[102]

Perhaps the limited enthusiasm for this option is due to the sparse data that come from ALPR in Montreal. There are only 30 ALPR at the SPVM, which is not that many considering the size of the territory the service covers. Even then, the vast majority of ALPR are not activated daily, and when they are, it is usually for only part of an AQSR's shift. As a result, by no means are detectives ensured that adding a plate to ALPR lists will lead to a hit. In contrast, one detective out of New Jersey mentioned that he and his colleagues used ALPR data "all the time" in investigations to learn about suspects' whereabouts, or to verify alibis.[103] In their jurisdiction, ALPR were installed around 2015, so time does not necessarily explain the expanded use of this PAITI. What did help explain their enthusiasm was the presence of fixed 24-hour ALPR at various locations on their territory, which adds to vehicle-mounted ALPR data. Moreover, most police services in the area used the same ALPR provider, which encourages him to consult their aggregated data,[104] as it appears more comprehensive.

The fact that most devices are not activated daily has been a recurring reality of the SPVM program. As with any technology, usage difficulties can become a disincentive for users. In recent years, the system has had a variety of technical problems linked to ageing cameras. Some LEO who used it in early years, when it often had multiple hits a minute, have refused to use it since[105]. Moreover, the SAAQ only updates its ALPR list twice a week, which means many hits are false once the officers manually confirm them.

In addition to these irritants, what comes through clearly from interviews with both police and non-police actors is that the ALPR in Montreal continues to be made sense of, first and foremost, as a road safety tool. The AQSR have *priority* on ALPR, but in interviews two of them used the word *reserved* when referring to *their* patrol car. Members

[101] Interview 10, Montreal, October 2020.
[102] Interview 13, Montreal, November 2020.
[103] Interview 57, New Jersey, 2020.
[104] This would not be possible, for instance, if his service was a Genetec Autovu client and the neighboring service was with another provider. Most providers, especially Vigilant, facilitate such data sharing agreements. Most companies actively promote this on their websites, with some exceptions.
[105] Interview 2, Montreal, June 2020.

of the road safety team themselves recognize and deplore that LEO outside of their section mostly ignore their program.

In terms of re-invention, when compared with some services in the USA, ALPR at the SPVM have undoubtedly not been used to their full potential. Yet, as mentioned in the literature review, empirically, the limited use of ALPR has mostly been the rule and not the exception (Willis et al. 2018). The counterpoint to this is that ALPR have not become a distraction or a destabilization factor in Montreal, as some technological transitions can be.[106] The swift approval of the renewal in 2019, with minor discourse changes to be more exclusively focused on road safety, demonstrates how it has been ingrained in daily police functions almost seamlessly.

Then again, not becoming a distraction is one thing; being underused is another.[107] Underuse became evident indeed as a result of organizational changes in the second half of 2018. As part of an institutional reorganization, AQSR were assigned to local precincts instead of being grouped within four regional safety sections, which were dismantled. This strategic decision was made independently from the upgrade of the ALPR hardware, as part of a broad restructuring within the SPVM starting in 2018, which saw the number of precincts reduced from over 50 to 31. The reassignment of AQSR was meant to allow the SPVM to target specific neighborhoods' road safety priorities, such as school and construction zones.[108] With this restructuring, precinct captains became responsible for encouraging patrol LEO to use ALPR when AQSR officers were not on duty.

The immediate result of this change was a drastic reduction in—and record low—ALPR activations and hits throughout 2019 and 2020. While a certain transition period can be expected when a technological tool is reassigned,[109] circumstances accentuated this decline: the signature of the contract to replace ALPR meant that dysfunctional ALPR were not to be repaired, but await replacement instead. Unfortunately, the installation process,

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[106] The SPVM had its fair share of these. See footnote 73 for details.

[107] Interview 9, Montreal, October 2020.

[108] The change was framed by interviewees as a means to give captains in local precincts an additional tool to contribute to safe driving practices in residential and semi-residential areas. In contrast, ALPR were previously assigned mainly to high-speed traffic areas, such as service roads near highways, and accident-ridden areas. This restructuring fits in the narrative of reassigning ALPR even more specifically to road-safety priorities.

[109] The drop in readings recorded between the first and second semester of 2018 is significant: it went from 3.9 million to 0.8 million hits a semester (SPVM - Section Sécurité routière. Unpublished documents, 2018).

which takes at least a full day of work for trained Genetec technicians, was considerably slowed as a result of COVID-related restrictions. One precinct, for instance, did not have access to its ALPR for over 18 months. COVID also impacted ALPR statistics in 2020 as AQSR were often reassigned to other police duties because of the drastic reductions in road traffic during the pandemic.

These factors make it impossible, for now, to assess comprehensively the impact of this organizational change on ALPR use. It does, however, underline that members within the SPVM are conscious the tool is not used at its full potential and are willing to revisit its role within the organization. It demonstrates that a decade after its introduction, the organizational sensemaking over this PAITI is still evolving.

2. The California ALPR Investigation & its Repercussions in Montreal

The decision by the SPVM to purchase upgraded ALPR in January 2019 had a limited public profile. A press release and a few articles explained that the measure was self-financed and that it concerned a technology that was both mature and limited in scope. This relative indifference is not uncommon: as previously mentioned, a 2019 US-based study has shown that nearly 90% of respondents did not know whether their local police used ALPR. Yet, there is an expectation among experts that community members will gradually develop more textured opinions on ALPR and PAITI policy in general (Merola et al. 2019).

Controversial police practices have started to make police surveillance in the era of AI hard for the public to ignore, and ALPR are no exception. In February 2020, the Office of the Auditor General of California submitted a comprehensive audit report of the ALPR use policies of four major *Golden State* police services. The scope of policy malpractices denounced by auditor Ellen Howle received national and international attention. It even led to a nonpartisan motion by Montreal city council to investigate SPVM ALPR policies, emphasizing the protection of citizens' private information. For the road safety division, which admitted having been less engaged with its ALPR program in recent years, this was a well-received opportunity. A captain interviewed a few days after a special meeting organized between the CSPM and SPVM leaders explains:

> We updated our dossier thanks to the questions [by the councillors]. One question they had was on access. We reviewed which users and administrators had partial or full access to the data… it was always delineated and secured, but we took the opportunity to revise the policy, make it official… Another

question they had was on where data was stored, and what happened to the data? Truth be told, we did not know, we discovered that yes, everything was kept within SPVM servers, and that all data was automatically deleted after five years… They understood how the machine works and how we use it. They realized the confidentiality question was not that big, and that in the end it is all very safe, that is what came out of the meeting.[110]

In addition to this private presentation and conversation with members of the CSPM, the SPVM drafted a six-page document presenting an overview of its ALPR uses (both vehicle-mounted and fixed). It focuses on data collection, security, access, consultation and suppression policies. The police service also shared with the commission relevant policy and training documents, including the aforementioned 2018 memorandum. While the meeting was not public, both sides expressed their satisfaction with the results. The CSPM required no policy changes following the meeting. As per the SPVM, it established a periodical review of ALPR data access, which is currently constrained to seven individuals: two sworn officers, and five civilian IT support technicians (three at the city and two with Genetec).

In addition, the SPVM put a hold on its plans to expand the instances in which a licence plate could be added to its ALPR hotlist:

We have not extended the list of crimes because the municipal council is observing our utilization of ALPR, so we need to justify everything we do. For now, we will stay with this list. We are waiting for recommendations, but from now on the 'go' will come from higher authorities.[111]

This points to the accountability role played by municipal political actors in Montreal, which is a central feature of democratic policing. Firstly, the captain's candour in recognizing that the councillor's questions led them to research their own program and tighten use policies. Second, the fact that the extra attention led the team to slow down its aspirations for expansion. In terms of transparency, the service added a section to its website introducing its ALPR program to the public, including part of its use policies. None of these measures were requested by the CSPM: merely asking questions led to policy changes.

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[110] Interview 14A, Montreal, October 2020.
[111] Interview 13, Montreal, November 2020.

As for the captain's comment that the privacy question was not "that big," it must be specified that many of the most controversial findings by the California inquiry did not apply to Montreal's case. First, the SPVM does not share ALPR data with any external agencies. In contrast, the average US police service distributes theirs to 160 agencies. The Sacramento police department does so with 1119 entities. Second, the SPVM does not associate criminal information to ALPR datasets. In Los Angeles, names, addresses, dates of birth and criminal charges are embedded in ALPR systems. Third, ALPR data in Montreal is stored within SPVM servers. In California, police departments contract external cloud vendors to store their data.

The further finding by the California auditor general was that most agencies do not specify who can access ALPR data, who oversees the system, and when or how data is destroyed (Howle 2020). Neither did the SPVM; however, this information was collected and presented to the CSPM in October 2020, including the names of the seven individuals currently holding access. The limited use of ALPR data in Montreal also helps to explain why the CSPM did not request any further changes by the SPVM.

The one area of the report which resonated with Montreal relates to the retention of data from innocent citizens. In Los Angeles, non-hits represent 99.9% of the 320 million licence plate data points stored by the police (*Ibid.,* 1). This was the first time the percentage of non-hits contained within ALPR output datasets had been publicly investigated. As such, although the size of the SPVM's ALPR datasets is unlikely to come anywhere close to this number,[112] there are grounds to assume that non-hits represent the overwhelming majority of records.

Regarding data retention policies: in California, 92% of ALPR data searches by officers (within audited organizations) concerned records that were less than six months old (*Ibid.,* 30). The two members of the SPVM road safety team that have access to ALPR data noted the same trend.[113] Yet, ALPR data is saved for five years by the SPVM. Granted, the data is both considerably less accessible in Montreal, as well as less invasive of privacy,

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[112] Although these precise data are not available (even internally to the SPVM), we can estimate the dataset to be currently composed of 30 to 35 million entries. This is based on available use statistics. It is considerably less than in California, but still significant if we consider that about two million people live on the territory of the SPVM.

[113] Note that the scale difference is also significant in terms of searches. In California, there are thousands of them every year. In Montreal, less than 50 (Interview 4B, Montreal, Mars 2020).

as it is not linked with other datasets. Still, Auditor Howle's recommendation to establish non-hit data suppression policies after six months could be applied to the SPVM without significant consequences for its current ALPR uses.

In contrast with the situation prevailing in Sacramento and Los Angeles, in Montreal, city councillors deemed this state of affairs acceptable. If they were relieved by their findings, their questions underlined the fundamental political dimension of police technology, and the challenges PAITI pose to power relations in our society. It also reminds us that when political actors play a decisive role in PAITI policy, it is often at the invitation of media, activist, academic or privacy watchdog reporting.

The Howle report pointed to how vastly unregulated ALPR are in the USA. In Oakland, California, the controversy surrounding questionable ALPR uses around 2015 led to the police service changing its policies so that all data would be suppressed within six months. This did not prevent other California police services from sharing and conserving data indiscriminately.[114] We will see in the next section that in Canada as well, ALPR controversies in one part of the country do not necessarily influence policies elsewhere. The perceived threats of police surveillance are, after all, socially constructed and contextually dependent.

In January 2021, a Montreal judge discarded two mailed tickets sent following ALPR reads, based on legal technicalities. Mailed ticket is a practice the SPVM wants to avoid. Only when patrolling officers are unable to intercept a vehicle are tickets sent by mail. Even then, the practice is not systematic. A member of the team explained that the impact on road safety is greater when the contact is in person, and that sending tickets by mail could alienate the public.[115] From a policing perspective, abolishing mailed tickets could send a dangerous message to the public: if the driver at fault can outrun the patrol, they will not have to pay their tickets. Still, mailed tickets do lead to public criticism (as the numerous comments on online articles demonstrate).[116] This point to the fact that the

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[114] Perhaps the wide media attention given to the Howle report will have a wider impact on the long-term. As of the Summer of 2022, policy proposals at the California state legislature are currently under consideration.

[115] Interview 7, Montreal, October 2020. Also discussed in informal conversations in January 2021.

[116] Note there was almost as many positive as negative positions on the ALPR in the public comments section under the article.

general public, in Montreal and elsewhere, is slowly developing textured opinions on the use of AI technologies in policing.

3. Controversies in British Columbia

Amidst the various ALPR programs in Canada, the British Columbia case is particularly well suited to inform this research. A vivid policy debate on this PAITI accompanied its establishment in the late 2000s and early 2010s. It represents an exception to the generally uncontentious nature of ALPR. Contextual factors help understand the intensity of this debate, in particular tensions between federal and provincial governments, and continuous reporting by a group of investigators. It led to important ALPR data suppression policy changes in the province, which impacts the expansion possibilities of the program today. Reviewing this instance of ALPR policy development helps to contrast the analysis from the Montreal case for the theoretical discussion which follows in this chapter.

ALPR made their appearance in BC and Quebec during the same period (around 2010). In both cases, provincial entities spearheaded the PAITI. The policing landscape, however, is more complex in the western province. There, an important actor to consider is the Royal Canadian Mounted Police (RCMP). BC has been under what Canadians call "contract policing" since 1955 (Penner 1979). This means that instead of having its own provincial police force, the BC government signs decade-long contracts with the federal government. Under these agreements, the federal government provides policing services to the province of BC, through the RCMP (Government of Canada 2005). Only the provinces of Quebec and Ontario do not have such contracts. Instead, they have their own provincial police services. Though policing is technically under provincial jurisdiction, in practice, the RCMP answers to federal authorities, which has at times been an area of irritation for provinces (Lunney 2012).

Most contract policing in Canada concerns rural areas, as many cities in provinces with contract policing will still have their own municipal police services. However, in BC a number of larger cities are also policed by the RCMP, and the *beautiful* province hosts the largest contingent of *Mounties* in the country. Historically, the service has been reticent to collaborate with municipal agencies or recognize provincial oversight measures (d'Ombrain 1999; Puddister and Riddell 2012; Stenning 2000). Costs of contract policing have also greatly increased in the past few decades (Perrin 2011). For all these reasons,

groups regularly question the viability of contract policing in the province (McClearn, Freeze, and Dhillon 2018; Tunney 2020). The 2012 contract negotiation between the federal and BC governments were particularly contentious, especially after Prime Minister Harper announced in 2008 his intention to double the length of RCMP contracts to 20 years (Lunney 2012). As such, ALPR were established during a period in BC when policing was a political priority, debated at the forefront of news coverage and commentary.[117]

There are no policy guidebooks for a nascent PAITI, and there were many variations in ALPR policies being established across North America at the time. At the start of the 2008 pilot project in the lower mainland region, hits were retained for no more than two years, and non-hits no more than 90 days. These use policies were relatively restrictive in comparison to most comparable examples at the time (Gaumont and Babineau 2008). As in other provinces, local agencies had to sign data sharing contracts with the RCMP, which granted access to the Canadian Police Information Centre databases. The federal police was also tasked with the daily management of the provincial ALPR program (Government of BC 2019).

From the beginning of the project, a group composed of investigative journalists, privacy activists and academics drew the public's attention to the provincial ALPR program. One member of the group, Christopher Parsons, was a doctoral student at the time who now conducts research at the Citizen Lab of the University of Toronto. He explains why they were concerned by this technology:

> Our law enforcement system is built on, frankly, 19th century, early 20th century conceptions of resource limitations. And that's one of the core ways of protecting freedoms. Mass surveillance technologies decrease the friction and cost that goes into the act of surveillance… There's an ontological shift in the nature of the surveillance. It's not just an extension of numbers. It's fundamentally different. It's transformed, and the risk is that… we're building a society of sensors… somewhat unthinkingly.[118]

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[117] This contrasts with the SPVM, which at this point is under stable leadership and still benefiting from the positive aura of the successful end of the Quebec Biker War. This aura will dissipate in the following years with a succession of controversies, the most notorious of which is the "Lagacé Affair" in 2015, wherein it was revealed that the anti-mob division of the SPVM spied on the cellphone of a famous journalist (Yates 2019).

[118] Interview with Christopher Parsons, Toronto, July 2020.

The primary objective (and accomplishment) of the group is a strict constraint of ALPR use policies in the province. Moreover, though, this quote shows the dedication of this group is rooted in their desire to use this PAITI to enhance a healthy public debate, and not just on ALPR, but also on what AI and automation mean for the future of policing. Their multiple articles resonated with the public, along with their sensemaking of ALPR as mass surveillance tools. This brought ALPR policies to the forefront of discussions in the province, to an extent that has arguably not been matched anywhere else in Canada.

Throughout this process, the group benefited from a context favourable to debating the political dimensions of policing. This included contract policing negotiations, as well as public protests against vast state surveillance technologies installed for the 2010 Olympics (Lupick 2010; Boyle et al. 2015). In 2012, the continued buzz leads the BC privacy commissioner to conduct an investigation of the ALPR policies of the Victoria Police Department (Denham 2012). By that point, police services in the province had mostly indicated they would delete non-hit data as a result of public pressure. None of these commitments were binding, though. Published in November, the report by Privacy Commissioner Elizabeth Denham rectifies this situation. First, it calls for the automatic suppression of all non-hit data from police databases. Second, it strictly forbids the sharing of ALPR hit data between police services present on BC's territory. This includes sending ALPR data to the RCMP for its safe destruction, as contracts indicated.

From that point on, this meant that only ALPR hit data would be conserved by municipal police services in BC, and that they could not share this information between services. However, the RCMP initially had no obligation (or intention) to follow the recommendations of the BC Privacy Commissioner (Gogolek 2012). To understand the position of the RCMP, one must consider that at that point it was reluctant to submit itself voluntarily to any provincial jurisdiction. What is more, it was in the process of integrating different databases to facilitate information sharing between Canadian police services at all levels. The reason behind this will be familiar to many English Canadians:

> The whole Paul Bernardo situation in Ontario sort of started the whole revolution of police officers having access to a single database across the country… that was sort of the catalyst because Paul Bernardo was able to commit crimes in different parts of the country, and the police officers were

not able to detect his crimes because they were all using their own individual databases.[119]

The initial lack of cooperation of the RCMP on ALPR policy in BC should therefore not be seen as an isolated event. The federal police showed the same initial reticence to participate in the Police Records Information Management Environment – British Columbia (PRIME-BC) program. They had to be forced[120] by provincial authorities to partake in this integrated data management system.[121] This is a reminder that provincial authorities can play an active role in police oversight and management practices despite the contract policing system. More in line with this project, it underlines that ALPR programs are part of a broader policing context and PAITI policy negotiations occur between a complex web of actors.

The aftermath of the November 2012 Denham report attracted considerable criticism for the RCMP. To illustrate, there were more media articles published on ALPR policies in BC in 2012–2013 than on SPVM ALPR policies during the entirety of its program. The facts and timeline do not cast the federal force under the most favourable light, especially given that they were in the final stages of contract policing negotiations. Reports at the time revealed that in 2008, a retired RCMP consultant had produced an internal privacy assessment on ALPR technology. The federal privacy commissioner drafted a non-public opinion criticizing the policies that ensued. In 2010, RCMP leaders had publicly promised to stop conserving ALPR data, but findings by the citizen investigative group confirmed that by late 2012 this had not been put into effect. In the end, the attention given to the Denham report pressured the RCMP into changing its policies. All ALPR non-hit data from that point on was deleted automatically in BC, and this data could not be shared between services. This was a half victory for the group, as the RCMP complied on a voluntary basis, not a binding one.[122]

The attention given to ALPR in BC impacted many of its policy dimensions. First, use policies were transparent, and made readily available online for the public to consult

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[119] Interview 27, British Columbia, May 2020.

[120] Initially, the RCMP was reticent to PRIME-BC as a whole, but their members now recognize the success of this initiative by the provincial government (Interview 26, British Columbia, May 2020).

[121] Interview 31, British Columbia, September 2020.

[122] For more details on the timeline, see Parsons (2013) and Wipond (2013).

early in the process. In contrast, the SPVM published an information page in late 2020, with limited use-policy information. It also impacted the quality of ALPR training, which in BC follows established rules, is mandatory, and is offered multiple times a year across the province. A Surrey ALPR user describes his training experience:

> In class they showed us the software, and how it works. Then they showed us a bunch of PowerPoint slides on policy. Then we actually went out and got the car and she [the trainer] showed it to me… Then I went out for a little drive and drove down the highway... we talked about how that worked. I did zero enforcement using the ALPR that day, but I was able to actually see how the tool works so that I understood that when she wasn't sitting next to me, I could do what I needed to do with it.[123]

In BC, the training lasts eight hours and follows a standard police "tell-show-try" training approach. It includes both functional and policy dimensions, as required by provincial authorities. The contrast with other police services in Canada is stark. In Montreal, a group of ALPR users was trained on the technology at the beginning of the program. A few months after the first ALPR were rolled out, official training was stopped. The service virtually stopped publicizing the PAITI to its members. Information about the ALPR program at the SPVM is shared through word of mouth and individual initiative. When a police officer asks for access codes to ALPR, the administrator sends a two-page handout explaining how to use the machine and basic policy guidelines. As a result of the absence of an established training program or outreach efforts, most precincts only have one or two officers that can use ALPR. This considerably limits the utilization of the technology by non-AQSR officers at the SPVM.[124]

The environment in which PAITI operate has a direct influence on the policies associated with any given program. It impacts how actors make sense of technology in many ways. In part, indifference or continuous attention by the public must be accounted for to understand police leaders' sensemaking and PAITI policy. In terms of public attention to ALPR policy, the BC case is the exception. It is noteworthy to mention that many Canadian police services that launched ALPR programs after the 2012 BC privacy report self-imposed stricter data privacy than early adopters. For instance, in Saskatchewan,

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[123] Interview 26, British Columbia, May 2020.
[124] One could argue that in contrast, ultimately, the controversy surrounding the use of ALPR in BC has probably ingrained, increased and intensified their long-term use by BC police services.

ALPR are highly common, hits are conserved for 90 days, and non-hits for 40 days (Bridges 2017). However, sending tickets by mail is common practice. In Ottawa, non-hits are deleted automatically, and hits are conserved for five years (Ottawa Police Service, 2020). In all cases, early policies matter. Once established, they can become hard to change. They can also influence PAITI re-innovation opportunities, in particular policies linked to data suppression.

IV – Technological Frames & Organizational Sensemaking

1. "Real" Police Work?

The interaction of PAITI with the change and surveillance continuums will vary between cases. Actors socially construct innovations based on individual experiences and organizational dynamics. In addition, to understand police policy leaders' sensemaking, we must consider dominant technological frames within police cultures, which vary across time, place, and police agencies. The environments in which services operate further complicates this picture. Taken together, accounting for individual sensemaking, technological frames, organizational dynamics and environments helps account for the variation in ALPR policy practices between the SPVM and BC.

In the social construction of technology literature, "technological frames" refer to assumptions, expectations and other prevailing ideas about technologies that members of organizations use to make sense of them. It is based on personal experiences, values, technical understandings, roles within organizations, and the services' histories with innovations. These frames mediate and help shape how technologies develop within organizations, as well as their outcomes (Orlikowski & Gash, 1994).

One of the most dominant technological frames present across police cultures is technical efficiency (Lum et al. 2016). This refers to how technologies perceived as inefficient or as distracting LEO from what they consider to be their primary tasks will be resisted. For instance, managers are in favour of standardized records management policies as it allows for better orienting the service's resources. Yet, where managers see gains, LEO see their own efficiency losses, as they must spend more time filling reports. From their perspective, it does not matter if it makes the service as a whole more effective (Lum et al. 2016). In fact, any technological transition perceived as *personally* ineffective or

reducing *front line* discretionary time in order to increase reporting tends to be resisted, because of the mythological dimension of patrolling for the police.

For policymakers, this means that it is helpful to educate and strategically promote PAITI internally, especially for innovations linked to data entry or other administrative tasks. Technological frames will have a direct impact on whether members of an organization see a PAITI as an amplification or as a transformation of their work. Members of services with strong commitment by leaders toward ongoing technological projects and positive organizational experiences with innovations will tend to perceive them in a similarly positive light.

From a purely technical standpoint, ALPR replace and amplify traditional policing: patrol cars mounted with ALPR are now able to run drastically more plates than if it had to be done manually. Yet, scanning licence plates is only one of many duties of patrolling officers. For this LEO assigned to responding to 911 calls, it is clearly a secondary function, which explains his negative experience with the technology:

> At 11 AM on a Tuesday it is not because he is 'alcohol zero' [in his driving requirements] that I will go test him. The ALPR, while driving, '*pops*' too much. I had to deactivate it. It really is not a technology that I appreciated. Then again, I did not necessarily get training on it, and as a patrol officer you have lots of things to think about… it harmed my work… I had my eyes stuck on the computer. To be fair, if I were in static patrols and not on response calls all the time, it could be an appreciated tool… Still, I prefer to scan the streets with my eyes, run a plate because of a specific behaviour. If not, I feel almost like I am cheating.[125]

Lum et al. (2016) argue that it is crucial that police officers see innovations as serving "real" police work, or they will be resisted. Yet, what "real" means is socially constructed, and depends on individual sensemaking of technological and organizational frames. In this case, the SPVM response team LEO does not perceive scanning plates to be a core police function.

Moreover, the distraction to which he objects is linked directly to cherished police discretion. If the ALPR automates scanning, this also means that individual officers are given less discretion—less leeway for decision-making—in the assessment of suspicious activity. AI now automatically flags irregular plates instead of individual officers spotting

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[125] Interview 2, Montreal, June 2020.

a suspicious car and running the plates manually. For this officer, this equates to "cheating" instead of using one's skill and experience to scan the street for suspicious behaviours, which represents "real" police work. Evidently, in his case the ALPR was perceived as a transformative technology that did not correspond to his understanding of what police work is and means. The PAITI distracted him, making him less efficient. Instead of an amplification of his function, it became a burden.

As an organization, the SPVM's story with ALPR reflects some similarities with that of this LEO' individual experience. ALPR are tools and not ends. Once a stolen car is detected, agents need to further investigate who is driving it, if it is abandoned, if it is the subject of an ongoing crime, and so on. This can mean establishing 24-hour surveillance of the car, with personnel reassigned from other policing functions. Interviews with Marc Parent and other police leaders underline that in the first years of the program, the service actively attempted to follow up on all hits, especially stolen cars. Rapidly, it became a strain and distraction instead of an additional tool. It transformed daily practices of police leadership, which had to redeploy their members accordingly. It became a "real headache" for the SPVM leadership, and such strains resonated throughout the organization.[126] This means that instead of ALPR being used as amplifying tools that make individual LEO more efficient, ALPR were seen as a "heavy tool" that cost the organization instead of saving officers' time. This exemplifies the dominant nature of the efficiency technological frame in guiding police actors' sensemaking of PAITI.

More concretely, this helps understand the gradual evolution of ALPR, from general and multifaceted tools to mostly road safety instruments. In a sense, the SPVM decided to highlight the amplification function of ALPR by prioritizing their use by AQSR, while pushing aside their transformative dimensions. This once again points to how the impact of PAITI on the change and surveillance continuums is not absolute; it is mediated by different technological and organizational frames. By putting the technology in the hands of AQSR, the service focused their use on illegal drivers instead of broader criminal trends.

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[126] Interview with Marc Parent, Montreal, February 2020.

Hints of the organizational sensemaking of ALPR as mostly road safety tools are present in the citation from the LEO assigned to responding to 911 calls.[127] AQSR tend to be more stationary than regular police "call-to-call" response teams, hence the comment that the tool was more useful in static patrolling. In the end, technological and organizational frames proper to the SPVM led to leaders choosing to limit the perceived nuisance of this PAITI on its daily operations and "real" police work. This impacted the outcomes of the ALPR program, which is arguably vastly underused: on any given day, there are more machines left off than activated on the SPVM territory. This being said, if ALPR were initially made sense of as burdens on operations, this perception faded after a few years, which opened the door to the 2018 memorandums to expand ALPR uses to certain crime investigations.

Nevertheless, it is likely that for the previously mentioned interviewee, the damage is irreparable. His experience with the ALPR in 2014 marked him so negatively that he has no interest in renewing it. Part of his contention has to do with training. At the time, he was launched onto the streets after a five-minute overview by a colleague, who mostly showed him how to log in to the system. This clearly contributed to his dissatisfaction, as he had to learn about the technology by himself while also doing his regular duties, instead of during a dedicated training session. In 2014, hits (or "*pops*" as he calls them) were also more frequent than today. Maybe being informed that the alerts are significantly less frequent today could change his mind, but the 2018 memorandum was not accompanied by any contextual information. Neither has the road safety team addressed the nonexistence of training which contributed to his dissatisfaction with the technology.

The absence of continuous training speaks to a lack of organizational buy-in to the ALPR program outside of the road safety team. As mentioned in the theoretical review of this chapter, less-than-full engagement with ALPR by leadership and the wider organization is one of the three barriers to this PAITI being re-invented within services (Willis et al. 2018). The second is individual perceptions; here again, by assigning priority for ALPR to AQSR, the signal sent by the organization is not one that encourages members assigned to non-road safety duties to look into using ALPR for other policing functions.

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[127] See the lattermost citation from interview 2, Montreal, June 2020.

These organizational dimensions impact the third criteria that influence innovation re-invention, which is the innovation itself. Some ALPR are activated less than 15% of calendar days, and rarely at night. This means that the data produced by ALPR is partial at best, which limits its usefulness for detectives. In contrast, cases in the USA where ALPR have been re-invented for investigative and alibi-check purposes tend to combine mounted ALPR with fixed hardware at key locations. This provides a more useful set of data points. In addition, agencies share their data with others. In turn, this encourages detectives to use ALPR data in different manners (on the condition that leadership buys in on an ongoing basis).

Contextual factors also contribute to the limited re-innovation of ALPR in Montreal. If police services tend to portray themselves as innovative because it demonstrates an aura of progressivism, they tend to avoid being the first ones to try something new. Instead, police services find inspiration for their own policies regarding innovations in the experiences of peer agencies. Yet, few police services in Canada have ALPR programs, and most do not retain any non-hit data. In fact, no other major urban police service in Canada retains data for five years, as the SPVM does (at the request of the SAAQ). Opportunities to learn from peers are therefore limited. The one instance where the SPVM did change its ALPR practices followed the 2018 visit by Danish colleagues. The team used this moment to revisit its program, strategically redeploy its patrol cars, and partially expand ALPR use policies.

The ability to retroactively search all readings for particular cars would not have been possible in British Columbia, for instance, where all non-hits are automatically deleted. Nor are positive hit lists shared across services in Canada, which limit the data officers can rely upon for PAITI re-innovation. These policy limits on use, data conservation and data sharing considerably contrast with the situation prevailing in the USA, where we see that data sharing for investigative effectiveness has so far vastly trumped privacy considerations (Joh 2007; Howle 2020; Tsukayama 2020).

2. The Contextually Constructed Nature of Surveillance

Technological and organizational frames help understand how different actors make sense of similar technologies. Sensemaking is not static, it fluctuates with time and the continuous interactions between actors, who mutually influence how they make sense of

PAITI. This underlines how actors in Montreal purposively made sense of ALPR to accentuate their amplification dimensions and limit the instability caused by transformative dimensions of the innovation. This is portrayed in Figure 2.1, which shows the interaction of ALPR with the surveillance and change continuums in Montreal.

Figure 2.1 Change and Surveillance Continuums: ALPR in Montreal

	Preferred Outcome		**Repudiated Outcome**
Change Continuum	Amplification (Partial)	«-»	Transformation (minimal)
Surveillance Continuum	Non-Identifiable	«-»	Identifiable (but licence plate can be changed)

ALPR are classified here as amplification PAITI because their transformative impact has been minimal in Montreal. Even this amplification is considered partial, as this innovation impacts a fraction of the 4600 members of the SPVM. As for the surveillance continuum, all actors in Montreal recognize that ALPR collect identifiable data. One expert does point out that not all identifiable data the police can access represent the same privacy risk for citizens; contrary to biometric information, licence plates can be changed. This distinction will likely become more important in years to come for PAITI policymakers. As biometric technologies such as facial recognition software become more accessible to services, so will their salience in the public debates.

This study of ALPR contributes to our understanding of the second continuum influence on PAITI policymaking in that it demonstrates the contextually constructed nature of surveillance. The impact of a technology on social life and perception of surveillance varies across contexts (Sanders et al. 2015).

From a technical standpoint, ALPR in Montreal and BC are the same. Experts and academics generally portray ALPR as transforming police surveillance practices. First, this PAITI corresponds to dragnet surveillance practices, meaning it collects data on everyone rather than only individuals under suspicion. Second, it shifts the nature of police surveillance from query-based to alert-based, meaning the determination of who is suspicious and deserves to be further scrutinized by the police is no longer determined through investigative work but through an AI linked to a database. Third, it considerably

reduces the cost of police surveillance, and even makes it profitable, whereas police resource limitations have historically been a prime restraint mechanism to police power.

Yet, if the capacities gained by the police are identical, the perception of what this means is considerably different from one jurisdiction to another. This means that in order to analyze comprehensively—and predict—the impact of AI on our democratic societies, we must go further than simple analyses of their technical dimensions. This is because technology is the product of the environment in which it operates and is socially constructed by the actors with which it interacts. Markedly, in Montreal, even while the city council was looking into ALPR in the summer of 2020, the public was generally indifferent to the PAITI. It has never been a political issue. There certainly has not been a movement denouncing this innovation as a threat to the balance of power between the public and the police, as we have seen elsewhere.

If experts can mostly agree on the impacts of a PAITI on police surveillance practices, different populations might not perceive the threat of police surveillance similarly. Nor do police services have (or are perceived as having) the same technical capacities to act upon new surveillance opportunities, or the same level of self-restraint. In British Columbia, daily ALPR program operations is managed by the RCMP. This makes administrative sense given that it hosts the federal database of stolen vehicles and is the largest agency in the province. Yet, this can also explain, in part, the public suspicion of the PAITI. The RCMP is a well-funded pan-Canadian force that is perceived as innovative and can afford PAITI re-innovation. The force was also actively working on data-sharing and integrating programs across all RCMP divisions during the period that the ALPR program was launched.

Given these dimensions, it is understandable that a group of experts perceived the potential privacy risk an unregulated ALPR program could represent for the British Columbian public. Contextual factors contributed to their voices being heard, as the public was attentive to political debates on the nature of policing in the province at the time. The group continuously published on the issue over a period of four years until policy changes were implemented. On this point, this case strengthens the finding by Merola et al. (2019) that the more the public knows about ALPR, the less favourable they are to the technology.

In contrast, until very recently the public in Montreal has been largely indifferent to ALPR. An access to information request to the *Agence de mobilité durable de Montréal*, which ran a trial ALPR program, confirmed that they currently have no use policies, be it on data privacy protection or data suppression. This contextual dimension helps explain why the SPVM never felt any pressure to adopt stricter ALPR use policies, whereas in BC, decisions were bounded by constant criticism and attention. It created an environment in which the range of use policies considered by police policymakers was, in Montreal, less restrictive from the beginning. This is a reminder that ideational and psychological explanations are complementary in this analysis. The strength of ideas in public debates has direct implications on the range of possibilities actors consider when making PAITI policy decisions. Figure 2.2 synthetizes some of the distinctions between the Montreal and British Columbia cases reviewed throughout this chapter.

Figure 2.2 ALPR Policy Dimensions in Montreal & British Columbia

	Montréal	**British Columbia**
Organizational dynamics (Change Continuum)	Amplification (by choice)	Amplification (by policy)
Characteristics of the information (Surveillance Continuum)	Minimal Integration	No Integration with Other databases (by policy)
Policy Culture (# of actors involved, complexity of implementation)	Simple, police controlled, limited provincial implication after emergence	Large provincial role; RCMP presence politicizes
Diffusion effect	Limited	Limited
Principal risk accounted for by policy makers	Cash cow criticism	Fear of Mass Surveillance

Though causes of emergence are out of scope of this research, investigating the context of its early apparition in Montreal helps underline technical dimensions and organizational frames particular to that police service. Experts largely agree that the SPVM does not have a reputation for being particularly innovative in terms of technology. Conversely, when asked what the SPVM was known for, almost all Canadian police leaders mentioned its anti-gang division or its crowd control expertise.[128] As such, the ALPR

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[128] Interview 34, British Columbia, November 2020; Interview 25, British Columbia, May 2020; Interview 40, Calgary, July 2020.

program is a rare PAITI adoption case for the organization. Renowned Montreal criminologist Benoit Dupont explains this is a logical first step for a police service with limited AI expertise:

> It is very rare to find technologies that are immediately adapted [to the patrol]. In a sense the ALPR is also a very mature technology… it is not very complicated. It is a technology that has been in gestation for about 20 years. It is not a cutting-edge technology. Yes, there is artificial intelligence in it, but it is the volume of artificial intelligence that is probably the best mastered: image recognition with licence plates that are normalized, standardized, with good contrasts and systematic camera angles… it is pretty much an ideal use-case.[129]

Contrary to most PAITI projects, ALPR technology had become mature by the time the SPVM launched its program.[130] While the SPVM was among the first to use ALPR in Canada, the technology was already widespread in Britain. The risk of experiencing technical glitches and having to allocate extra resources to the technology was therefore limited—nor does it require vast human resources to establish the program or to run it.

In addition, from a financial perspective, ALPR are not a cost, but a gain. Dupont specifies that it creates quantifiable performance incentives and metrics that align with the priorities of the SPVM. It makes LEO more productive—or efficient. Both a councilman and an IT specialist interviewed similarly underline technical maturity and financial self-sufficiency as reasons why the program was renewed in 2019. This combination of technological factors makes ALPR particularly well-suited for a first dip into PAITI policy.

From an organizational standpoint, the SPVM had long been trialing novel projects within the road safety division. This included strategic, technological and administrative innovations. Different SPVM actors perceive that the population is more willing to accept intrusions of privacy if it is related to road safety.[131] This would be in part because road safety has continuously been a preferred topic in local media reports. In 2019, the service launched a road safety PAITI project in partnership with the bicycle division of the SPVM.[132] This was a rare instance that contrasted with current director Sylvain Caron's

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[129] Interview with Benoit Dupont, Montreal, May 2020.
[130] This is a completely different dynamic than the one that occurred in Vancouver with the PP program, which will be explored in Chapter 3.
[131] Interview 5, Montreal, May 2020.
[132] This pilot project installed distance readers on police bikes to ensure the distance between bikes and cars is respected by the latter (Pelletier 2019).

usual discourse of arguing that lack of funding explains why the SPVM is technologically behind (Thibault 2019).

Other contextual elements help explain the limited political and public attention given to the SPVM ALPR program. The criticisms of ALPR policies in BC could easily have resonated in Quebec. However, 2012 was an extremely busy year politically and socially in the province. Between the widespread student movement, the fall of the provincial government, the September 4th attack on premier-elect Pauline Marois, and the formation of a new minority government, there was not much space in the public sphere for technical policy debates.

What is more, in 2012 AI was not on many people's minds, even among experts. A group of leading Canadian experts, academics, and practitioners drafted a document on Policing Canada in the 21st Century (Goudge et al. 2014), where there is no mention of AI or ML. The only reference to ALPR is to argue that there needs to be more information-sharing between Canadian police services to fully benefit from ALPR data. This shows how actors' sensemaking, including among practitioners and experts, can evolve rapidly. Arguably, it is the noise in Vancouver that is the exception, not the quietness in Montreal, as virtually all other ALPR cases at the time were established without much attention. Such projects would probably raise more flags today, given what we now know about police agencies' uses of ALPR databases in the USA. Recent Canadian ALPR adoption cases have indeed received more attention, and established stricter use policies, notably in the case of the Ottawa Police Department.

Policies can become sticky if they are not modified for a while. Once a program is launched, organizations do not have many incentives to change policies unless there are exceptional pressures to do so. In Montreal, there have not been many critics of the ALPR program. Initiative for the program was also taken by the SAAQ. This allowed the service to defer data preservation policy questions by explaining, rightly, that they were a requirement set by the provincial entity. Indeed, one noticeable element in the analysis of all Canadian cases is the active role of provincial entities in ALPR emergence and management. There is often a perception among Canadians that, because of the contract policing system, provinces are bereft of law enforcement policy making outside of Quebec

and Ontario. This is a reminder that policing remains within provincial jurisdiction, and provincial legislatures have a role to play in its regulation. Perhaps if the SPVM had taken the initiative of ALPR deployment itself, it would have been perceived by privacy activists and media actors differently. This was not the case, though, and once services establish programs, they do not have many reasons to change their policies, especially since the more we talk about a PAITI, the less popular it becomes (Merola et al. 2019).

Policy making is also cyclical, and the ALPR file in Montreal was rapidly surpassed by a more pressing priority. In the immediate aftermath of the ALPR launch, the police service had difficulties with the rollout of its integrated data entry project, *M-IRIS*.[133] Important delays and costs were associated with this program. It is now well established, but this experience did leave many members bitter and skeptical of wide-ranging innovations. In addition, between 2016 and 2019, the service was plunged into a series of controversies, including revelations in October 2016 that the SPVM spied on investigative journalists. Other noteworthy events were linked to the handling of informants, criminal investigations of high-ranking members of the agency, and accusations of fabricating evidence. This culminated with the suspension of the director, Philippe Pichet, in December 2017. Combined, these events drastically worsened the image of the SPVM among the Montreal public, who dealt with an almost continuous communications crisis at the upper levels of the organization for close to half a decade (Yates 2019).

As a consequence, while both technology and research were at the forefront of Marc Parent's tenure as SPVM's director (2010–2015), the most recent leadership has followed a more conservative approach. Benoit Dupont explained that, given the current image of the service with the public and to avoid further controversies, leadership prefers advancing the fundamentals of policing rather than experimenting with technology.[134] This helps understand why the ALPR program is a rare PAITI within the SPVM, and not the beginning of multiple AI projects, as was the case with certain BC police services, in particular the VPD.

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[133] *Montréal – Inscription et recherche de l'information sur la sécurité*. The impact of this program will further be discussed in Chapter 4, as this experience influenced the SPVM decision-making on BWC.
[134] Interview with Benoit Dupont, Montreal, May 2020.

This discussion reminds us that trust is a fundamental dimension to consider with regard to PAITI policy. The way the public understands a technology will depend on the legitimacy they grant to the police services in their community. Existing research demonstrates that trust level toward police services (and government in general) is directly linked to one's willingness to support policies that sacrifice individual rights for the benefit of increased security (Schoorman et al. 2007). Actors make sense of AI through reinterpreting frames they are continuously constructing, which impacts how they perceive technology. This influences police leaders' sensemaking and decisions. We see this in how the service actively worked to ensure ALPR would not become cash cows for the organization.

In 2009–2011, when opinions toward the SPVM were generally favourable, the service's ALPR project was not made sense of negatively. A decade later, any PAITI policy risks being interpreted negatively by the public. With the difficulties of M-IRIS and the leadership crisis in the rear view mirror, one could expect the SPVM to be open to AI projects in the near future. We will explore this further in Chapter 4 on BWC.

Another theoretical point can be made concerning the drastic reduction in ALPR activations following the 2018 institutional reorganization that transferred AQSR and ALPR to local precincts. Incoming police directors typically like to reorganize the structures within services. The number of changes in the organization chart of the SPVM each year could be the subject of a dissertation in its own right. These regular organizational modifications are also visible with personnel assignments. This speaks to a regular dimension of North American policing, which is that promotions typically function on two-year cycles. This means officers in Montreal and elsewhere generally spend two years in a position before being reassigned or promoted. This can have consequences for the effectiveness of the organization:

> Assignments are based on experience, not competence. Promotions are systematically offered after two years in a position. So, you are always working with incompetents…. When a captain is named somewhere, if he's smart, he will listen for six months. Then he will work for six months. But then he spends a year preparing his next promotion, avoiding mistakes, because he knows he will be moved. That is how it works. One of the big problems with this system of systematic promotions is that in some positions

you need a high level of expertise, but people want to continuously move up.[135]

This type of commentary was typical of retired officers, as well as academics. This ability to change roles every two years is one of the attractive dimensions of policing as a career. Yet, if rotations at leadership positions can be beneficial for an organization, constant replacements pose problems in terms of effectiveness and consistency of services. One surprising admission by the captain charged with answering the June 2020 questions from the municipal council was that they had "forgotten" about the ALPR program, and that his team "learned a lot" as a result of the process. The new leadership of the road safety team had to review the program in its entirety, which was a learning curve in itself.

To be clear, this promotion system is not unique to the SPVM or to ALPR programs. It points to a long-lasting organizational dynamic present across North American policing with many consequences, one of which is the difficulty of establishing durable COP (Morabito 2010). This organizational hurdle could particularly hinder upcoming technological programs. PAITI propose particularly technical and challenging policy decisions for police leaders, who often do not have backgrounds in technology. ALPR are relatively straightforward and easily explained in both technical and policing terms. The same cannot be said of more complex AI technologies which are being integrated by police services. This is to say, further integrating PAITI within police services might require adapting police structures to foster stable PAITI policy development.

V – Conclusions

This dissertation looks at the dynamic sensemaking exercises that police leaders continuously make on PAITI. As a mature technology widely used by the police across North America for over a decade, ALPR represent a prime case study. It allows the study of police leaders sensemaking of PAITI across time and space, emphasizing environmental factors' interaction with sensemaking, and technological frames' influence on re-invention. The police values and perceives itself as processing relevant information in a systematic, unbiased way. Yet CI teaches us police leaders sensemaking of PAITI is rooted in preconceptions of what policing fundamentally is, and ALPR does not always equate to

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[135] Interview 21, Montreal, October 2020.

what "real" police work represent for LEO. The bounded rationality argument in addition teaches us individual and organizational decision making is limited by distortions proper to human rationality. The rapid adoption of ALPR technology at the end of the 2000s was not accompanied by proper outcome evaluation on crime persecution or community acceptance. As a result, police policy leaders have little non-technical information to help them make decisions regarding oversight, the nature of ALPR hotlists, and data storage considerations.

What is developed throughout this dissertation is an assumption-based model to explore how the police deals with such incomplete information and simplify PAITI according to their preferences. It argues sensemaking of PAITI is influenced by how police leaders use their foreground ideational abilities to translate the impact of these innovations on the place of police in society (transformation, surveillance), state-police-citizen relationships (accountability), and the reaction to these technologies for various stakeholders. In other words, facing complex challenges, police leaders use inferential shortcuts to simplify how they make sense of PAITI.

This dissertation suggests police leaders sensemaking of PAITI is centred on (1) the impact of technologies on traditional policing (enhancement versus transformation), and (2) the type of surveillance capacities they enhance (direct or indirect). Concretely, my argument is that police leaders favor PAITI which *enhance* traditional police work and develop *indirect* surveillance capacities. From a technical standpoint, ALPR could represent such an innovation. Yet, in terms of the change continuum, the dominant technological frame of technical efficiency can translate the same PAITI in different contexts as an enhancement or as a transformation. Running plates might not be considered "real" police work by some, and it limits police discretion. Technological transitions perceived as ineffective or reducing front line discretionary time to increase reporting tend to be resisted, because of the mythological dimensions of patrolling for the police. This helps understand the gradual evolution of ALPR from multifaceted tools to mostly road safety instruments in Montreal. This once again points to how the impact of PAITI on the change and surveillance continuums is not absolute; it is mediated by technological frames, organizations, and environments. By putting the technology in the hands of AQSR, the SPVM focused its use on illegal road uses instead of wider criminality trends. This

underlines how actors in Montreal purposively made sense of ALPR to accentuate their amplification dimensions and limit the instability caused by the transformative dimensions of the innovation.

As for the surveillance continuum, ALPR transition police surveillance practices from query-based to alert-based, meaning the determination of who is suspicious and deserves to be further scrutinized by the police is no longer done through investigative work but by an AI. This dragnet surveillance practice has direct consequences for democratic policing principles of restraint and due process. It reduces the cost and systematically widens the scope of police surveillance, whereas police resource limitations have historically been a prime restraint mechanism to police power.[136] Still, if experts can mostly agree on the impacts of a PAITI on police surveillance practices, different populations might not perceive the threat of police surveillance similarly; nor do police services have (or are perceived to have) the same technical capacities to act upon new surveillance opportunities, or the same level of self-restraint.

This is why to comprehensively analyze the impact of AI on our democratic societies, we must go further than straightforward analyses of technical dimensions. In British Columbia, daily ALPR program operations is managed by the RCMP, increasing public suspicion of the PAITI. The RCMP is a well-funded pan-Canadian force that can afford PAITI re-innovation. The force was also actively working on data-sharing and integrating programs across all RCMP divisions during the same period as the ALPR program was launched. The SPVM does not carry the same reputation. Given these dimensions, it is understandable that a group of experts perceived the potential privacy risk an unregulated ALPR program could represent for the British Columbian public. Contextual factors contributed to their voices being heard, as the public was attentive to political debates on the nature of policing in the province. The group continuously published on the issue over a period of four years until policy changes were implemented.

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[136] Then again, one expert points out that not all identifiable data the police can access represent the same privacy risk for citizens. Contrary to biometric information, licence plates can be changed. This distinction will likely become more important in years to come for PAITI policymakers. As biometric technologies such as facial recognition software will be more accessible to services, so will their salience in the public debates. These questions will be further elaborated upon in Chapter 4, as many concerns over BWC policies are linked to FR.

On this point, this case strengthens the finding by Merola et al. (2019) that the more the public knows about ALPR, the less favourable they are to the technology.

As the previous paragraphs demonstrate, this chapter emphasized environmental factors' interaction with sensemaking. It also helps understand how technological frames influence whether different jurisdictions have developed, across time, novel uses for their ALPR and the data it produces. From a technical standpoint, ALPR are prone to re-invention. This is often the case in US police departments, which changes the nature of police surveillance, and as such how it enacts the state monopoly on legitimate violence. But how a PAITI is used depends on how it is made sense of. In Canada, ALPR have mostly been used for road safety purposes. In Montreal, this was because the SPVM feared it would become a distraction for its LEO. The service still collects large amounts of ALPR data. In BC, debates around increased police surveillance during the 2010 Olympics led to restrictive ALPR data-collection policies which limited the possibility of re-invention. Technology is the product of the environment in which it operates and is socially constructed by the actors with which it interacts. Markedly, in Montreal, the public has been generally indifferent to ALPR, even while the city council was looking into the PAITI in the summer of 2020. It has never been a political issue. There has not been a movement denouncing this innovation as a threat to the balance of power between the public and the police like in BC.

This empirical chapter emphasized environmental factors' interaction with sensemaking, as well as technological frames' influence on re-invention. It underlined that the perception of police surveillance—as threat or promise—is socially constructed and context dependent. Similarly, PAITI' impacts will vary from one service to another, as actors within organizations can purposively emphasize the amplification or transformation dimensions of given technologies. In contrast, the next chapter reviews a technology less mature, and less common: predictive policing. Accordingly, police and non-police actors' sensemaking exercises on this PAITI are not as established as with ALPR. The next chapter will notably explore variations in actors' forecasting of how this open-ended PAITI will transform police-citizens relations.

Chapter 3: Predictive Policing

PP is less established in law enforcement than BWC (Chapter 4) or ALPR (Chapter 2). Adopting this PAITI is a complex operation that is conditional to the development of trustworthy algorithms and data quality thresholds which many police services do not meet. Most police leaders lack the technical skills to understand how PP works, which makes it a prime case to examine how they make sense of intricate AI-induce law enforcement applications. This dissertation argues that faced with this complexity, leaders translate PP by a simplification process centred on how technologies change traditional policing (enhancement versus transformation), and the type of surveillance capacities they enhance (direct or indirect). On the change continuum, technologists within services simplify the PAITI to explain it as an enhancement of traditional policing strategies to leaders. The cases this chapter studies are place-based PP, which are made sense of in line with a vast tradition of crime prevention strategies rooted in criminology of place theories. As per the surveillance continuum, PP allows us to explore quick shifts in public and police sensemaking of a PAITI. Early applications of PP were received enthusiastically by most stakeholders. However, controversies quickly raised questions on the private nature of non-criminal justice data that feed PP algorithms, and what it meant for democratic policing principles of restraint and transparency.

The literature review presented in Section I of this chapter examines these democratic dimensions and defines the wide array of police use of ML analytics which fall in the category of PP. This PAITI received much interdisciplinary academic attention—albeit perhaps overly focused on a few early controversial cases. These polemics matter as they influence cases and interviewees of this chapter. Most of the latter do not have direct experience with the PAITI, but almost all had more to say about PP than ALPR. PP is in this regard the least widespread, least mature, but most controversial PAITI studied in this dissertation.

Section I will in addition detail how PP raises fairness, accuracy, and accountability interrogations, in a review of social impact of AI literature. These influence leaders sensemaking of PP, but also relate to our second research question on the impact of PAITI on democratic practices. Most notably, PP greatly contribute to the embeddedness of police

services in urban infrastructures. It leads to police presence on certain territories based on algorithms and data that cannot be explained to the targeted populations, or LEO for that matter.

Section II examines the challenges of studying a PAITI whose translations is still in the making, and that few Canadian LEO have real-life experience with. Some experts consider current PP programs are only the point of the iceberg of what PP and AI in policing can achieve. Making sense of this potential increase in police power leads these actors to be wary of citizens' privacy and rights. Others consider the potential of PP has already been attained, and that further developments of PP are somewhat predictable. A central contribution of this chapter will be to study which assessment of PP (point of the iceberg or already at maturity) LEO and police leaders tend to follow, focusing on members not directly involved in PP programs. Scholars studying police sensemaking of this innovation have indeed mostly focused on actors directly involved in PP research projects. These are valuable perspectives, but they might not give a full picture of police organizations sensemaking and sociotechnical imaginaries.[137]

Section III focuses on the VPD place-based B&E PP unit. Place-based PP has received the most academic attention and is the more common form of predictive analytics within North American police services and Europe. I introduce here a Canadian perspective to this growing literature. Implemented in 2017, the VPD stands out by implementing the first permanent PP program in Canada. Few others Canadian municipal police services are experiencing with the PAITI. Many cities do not have sufficient volumes of crimes and associated historical data to justify the capital, time, and human investments required to successfully develop PP. Those that do often lack the expertise to engage with such complex analytics. In contrast, crime datapoints were uniformized in BC in the early 2000s, and the VPD has a longstanding reputation as a Canadian leader in criminology of place analytics. A key contribution of this chapter will be to provide a police policy analysis of this program in light of international experiences. This will help underline that what might appear unique as it stands out within the Canadian policing ecosystem shares many similarities with European and United State cases.

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[137] Both the concepts of organizational sensemaking and sociotechnical imaginaries will be further expanded upon throughout the chapter.

Section IV examines the rapid evolution of PP sensemaking. This chapter will argue the VPD exemplifies how police technoscientific attitudes risk perpetuating historic flaws under a false sense of algorithmic impartiality. Yet the VPD leadership emphasizes the amplification side of the change continuum to portray PP as a mean to make traditional crime mapping more precise. This section examines how sensemaking of PP has drastically shifted in half a decade, using the VPD as an example. Between 2017 and 2022, as the result of publicized controversial PP cases, the public understood PP is not simply a digital version of old "dots on the map" police strategies. In practice, this PAITI is built on risk-level assessments based on data sometimes irrelevant to the criminal justice system, such as graffiti density. What was once made sense of as an extension of traditional preventive policing strategies and an indirect form of surveillance based on crime data is now under review by activists, politicians, academic, and police leaders for the fundamental biases and privacy implications it raises. Unregulated unsupervised algorithms pose considerable ethical and policy dilemmas that must be accounted for. My interviews underline that internally too, PP is no longer perceived as a panacea.

Section V concludes the chapter. It will consider what the VPD PP program hints for future PAITI developments in Canada, and assess similarities in PP, ALPR, and BWC sensemaking.

I – Literature Review

1. Defining Predictive Policing

PP use by police services is considerably less common than ALPR. Integrating the former is a complex operation that is conditional to the development of trustworthy algorithms and data quality thresholds. Most police services do not meet these, especially at the municipal level. The majority of LEO asked about potential uses of AI in policing naturally made the association with PP.[138] The technology therefore speaks to officers' imaginary and sensemaking of what their profession is developing towards.

There are different types of PP. Each set of authors suggest a particular wording to these categories (Perry et al. 2013; Van Brakel 2021; Berk 2021; Ratcliffe et al. 2021;

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[138] In most cases, the question specifically asked LEO to talk about potential uses of AI in policing that could impact patrolling, without specifically mentioning PP.

Meijer and Wessels 2019). Part of the difficulty of studying PP is this absence of an accepted definition among the academic community (Meijer & Wessels, 2019). Likewise, most police services trialling this PAITI keep open their definition of PP to allow space for experimentation during pilot projects and potential program extension afterwards (Egbert & Leese, 2021).

Nevertheless, two fundamental elements are present in all definitions of PP. First, PP entail the use of quantitative (Camacho-Collados & Liberatore, 2015) and analytical (Pease & McDaniel, 2021) techniques to translate historical data into forecasts of criminality trends (Leese 2021; Ferguson 2017a). Second, forecasts, or predictions,[139] are used to help guide police personnel attribution, intervention, and prevention strategies (Meijer & Wessels, 2019, 1033; Moses & Chan, 2016). Examples of PP that fit into these two fundamental dimensions include general estimates of future crimes locations (Moses and Chan 2016), pinpoint targeted areas for police intervention (Beck and McCue 2009), the identification of plausible victims or perpetrators of crimes (Dupont et al., 2018), or the use of algorithmic formulas to help solve cold cases (Lum and Isaac 2016).

Numerous scholars have attempted to further specify and categorize these different uses of predictive analytics. Here again, one fundamental separation is present in virtually all academic classifications: the analytical distinction between place-based and person-based PP (Ferguson 2017a; Berk 2021; Meijer and Wessels 2019; Leese 2021; Perry et al. 2013).[140] Place-based PP refers to programs that aim to identify locations and times in which crimes are more prone to be perpetuated. Person-based PP refers to programs that aim to identify plausible victims or perpetrators of crimes.

PP can be further divided by algorithmic models, with two subsets being *Risk-Factor*[141] and *Seismic* models (Ferguson 2017a).[142] Another distinction can be made between PP application that target property crime, and those that target violent crimes (Ferguson, 2017b). For Hung and Yen (2020), the former is simply referred to as *place-*

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[139] As mentioned in Chapter 1, *forecasting* is probably a better term than *predictive* to describe the impact of this PAITI on policing. However, both academics and police practitioners have accepted, and currently use, the term *predictive policing*.

[140] Note this distinction is not only considered as fundamental by most academics, but also practitioners (Prox, 2020a, 2020b).

[141] More on this in the following subsection.

[142] This distinction will be further extrapolated in this literature review with case studies in the USA, the UK, and continental Europe.

based policing, and the latter as *event-based policing*. Predicting violent crimes is the less theoretically grounded of the three branches of PP. Violent crimes are by definition impulsive acts, which makes them especially hard to predict. Moreover, since there are less violent crimes than property theft, algorithms rarely have sufficient data to support them. There is currently no violent-crime PP program active in Canada.[143]

Person-based predictions have a longer history within the field of criminal justice. As early as 1928, Ernest Burgess attempted to use prisoners data to reveal patterns between those who violated the terms of their parole (Pease & McDaniel, 2021). These approaches have however long been contested for their determinism (Jobard and Maillard 2015).

In contrast, place-based PP build from a long tradition of "criminology of place" notions (Weisburd et al. 2012). Thieves, as all humans, are creatures of habit. A robbery in a precise location will likely lead to other robberies by the same person in a similar area (Ferguson 2017a). PP experts regularly take out "impulsive" robberies from their data, such as when someone forgets to lock the door of their automobile, so that their algorithms only consider those that follow the signs of a "professional" burglar (Egbert & Krasmann, 2020).

The potential benefits of place-based PP are logical to understand when considering place-based criminology theory. Burglars follow patterns which produce data points. An AI takes this data to forecast where other burglaries are likely to happen. The police then use these predictions to implement adapted prevention policing techniques.[144] This last step is essential to PP, since without police redirection toward forecasted areas, the use of predictive analytics techniques would be done in a vacuum.

This PAITI therefore allows to redirect police resources more effectively. Moreover, it allows the police to act proactively, by using crime analytics to conduct targeted crime prevention strategies instead of responding to crimes on an ad hoc basis (Egbert & Leese, 2021). This follows the principles of situational crime prevention approaches (Clarke, 1980) and preemptive policing (van Brakel, 2016; Van Brakel & Hert,

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[143] At least none that the public is aware of (Robertson et al. 2020). This being said, the lack of transparency on police uses of facial recognition technologies in Canada demonstrated Canadian police services are not always transparent when it comes to its uses of PAITI. See the New York Times free online version, subsection "The Privacy Project" for reports of secretive police uses of facial recognition software in North America. These were mostly published in the last trimester of 2019 until February 2020.

[144] These interventions take different forms, which will be reviewed shortly.

2011), the difference being it heavily relies on statistical data instead of other forms of information that would for instance come out of *beat* policing (Moses & Chan, 2016).

Placed-based PP is touted as a means to make LEO more attentive to *hot spots* during their patrol. In an era where the police are suspected of biases, it can legitimize police operations as empirically sounded (Perry et al. 2013). This last argument was particularly popular amidst officers interviewed for this project. From a socio-political standpoint however, critics of PP would argue, reversely, that PP based on biased data would legitimize the over-policing of vulnerable populations (Moses & Chan, 2016).[145]

This chapter focuses on placed-based PP, and its impact on the patrol. Berk (2021) argues many formulated critics of PP are primarily about criminal justice, notably biased bail hearing algorithms (Angwin et al., 2016). This is the ultimate step of the criminal justice system, with the patrol being at the opposite end. These person-based non-policing applications are not the subject of this chapter. They will however be considered as they play a role in how actors make sense of this PAITI.

2. A Growing Interdisciplinary Field of Study

While there are multiple police services experiencing with PP, only a few have been the object of comprehensive academic research. Many authors were constrained to use the same cases to summarize the state of research: Los Angeles for a somewhat successful example (Mohler et al., 2011), Shreveport for an inconclusive research (Hunt et al. 2014), and Chicago to underline issues with person-based PP (Saunders et al. 2016). The review of these cases is almost always coupled with warnings related to the ProPublica report on biased bail hearings, and the key work of Chan and Moses (2016). Add a reference to Minority Report, and most early literature reviews are complete.[146]

Ferguson's (2017a; 2017b) underlines there are more services experimenting with PP than scholars able to study it. The limited attention is however interdisciplinary, which contrasts with criminology-focused ALPR and BWC literature. From this arises a list of potential problems. Mainly, that improper algorithmic models could lead to distorted

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[145] See *Fairness* subsection of this chapter for a comprehensive assessment of these critics.
[146] The 2003 movie Minority Report showcases Tom Cruise being arrested *prior* to committing a murder. Although potentially anecdotical, almost all early academic work on PP has at least one reference to this movie. It appears to have marked the imaginary of a generation of scholars of which this author is not part of.

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depictions of criminality (Innes et al. 2005; Meijer and Wessels 2019), that they might be inaccurate (Hung & Yen, 2020), lead to biased policing (Robertson et al. 2020), and lack transparency (Moses & Chan, 2016).

Berk (2021) points out that, just like enthusiastic claims on PP, these critics are based on limited empirical research. Thankfully, recent work on PP has answered many gaps it the academic literature. In the first three months of 2021 an in-depth review of place-based PP in Philadelphia that focuses on enforcement strategies (Ratcliffe et al., 2021), a comprehensive assessment in the annual review of criminology (Berk 2021), an edited volume (McDaniel & Pease, 2021), and a book (Egbert & Leese, 2021) finally not exclusively focused on Anglo-Saxon cases were published on PP. Numerous academic articles and book chapters can be added to this list (to list a few: Van Brakel 2021; Leese 2021; Ha and Andresen 2020; Szkola et al. 2021).

On the issue of accuracy, fairness, and transparency, critics and proponents of PP agree that that the appropriate scope of state big data surveillance is a political question, not a policing one (Ferguson 2017b; Berk 2021, 209). Yet, out of 37 relevant academic publications on PP between 2010 and 2019, none were in the field of political science (Meijer & Wessels, 2019, 1032).[147] Political scientists and policy scholars have a role to play in studying and advising decision makers on the development of AI in policing. It is my hope that this chapter contributes to transitioning PP into a *political* discussion.

3. Reviewing Significant Predictive Policing Cases

While PP is new, the use of statistical data and predictive techniques to inform police decisions is not. Attempts by the police to use data and apply future-sensitive predictive analysis dates back to the early 2000s (McCue and Parker 2003). Prior to 2003, the Richmond Police Department (Virginia, United States) had a gun firing on New Year's Eve problem.[148] The department predicted where such event would occur and adjusted their patrols. The results were satisfying, as random gun firing decreased by 47% versus preceding years, and the seizure of weapons increased by 246% (Pearsall 2010, 17).

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[147] Meijer and Wessels focus on publications up until 2017. Since then, a notable exception is the work of Political Scientist Matthias Leese.
[148] This is a practice that can lead to serious injuries and is the object of much public security sensibilization campaigns in the USA (Siegel 2017).

As per PP, the first attempt to leverage AI for forecasts traces back to a group of scholars led by University of California, Los Angeles (UCLA) professor Jeff Brantingham.[149] With colleagues in Criminology and Computer Sciences, he develops short term event patterns algorithms grounded in seismic environmental criminology (Mohler et al. 2011).[150] They test empirically this PP algorithm in a *real-world* environment, working with police services in Los Angeles (Mohler et al. 2011), Kent, UK (Mohler et al., 2015), and Santa Cruz, California, (Goode 2011).[151] These projects set the standard for future academic studies of PP: control sectors (or in some experiences, different shifts in the same precinct) are patrolled following predictions made by analysts, while others are following AI predictions. Mohler et al. (2015) claim a combined 7.4% decrease in crime in areas policed with the latter.

These early results were used by Brantingham and Mohler to commercialize their software. *PredPol*, the name of their algorithm, became a commercial enterprise after the California trials.[152] The straightforward data points feeding their algorithm is touted as the strength of their product: crime type, location, and time. This is advertised as a proof of the transparency of their algorithm, neutral nature of their software, and of their theoretically grounded approach. It also facilitates selling it to virtually any police service.[153]

Following the Mohler et al. (2011; 2015) findings, PP became the new "watchword" for innovation in policing. By 2015, PredPol has 60 clients in the USA (Ferguson 2017b). This rapid spread contrasts with the lagging policy, academic, and legal debates on PP.

This is gradually changing. The most complete recent example of this is Jerry Ratcliffe and colleagues' (2021) work on the Philadelphia Police Department (PPD). This

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[149] Jeff is the son of environmental criminologists Patricia and Paul Brantingham, who co-direct a criminology research centre at Simon Fraser University, British Columbia. This research center played a role in the development of PP in Vancouver. Refer to the empirical section of this Chapter for more details.

[150] For instance, Haberman and Ratcliffe (2012) uncovered there is an increase of near-repeat arm robbery events in the seven days following an offence, but not afterwards. Police services can use such finding to adjust their patrolling strategies for the period of increased risk.

[151] The Santa Cruz pilot project did not receive as much academic attention as the LA collaboration with PredPol. This is potentially a conscious choice by the authors, as the LAPD has a good reputation innovation-wise among North American policing.

[152] The company was rebranded as Geolitica in 2020. This occurred after public backlashes and controversies in LA, which will be reviewed shortly.

[153] The PredPol website is dedicated specifically to convince members of police services to purchase their products, with sections giving tools to LEO to convince their leaders, etc.

place-based, randomized experiment studies enforcement strategies. Much early research on PP focused on the algorithmic side of the technology (Rummens 2017, 7). As a result, knowledge of its impact on police effectiveness had previously been lacking (Santos 2019). From a policy perspective, this clouded the ability of police leaders to make comprehensive assessments of PP.

Concretely, forecasts were used to guide patrols on regular 8-hour shifts, and the study examined larger impacts of preventive interventions. On the one hand, PP "success" could hide crime displacement (Bowers and Johnson 2003), which refers to reductions in one test area being linked to increased criminality in another one, or in the same area during a subsequent nonexperimental time block. On the other hand, we could see a temporal diffusion of police intervention benefits (Weisburd & Green, 1995).

Using predictions made by *Hunchlab*, twenty of the twenty-two Philadelphia city districts were randomly assigned to three interventions (five districts each) and a control group (five districts as well). In group A, officers were made aware of predictions during roll-call, but not directed to treatment areas. In group B, unmarked autos were sent to the areas. In group C, marked autos were dedicated to areas. The control group districts conducted business-as-usual patrolling strategies. The deterrence impact was tested on both property crimes, as well as violent crimes. There were no positive results for violent crimes. As per property crimes, treatments A and B had no meaningful impact on crime. Group C, the marked auto treatment, saw a 31% reduction in forecasted crimes during patrol shifts. The researchers also found a significant 40% reduction in forecasted crimes in the 8 hours following the intervention, proving a temporal diffusion of PP.

One notable difference between PredPol and Hunchlab is the datasets that feed their respective algorithms. The latter make predictions that can be made on various variables including sociodemographic indicators (ex: housing density, median household income), Risk Terrain Modelling[154] (RTM, i.e. water area coverage, bus stops, nearest bicycle network), recurring temporal events (ex: sporting events, school hours), the weather,[155] and near-repeat patterns. Some of these are exactly those that expert warn could lead to

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[154] Also referred to at times as Risk Terrain Analysis (RTA).

[155] Weather and recurring temporal events were not used for the Philadelphia experiment, but can otherwise be incorporated to Hunchlab predictions.

increased policing of vulnerable populations. Using sociodemographic indicators is considered a particularly slippery slope by Moses and Chan (2016).

With this last reserve noted, RTM applications are promising for police policy makers because they aim to explain crime, not just predict it. An RTM study out of Colorado Springs underlined four percent of city blocks were 48 times more likely to have cars broken into. Different risk factors uncovered included store foreclosures, disorder calls, parks, commercial zoning, and multifamily housing units. In this last case, autos are parked out of view of residents, not in their driveway, making it easier for thefts to operate. A preventive campaign with residents was launched, and patrolling officers were instructed to be attentive to such parking lots. Similar steps were taken for every risk factor. In the end, the study noted a 33% crime reduction in the RTM target area versus the control sector (Kennedy et al. 2015 from Ferguson 2017a, 67–68).

In another case, RTM helped the Newark police expose that five percent of its territory was 58 times more likely to be the location of gun violence. The locations had in common that they corresponded to places where young men could hang out, such as 24-hour gas stations, abandoned properties, or take-out restaurants. The police response was to send patrols in these locations and identify potential hangout spots, especially neglected buildings. This did not lead to an increase in arrests of these vulnerable populations, a common fear some have toward PP disparate impacts. It did, however, result in a 35% drop in violent shooting within RTM areas versus control sectors (*Ibid.*)

Seasonal factors are another dimension incorporated into RTM predictions (Szkola et al. 2021). One study for instance found that good surfing conditions in specific areas of California lead to increased criminal activity, precisely between 1430 and 1730 (Dario et al., 2015, p. 271). These types of outputs explain the attractiveness of RTM despite their opacity. Knowing exactly when and where to patrol to optimize your deterrence power— or simply shutting off park lighting later than usual during warm summer nights—is valuable. The dilemma is that this increased accuracy is often made at the cost of transparency and the prospect of bias (Berk 2021).

PP have also emerged in Europe. The most researched project is the Institute of Pattern-Based Prediction Technology's Pre-Crime Observation System (PRECOBS), in Germany. The objectives behind this place-based PP program are framed in analogous

terms as in the USA: to make to police more effective, and ideally preemptive (Egbert and Krasmann 2020). To be included in the software's calculations, burglaries have to show signs of professionalism. Professional burglars are at risk to follow up after a successful heist (Egbert and Leese 2021). Unprofessional burglars seize random opportunities to make quick gains. This choice is a reminder that AI is in the beginning a human creation and, as such, cannot be separated from the programming decisions of its creators.

PRECOBS teaches us that the engineers behind PP algorithms are playing a long-term political role by setting the grounds for future developments in their program, and as such law enforcement. Indeed, another noticeable element of PRECOBS is that it was imagined with a clear development strategy in place, with crafters planning from the beginning of extending the software usability to auto-theft. This is somewhat understandable, as it is the third most common type of property crime, after commercial and residential burglaries. In the long run, PRECOBS leaders want to include property damage to their program (Leese 2021). Such further uses are implied in most USA cases (and in Vancouver), but it is not purposively stated as such.

A noticeable element of PRECOBS is that a group of scholars produced a socio-technical analysis of this program, diving into the impact of PP on police work, the patrol, and sensemaking. Leese (2021, 152) notes PP in Switzerland was developed to encourage the automation of "…dull analytical functions." Yet in practice, concerns over conserving human control over the technology led to limited automatization. This reminds us that the technological is simultaneously political: PAITI are socially constructed by police actors once they interact with the technology. This process continues after the moment of adoption, as actors sensemaking evolve as they interact with technologies across time.

Likewise, police AI policies are set to fluctuate as technologies modernize and stakeholders interact with each other and the PAITI. Egbert and Leese (2021) detail how difficulties can arise during the moments of translations from predictions to prevention strategies. This was the weak point of many initial USA PP experiences, notably in Chicago, Illinois, and Shreveport, Louisiana.

In Chicago, a person-based PP software developed a Strategic Subject List (SSL) of potential shooting victims. The risk factor algorithm was fed a list of individuals who were arrested in the past with recent gun violence victims (co-arrest). The aim of the

program was to prevent these at-risk individuals become victims of gun violence. Officers at the Chicago Police Department were given lists of potential victims, with no enforcement instructions. The experiment did not lead to a reduction of shootings of individuals on the list. However, it lead to an increase in their arrest. Instead of using these lists to implement preventive policing strategies with potential victims, detectives used them as leads for investigations. This preventive experience therefore rapidly became punitive when translated by police actors, demonstrating the unpredictability associated to the social construction of an emerging PAITI (Saunders et al. 2016).

In Shreveport, a 29-week place-based risk-terrain experiment was conducted. Just like the previous case, the study had financial support from the RAND corporation Safety and Justice Program (Hunt et al. 2014). This rare independent study of a PP project established the experiment was inconclusive. Problematically, it was not able to determine with certainty the reason of this failure. Three potential explanations were suggested. First, that its statistical power was limited because there were not enough participating districts. Second, that the LEO and departments did not follow the pilot project uniformly. Third, that the algorithm's predictions were inadequate.

4. Fairness, Accuracy, and Accountability: Setbacks & Critics

The Chicago and Shreveport cases were introduced beforehand because much early concerns toward PP are rooted in these projects. In Shreveport, the inability to explain the failure of the experiment is often used to denounce the speed with which police services are adopting PP despite limited demonstrated success (Ferguson 2017b). As per the Chicago SSL, it received a considerable amount of critical attention (Moses and Chan 2016; Meijer and Wessels 2019). Despite its laudable objectives, the fact it targets individuals is argued to be highly invasive by the authors of the study (Saunders et al. 2016). As the authors of the Chicago report put it, when it comes to how the police interacts with at risk citizens, *riskier* cannot be taken as *risky* (*Ibid.*) Police intervention in citizens life following such a confusion of terms would fundamentally contradict due process and restraint principles of democratic policing.

The early enthusiasm toward PP rapidly dialled down. Concerned about the reliability of the technology, the British West Midlands Police concluded the implementation of a place-based PP program would be ill-advised (March, 2019). In

Germany, police services in Karlsruhe and Stuttgart decided to terminate their PRECOBS program because of a lack of sufficient clean crime data (Van Brakel 2021).

Even more symbolically stringent are the setbacks by all three first documented PP adopters. The Kent police discontinued its PredPol program in 2018 because increasing crimes and decreased resources meant officers had less time to use the software—two problems PP was supposed to fix, not accentuate. In California, the LAPD discontinued its PredPol program in 2020. The service cited financial constraints as a cause for this decision (Haskins 2020). However, the use of PP by the LAPD was the object of much criticism from privacy and vulnerable group advocates. The same is true for Santa Cruz. After becoming the first city in the USA to adopt the technology nearly a decade ago, it was also the first to impose a complete ban on the PAITI, in June 2020 (Sturgill 2020). Many cities followed suit, including Pittsburgh (Murray and Giammarise 2020) and Oakland (Burbank 2021).

The situation in Santa Cruz is revealing of the 180-degree shift in sensemaking on PP. When the program was first launched, media, politicians and police leaders touted PP as the technology of tomorrow (Goode 2011). Nowadays, the technology is clouded by all forms of critics and concerns. An officer is not sent by accident to patrol the streets following a PP algorithm. That presence is the result of policy decisions and moving power relations in societies. This reminds us that while the police are the armed branch of the state entitled to legally exert power using coercive means forbidden to other members of society, this power is not unlimited. It is conditional to political and citizen oversight. PP setbacks expose how the PAITI is now made sense of as a potential threat to democratic policing principles of due process and restraint. They are here regrouped in three categories: *fairness*, *accuracy*, and *accountability*.

Fairness

Fairness refers here to critics of PP that underline that the technology may not impact all citizens equally. Setbacks in Santa Cruz, Pittsburgh, and Oakland are linked to such concerns. Academics (Lum and Isaac 2016; Moses and Chan 2016; Ferguson 2017a) and activists regularly denounce the unforeseen impacts of this innovation, most notably in Los

Angeles (Haskins 2020, Robertson et al. 2020).[156] *Fairness* concerns are rooted in the social construction of technology notion that there is no such thing as a neutral technology. If there are inequalities in a criminal justice system, one can suspect algorithms built within this universe are subject to similar prejudices (Jones 2017).

Often, academics use the expression "garbage-in-garbage-out" to explain that algorithms are only as good as the data that they are fed. This "dirty data" problem is present in all fields of AI. PP algorithms learn from reported crimes alone. This might represent a substantial difference from actual crime patterns—for instance if the agency has over policed certain areas in the past (Lum and Isaac 2016). The risk here is one of feedback loops, where algorithms direct LEO toward areas that were already over policed. The enhanced police presence then intensifies the control of these populations, which feeds further algorithmic distortions, and so on (Kaufmann 2019). Politically, this becomes particularly controversial when over-policed neighbourhood were and still are inhabited principally by minorities. This is a prospect we can expect police leaders will want to avoid.

Legally, an area being flagged as "high risk" is not a sufficient suspicion criterion to search or control an individual (Weiss 2020). In practice, PP accentuate your likelihood to interact with the police. In some cases, it can dictate how the police interacts with citizens, and how likely LEO are to escalade violence. In Fresno, California, the Beware Software is a threat-scoring technology which is a real-time PP used in the context of 911 response calls. This gives a colour-coded (red-yellow-green) assessment to responding officers of the danger represented by the citizen present at a given address. In a test, a councilman was flagged green, but when using his address was flagged yellow, because of the criminal record of the previous owner of the house. This means a police officer responding to a call at his house will be advised by AI to be wary of this person—and will be more likely to use violence—because of a prejudicial algorithm (Jones 2017). This is a concrete example of how from select citizens' perspectives, PP impact the democratic principles of due process and restraint. This becomes especially problematic if these consequences impact predominantly individuals living in minority neighbourhoods.

Berk (2021) argues solutions exist that overcome the prospects for bias. Algorithms can be fed only data which are the results of the police being called to action, like with

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[156] The Stop LAPD Spying is the most notable anti-PP organization active in the United States.

PRECOBS. He also pests that those decrying the over policing of neighborhoods only give voice to delinquents, not crime victims who live in these areas and might welcome police presence. Berk's remarks help equilibrate the scale of an academic and public debate disproportionately tilted against PP. Nonetheless, the perception that PP could lead to an accentuation of law enforcement discriminatory practices cannot be ignored by police leaders making sense of this innovation. The drawbacks of a PAITI on police-citizen trust need not overcome its benefits, however great they are.

Accuracy

Overall, there are doubts about the capacity of PP to effectively reduce crimes on a given territory (Perry et al. 2013). This is what is referred to here as *accuracy* critics, which are the main reason for setbacks in Kent, Karlsruhe, and Stuttgart.[157] Place-based algorithms lead to a huge number of false positives. Even if an algorithm is excellent at forecasting where and when some crimes occur, most of its predictions are wrong. In San Francisco, an official rejected PP, asserting police officers would spend too much time in boxes, which would tilt the accuracy of predictions. With or without algorithms, increased police presence in the streets reduces crimes (Dupont et al., 2018). Even then, it is particularly difficult to prove something did not happen. One can question whether it is appropriate in a democracy to feed loads of (at times private) data to an algorithm without being able to demonstrate the benefits of said AI to the community.

The Shreveport report did note that LEO spent more time in forecasted areas. At times, they conducted what can be qualified as COP by proactively seeking the factors that enhanced crime in the area (Hunt et al. 2014). This sort of work might be a positive unintended consequence of place-based PP: "Ironically, a data-driven policing system could—if so implemented—result in less data emphasis and more human interaction" (Ferguson 2017a, 80). This community approach could fix the fundamental flaw of PP, which is that algorithms suggest risk correlation, not causation (Andrejevic 2017).

For policy makers, it can be helpful to consider that accuracy and fairness critics are overwhelmingly directed toward less common person-based PP. This is perhaps because the former resonates with current debates on big data surveillance and individual

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[157] And, according to the official story, in Los Angeles too.

privacy, notably linked to the proprietary nature of digital footprints, legal safeguards issues, and big tech regulation (Edwards and Urquhart 2016). In the 21st century, preserving citizens' privacy while increase their security is a key police challenge. Yet, setting the balance between accuracy and fairness is a political decision, not a law enforcement one.

Accountability

Accountability refers here to critics of PP that centre around the lack of transparency of algorithms, and its impact on the third principle of democratic policing: public oversight of the police. At a time in point, prospective thought exercises envisioned technology would give political leaders tools to make law enforcement more accountable (Chan et al., 2001, 139). The reality has been different: technology evolved, but traditional accountability mechanisms dragged behind.[158] One example is that the study on Chicago's SSL was published years after the Chicago police made changes to its algorithms. Then again, at least the criteria feeding the heat list could be tested. In many cases, the police are unable to understand the PP software they use. This leads many to denounce algorithms as black boxes (Schlehahn et al., 2015).

This is where algorithmic and police accountability collide. The more AI is integrated in daily police practices, the more technical law enforcement knowledge becomes. This in turn increases the opacity of police decision-making (Egbert and Krasmann 2020). It embeds the police, which diverts resources away from the streets to leverage these new forms of knowledge. It becomes less visible for citizens, but more informed on crime trends. Every untraceable AI calculation complicates the ad hoc reconstruction of police exercise of its discretion, which is a key dimension of police accountability (Moses and Chan 2016, 817–18).

What further complicates liability in the field of PP is the role played by private technology companies. Documented cases show police services being forced to abandon prosecutions because of private entities refusing to divulge proprietary information (Joh 2017a). As it currently stands, the data that comes in and the predictions that come out

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[158] As a reminder, the two classical traditional accountability mechanisms are cost and time (the police being limited in both). Both are at risk of being overcome by police services with the development of PAITI (Brayne, 2017)

of PP generally belong to police services. However, the algorithm in between does not always. As such, the PP software usually cannot be the subject of public oversight.

Adapting accountability mechanisms to 21st century policing should therefore account for the role played by private companies (Egbert and Krasmann 2020). Fixing this lack of algorithmic transparency should not be read, however, as a call to terminate traditional police accountability mechanisms. One risk is that looking into algorithmic transparency means that police accountability concerns over adjust to focus exclusively on technical details (Moses and Chan 2016; Leese 2021).

If current accountability entities (police boards, local politicians) are ill-equipped to conduct technical overviews, they can at the very least help uncover when police entities are not being honest about PAITI. In New Orleans, reporters denounced the police service dabbled with PP software without informing the mayor's office. The program was rapidly terminated (Johansson 2018). As for the early-2020 Clearview AI facial recognition scandal, it was only accentuated by the fact police services were openly attempting to hide the truth about their uses from the public.[159] Yes, many of the critics of PP are more about AI than policing. But when it comes to police accountability, many issues predate PAITI.

5. Debated Translations: Sociotechnical Imaginaries

Much of the early scholarly work on PP has focused on its technical dimensions. Others produced macro thought exercises discussing its potential social repercussions. In both cases, attempting to understand PP without considering its impact on police practices risk reproducing definitions of this PAITI detached from the reality of the patrol, and potentially promote a deterministic depiction of technology (Leese 2021). As such, the study of PP benefits from the contribution of science and technology (STS) scholars. This contrasts with the chapter on ALPR, where links with this social construction of technology theoretical framework had to be built mostly from the ground up.

The fairy tale that the social world and technology are disentangled has long been debunked (Callon 2012; Bijker 1995; Bijker et al. 2012). STS research teaches us that technology and social context (or environment) co-constitute meaning, and as such must

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[159] Supra note 29.

be studied together. PP is not an isolated technological artefact; it is ingrained within sociotechnical practices proper to the universes in which it operates (Leese, 2021).

If police departments have historically used technological innovations to be mindful of citizens' privacy, and approach PP with a human rights sensibility, it will likely be translated in similar terms. On the other hand, PP introduced in police departments that have a history of using technology to abuse their powers risk reproducing these. To avoid such outcomes, the particularities of each sociotechnical environment must be considered by police policy leaders. This means that to understand PP, one must examine the social context in which it operates. This is especially important if we postulate, like Egbert and Leese (2021), that this PAITI is the *blueprint* for how the police will engage with AI in future.

The way in which PP algorithms are co-constituted by police practitioners can be visualized in Figure 3.1 (following page). In its meekest form, PP can be understood as crime feeds AI, feeds police operations, feeds crime.[160] Each of these steps are moments of complex sensemaking by human and non-human actors, which is why it is useful to present this cycle as one of ongoing *translations* (Egbert and Leese 2020). For instance, as noted earlier, not all crimes are reported, and amongst those that are, human actors must make decisions on which of the reported crimes are fed to the AI before it intervenes. This translation explains the presence of one box for crimes, and one for crime data.

Another translation moment then happens as this data is sorted by algorithms in ways not always understandable to humans. These predictions are reviewed by analysts. Some predictions are at times discarded for technical or policy reasons. For instance, a neighborhood might have to be ignored by the algorithm for sociopolitical reasons.[161] Once some predictions are accepted, another translation step involves the decision of what to do with them (i.e., if and what preventive strategy to adopt). LEO then exercise their discretion in considering both the predictions and their superiors' instructions. This too is a crucial

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[160] A similar graphic is present in many early PP work. The earliest one can be found in Perry et al. (2013). Egbert & Leese (2020, 4) present a graphic named *Predictive policing as a chain of translation*. Some authors that tend to deemphasize the entanglement of the social and the technical present it in a linear visual (Berk 2021).

[161] This is the case with the Downtown Eastside of Vancouver, which was excluded from the VPD PP project to avoid accentuating the perception of persecution and biases toward this particularly vulnerable neighborhood. More on this decision in the empirical section of this chapter.

moment of translation.[162] This final intervention switches where the police go, influencing in turn crime data collection; and the translation cycle continues.

Figure 3.1 The Predictive Policing Cycle
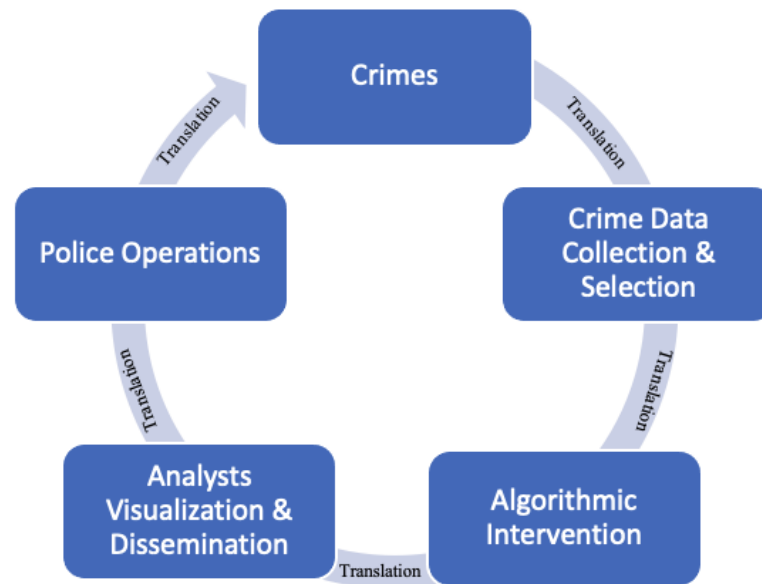
Therefore, if PP is often portrayed as a simple idea, there are multiple interventions between past crime and having officers preventing future ones. These complex moments represent ongoing translation processes that influence the sensemaking of actors involved in these sociotechnical environments. At each point, choices sway the trajectories followed by PP. Understanding how these sensemaking exercises are made requires an appreciation of how police cultures influence technological changes within services (Chan, 1996, 1997, 2003, 2007; Egbert & Leese, 2021, p. 316; Moses & Chan, 2016). Engineer-sociologists who develop PP software and policy leaders likewise have habitus that co-constitute the development of PP. This is to say that while it is tempting to portray technology as the invention of one man in a UCLA criminology department, an innovation is the result of a dense technological system composed of entangled technical and social elements. Multiple actors must be accounted for, including the AI itself.

Incidentally, not all actors engaged with PP will have the same understanding of the innovation. This has recently been underlined by Janet Chan (2021), who uses Shella

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[162] Predictions are, after all, only one amidst many technological tools and contextual considerations that patrolling officers must consider at any point in time.

Jasanoff's concept of sociotechnical imaginaries to study four different ways PP is portrayed in current debates. Sociotechnical imaginaries are defined as "collectively held, institutionally stabilized, and publicly performed visions of desirable futures, animated by shared understandings of forms of social life and social order attainable through, and supportive of, advances in science and technology" (Jassanof 2015, 4 from Chan 2021). These imaginaries form discourses which frame how people think about technology, making them imminently political. They require actors to use their foreground ideational abilities to build inventive narratives about what current event forecast for the future.

The first PP narrative Chan describes is the *utopian* view. Usually held by police leaders, this outlook promotes PP as a panacea for crime reduction. This view also assumes such goals can only be attained by purchasing expensive software, and that the computer will do everything for the human. The author notes this perception oversells PP. For instance, human interventions are still necessary in confirming predictions.

The second view on PP is the social science view, where authors unveil the assumptions behind PP programs, and question how empirically founded its rapid development in the USA has been. This view is also where police accountability concerns are raised (Lum and Isaac 2016; Moses and Chan 2016; Hunt et al. 2014; Saunders et al. 2016). Third comes the data scientist view, where authors underline data issues such as the risk for feedback loops (d'Alessandro et al. 2017). Finally, the civil rights view underlines privacy and racial bias concerns, and calls for PP being used to monitor police misconduct instead of behind used *against* the population (Robertson et al. 2020).

Chan is unapologetic in her critic of the so-called utopian view. She is not alone: Perry et al. (2013) formulate similar arguments about what they call the *myths* of PP. In both cases, the criticism lays on the idea held by PP enthusiasts that algorithms alone can solve social problems. Within law enforcement, this is accentuated by the fact that technology has long been seen as a "silver bullet" to solve deeper problems (Marx, 1995). In Europe, national defense agencies have developed predictive policing programs to respond to citizens fear of terrorism despite their accuracy rate of 1 to 100,000 (Munk, 2017). The assumption—Munk uses the word *ideology*—is that putting AI on a pedestal led national security leaders to adopt antiterrorist software despite the absence of scientific evidence that person-based PP can prevent terrorism. This is done at a phenomenal cost

considering the infringement on digital privacy this entails for the millions of false-positive individuals flagged by these algorithms.

The aura of modernity that surrounds PP is fed by police technology companies which tend to promote their services in Hollywood-like publicities, such as the ones that introduced this dissertation, where the central message is that integrating PAITI makes stopping crime seamless (Egbert and Leese 2021). This is essential to the glow of progressiveness that comes with PP within policing circles. One influential policy actor interviewed for this project revealed he often used an Axon advertisement to convince colleagues police services need to collaborate with private enterprises.[163] Another cites his favourite CSI character when describing enthusiastically the level of technological advancement of his police department.[164]

A characteristic of the imaginary of modernity proper to PP can be denoted in the way the PAITI is introduced within law enforcement agencies. The technology is typically initiated into services as field tests or research projects.[165] In Germany and Switzerland, this allowed police departments "to carve out an experimental space within which they could observe the formation of sociotechnical relations and tweak these formations such that predictive policing would align with a number of organizational and political priorities" (*Ibid.*, 45). Contrary to ALPR, PP is not an off-the-shelf product. Experimental phases allow police leaders to adapt the capacities, limits, and bearings of PP. Police leaders participating in research projects assume that framing their endeavour in scientific terms will make their work more rational. Egbert and Leese (2021) qualify this as a *technoscientific attitude*.

Regularly, this is conducted in collaboration with universities or research centers "to ensure that both methods and results could be considered 'scientifically sound,' thus creating legitimacy for predictive policing methods" (Egbert & Leese, 2021, p. 49). Yet, while the police is happy to look "scientific," it does not follow the same standards as academics. Unintended side effects could include that the police adapt outcomes measurement (how it report crimes) to satisfy PP objectives. This is something students of

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[163] Interview 31, British Columbia, September 2020.
[164] Interview 52, New Orleans, June 2020.
[165] In North America, this phase is generally called pilot projects.

COMPSTAT[166] have noted since the late 1990s. These statistical programs were praised for the rationalization of law enforcement it encouraged. Unfortunately, it made police leaders overly focused on quantifiable results such as decreased crime statistics instead of more comprehensive assessments of their work, notably community engagement (see Willis et al. 2007; Silverman 2006; Eterno and Silverman 2006).[167]

The "gamification" (Egbert & Leese, 2021) of police work that resulted from ILP and COMPSTAT programs has been ingrained in many organizational cultures. This resonates within emerging PP technological systems and is used to justify fears that this PAITI risk perpetuating historic flaws policing with the "imprimatur of impartiality" (Barocas and Selbst 2016, 673).

The way PP is currently engaged with by law enforcement gives us hints for future discussion of the policing and AI nexus in Canada. Indeed, much of the ongoing sociotechnical imaginaries quarrels over PP are about the future, not the present.

For some, current programs are only the point of the iceberg of what PP and AI in policing can achieve. Making sense of this potential increase in police power leads these actors to be wary of citizens' privacy and rights. These thought exercises engage a larger level of introspection than a simple cost/benefits analysis of predictive analytics. They are about power, state surveillance, and what PP means for democratic policing.

On the other hand, if like Berk (2021) we consider that much of the potential of PP has already been attained, then the current advances are not so fundamental. With this assessment, further developments of PP are somewhat predictable—and not as risky. Police databases will improve to reduce bias risk. Algorithms will remain place-based and become more accurate. Most importantly, the necessity of software middlemen or analysts will in the long run be reduced, enhancing the benefits of PP for the patrol.

As announced in this chapters' introduction, a central contribution of this chapter is to study which assessment of PP (point of the iceberg or maturity) LEO and police leaders tend to follow.

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[166] As a reminder: short for "Computer Statistics."

[167] Season 3 of HBO's cult series The Wire immortalized the unintended negative sides of COMPSTAT.

II – Studying Predictive Policing

This analysis benefits from a literature on PP that is both growing and rich in quality. Here I introduce a Canadian case to the study of place-based PP, the subset of PP that has received the most academic attention. It is also the most used by police services across North America. Place-based property crime application is what most police actors interviewed intuitively referred to when asked about PP. Likewise, all academic definitions of PP include such place-based practices, regardless of what theoretical boundaries they set.

The VPD B&E PP program was selected as the central case study for this chapter. This is the first and most significant place-based PP program in Canada, in terms of degree of AI intervention and importance of human-resource allocation. It is publicized and understood by VPD members as PP, and influences VPD patrolling LEO daily. The program was implemented in June 2017, following a pilot program beginning in April 2016. This allows to tap into temporal sensemaking evolutions of this PAITI. Importantly, the program was launched prior to most PP controversies presented in the previous section. As we will see, the latter influence how actors in Vancouver translate their own program. This allows to tap into sensemaking as a dynamic process both temporally and relationally.

The impact of the VPD's PP program on LEO has no match in Canada. In 2018, the Calgary Police acquired software licenses from Palantir. This includes potential PP applications, which means the CPS has the theoretical capacity to implement PP (Robertson et al. 2020). The TPS demonstrated interest in location-based predictive analytics, notably establishing a partnership with Environics Analytics and IBM (*Ibid.*) The Saskatoon Police established a partnership with the provincial government and the University of Saskatchewan. The Saskatchewan Police Predictive Analytics Lab (SPPAL) is drafting models to different ends, notably the identification of at risk youth. Like the TPS and CPS, this PP case has no current impact on the patrol. In addition, the SPPAL has not demonstrated what they are developing can be categorized as AI. Generating estimates from data repositories[168] is not the equivalent as deconstructing data repetitively and

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[168] This is what the very limited information provided by the SPPAL on the subject appears to indicate. Three consulted experts expressed doubts that the current program can be categorized as AI. Yet there is a clear ambition to move in this direction, as can be noted in the name of the laboratory.

without supervision to provide meaningful forecasts. Dynamics proper to these cases will sporadically inform this analysis of the VPD PP program. They provide insights into the evolving politics of PP in Canada. The SPPAL also help contrasts person and place-based implications of PP.

The corpus and set of interviewees for this chapter on PP is less extensive than the one on ALPR. Few Canadian police services have trialled this PAITI. Those that have are less inclined to open their books than with ALPR.[169] PP tap into contested sensemaking exercises, which contrast the consensual translation of ALPR.[170]

Former SPVM chief Marc Parent introduced me to Chief Adam Palmer following our interview, in February 2020. Contact was made through LinkedIn. Chief Palmer directed me to Dr. Ryan Prox, the VPD Special Constable in charge of their PP program. At this point, it is the only research request the team had received. After a 45-minute initial phone call, fieldwork in Vancouver was scheduled for the months of May-June 2020. Yet, this fieldwork was cancelled because of McGill's ERB COVID-19 travel restrictions. In the meantime, Prox, who in addition to his police work is also an adjunct professor at Simon Fraser University, published an article in the magazine *Police Chief*. The team received eight research requests within a week of the publication of said article.[171] The service refused six of them and accepted only two from BC universities. As a result of this sudden intake of inquiries, and because COVID 19 strains on the VPD, the decision was made to limit my access to the team to a second interview with Dr. Prox. This second conversation was held in the fall of 2020 and lasted close to two hours.

This reduced access was compensated in part by a benefit of the pandemic, which was the great variety of actors who were willing to be interviewed virtually or via phone to discuss issues linked to PAITI, notably the VPD PP program.

The corpus of interviewees specific to this chapter includes 15 actors in and around Vancouver. Out of the 15, four interviews were conducted with individuals working in Vancouver for police technology companies, including one former VPD executive. Two

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[169] ALPR a technology that has been accepted for over a decade within Canadian policymakers, police practitioners, and the public. It is also a technology few have studied in Canada despite being used for over a decade. This contributed to services being attentive to research requests, as described in Chapter 2.

[170] BWC are also similarly consensual among sworn members. More on this dynamic in Chapter 4.

[171] *Police Chief*, a publication of the International Associations of Chiefs of Police, is arguably the most prominent police policy and practitioner publication in North America.

social activists were interviewed respectively on the issues of police violence and social exclusion in the Downtown Eastside of Vancouver (DTES). Four are relevant policy actors: a high-ranking public safety actor within a BC government organization; a policy analyst working in Vancouver while the program was launched; a federal government privacy information officer; and Chris Parsons. The latter is a key interviewee and actor of ALPR policy in BC, which also discussed predictive technologies in his interview. Finally, five of the 15 are police officers in three different agencies working in the Vancouver area (two within the VPD, including SC Prox). All were ranking members with careers of at least 10 years and had some knowledge about the VPD PP program.

In addition to these 15 case-specific actors, the corpus includes interviews with 27 other police officers, mostly at the street level.[172] This non-random purposive sampling included interviewees selected through personal connections or found on different practitioners Facebook groups.[173] The semi-directed conversations were aimed at discussing LEO sensemaking of different PAITI. In about half the interviews, PP was brought forward by interviewees, when asked open-ended questions about police technologies or AI. Many made the connection between questions on AI in policing and PP—something rarely made about ALPR. When the technology was not brought forward by the officer, a question on PP was asked. On rare occasions, the concept was a novelty to the interviewee, but in most cases, it was not necessary to describe the technology. This allowed to review what different officers know about the PAITI, and what aspect(s) of it grabbed their attention.

Most early work on PP focused on interviewing members of police agencies that are privy to PP programs. Egbert and Leese (2021) for instance conducted 62 interviews with sworn members directly engaging with PP[174] within 11 police departments in

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[172] A few officers had no opinion on PP. In these cases, they diverted the question to data entry systems, or BWC. These are not counted as part of the corpus specific to this chapter.

[173] The name of these groups is kept confidential to ensure the confidentiality of interviewees. They are private group composed mostly of LEO. Their administrators accepted for me to share an open interview request.

[174] Such endeavours provide invaluable insights on how PP is emerging and how active participants to these programs project this will shape the future of AI in police agencies. It is from this type of early work that Chan (2021) develops the concept of the PP utopian sociotechnical imaginary. The latter is mostly embodied by police leaders in services allocating important human and financial resources to PP.

Germany and Switzerland.[175] To complement this this type of work, I interviewed police members that do not engage directly with predictive analytics—which represent a vast majority. I will notably argue that while the utopian imaginary is dominant, it might not be as overwhelming in policing as portrayed by most of the current PP literature. Many within police circles are skeptical of PP.

In addition to interviews, the corpus sustaining this chapter benefits from the local and national media attention given to the VPD PP program. SC Prox and Chief Palmer gave many interviews on the subject, and the service produced press releases and promotional material to inform the public about each step of the program.

Another benefit of choosing this case study is the VPD Geographic Data Analysis and Statistics Hub (GeoDASH). This allows any citizen to access local criminality data. As of 2015, anybody can now go on the website of the VPD to get a general sense of where and when crimes are happening. This includes monthly B&E statistics dating back to 2015, covering the period of activity of the VPD PP program. This was instrumental in preparing interviews, and it allowed me to examine comprehensively B&E data. This adds a degree of confidence in this analysis, as it is not based on ad hoc numbers present in often imprecise police statistical reports.[176] Making crime statistics publicly available can be considered as a transparency measure.[177]

A valuable source of information is the PhD dissertation of Dr. Prox, which focuses on the pilot project and algorithmic dimensions of the VPD PP program. As the dissertation is published in 2019, Prox writes after many of the critics of PP have been formulated, most noticeably toward PredPol. This gives us a direct look at how an actor traditionally associated with the first sociotechnical imaginary (efficiency, enthusiasm) dialogues with critics of PP. Prox for instance describes precisely how his team accounted for potential biases, dirty data problematics, and other concerns raised by academics, data specialists, and human rights activists. For instance, he explains how it was decided to exclude the

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[175] These interviews are triangulated with document analysis and focused ethnographies studying specifically how PP is integrated into daily police activities. The book by Egbert and Leese (2021) is the most complete empirical and theoretical work on PP produced to date on the old continent.

[176] The latter beg cautious analysis because of a degree of uncertainty linked to the risk of selectively presented data in ways that fit certain police narratives.

[177] It contrasts with the important clerical work to obtain (often incomplete) ALPR data from the SPVM (see Chapter 2), and the deficient collaboration of the CPS (see Chapter 4).

DTES from the project to avoid accentuating the perception of persecution and biases toward this vulnerable neighborhood.

Another key document for this chapter is a report published by the University of Toronto Citizen Lab on the state of algorithmic policing in Canada, in September 2020. This human rights analysis of PP written by law specialists provides an indicative review of bias-based and legal sensemaking of different PP program in Canada. Its critics of the PP in Vancouver will notably be reviewed and assessed, as well as Prox's reaction to the report during our second interview.[178]

These two key documents, GeoDASH crime statistics, media reports, press releases, and video evidence will be contextualized by the 15 case-specific interviews on Vancouver. This will allow to test the grounds of how local actors react to this unique utilization of AI in a Canadian policing context.

In all transparency, this corpus is not equivalent to what would have been the results of a six-week boots-on-ground fieldwork. This scenario would notably have included non-participatory observations, and more extensive document data collection. Unfortunately, the COVID-19 pandemic restricted the possibility to travel for research. This meant adapting investigative strategies, and to an extent the project in itself. In the end, this chapter will fulfill its original intention to introduce the VPD PP project from a policy perspective and analyze it in relation to international cases.

One change from my dissertation proposal is the increased emphasis on sensemaking of PP by actors not directly involved with the technology. This has been a research interest of mine since the beginning of this inquiry but has grown in theoretical centrality as a result of the data I had access to. As argued earlier, this is something that has been lacking in the literature. It provides an important initial insight into often forgotten actors when it comes to PAITI: frontline patrol officers. These are the actors who will most directly be impacted by these technologies. Yet, most research so far has focused on key ranking individuals that develop, promote or participate in PP projects. Perhaps this chapter

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[178] Authors of Citizen Lab report interviewed Prox as part of their comprehensive inquiry into PP projects in Canada. Their interview was mostly oriented around human rights implications of PP in a Canadian context. As per my interview, it was specifically targeted to PP police policy, data treatment, enforcement strategies, and communications.

will help underline a challenge these actors have not fully considered so far: that members within their own organizations might not themselves be convinced of the validity of PP.

III – The Vancouver Predictive Policing Program

In the past 20 years, violent crime rates have been on a steady decline in Canada. This allowed police services to refocus their attention to other forms of social disorders such as property crimes. This is an offence likewise marked by overall declining rates but is hit by cyclical spikes in occurrences, notably in Vancouver (Linning 2015). Residential and commercial B&E remains common in many Canadian cities, especially so in British Columbia. Place-based criminology helps understand these fluctuations: property crimes come in waves, as once a theft has success in one property, he is likely to try again in a similar location in the future.

Crime analysts at the Vancouver Police Department were "fairly successful" in spotting cyclical fluctuations in property crimes, especially in terms of residential B&Es.[179] Yet the ability to act upon these analyses was limited by the 48-hour turnout between each forecast, as it allowed crime trends to change in the meantime. With an objective to accelerate the rate and improve the quality of predictions, the Crime Analytics Advisory & Development Unit started as early as 2014 to conduct tabletop exercises in experimental statistics. The objective was to examine if the data already in the hands of the VPD could serve to develop automatic techniques which would produce quicker and more precise property crime forecasts. Precision, here, meant shorter period per prediction (different locations every two hours instead of one set for the day), and smaller geographic area—or *boxes*, in the jargon.

Inspired by encouraging trial results, the VPD secured a development partnership during a police leaders' conference in Washington, D.C., in the spring of 2014. The association included mathematicians and other academics in BC universities. It also included Latitude Geographics, a BC-based software and services company specialized in accessible and detailed geographic information mapping. Latitude's most popular service is its Geocortex Essential Solutions, which structures the design, development, and periodic updates of web apps. Using this service, the VPD developed in 2015 the aforementioned

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[179] Interview with Ryan Prox, British Columbia, September 2020.

GeoDASH machine-learning technology, whose main function is to retroactively plot crimes on city maps. In December of the same year, a public version of GeoDASH was implemented. Anybody can now go on the website of the VPD to get a general sense of where and when crimes are happening, as of a few days or at times hours beforehand. For instance, prior to going to a restaurant, one might open the app, see that theft-from-auto is common in a certain area, and decide to park a few blocks further, or on a busier street.[180]

The VPD PP algorithm stems from the structured data architecture provided with GeoDASH. Designed by geospatial engineers specialized in artificial learning neural networks, mathematicians, and place criminology experts, the result is a forecasting system giving eight predictions at two-hour intervals. Boxes are either of 100 metres or 500 metres.

The VPD first tested the proof of concept without any intervention, to examine the precision of the algorithm. It determined with this system it could capture about 75% of crimes by flagging 10% of forecasts. From April to September 2016, the department ran a pilot project focused on residential B&Es. Predictions were used to enforce targeted property crime deterrence strategies.[181] The pilot ran during day shifts, from 8000 to 1600. It included control neighborhoods and location-based crime displacement analysis.[182] Upon completion of the six-month pilot, the team conducted an eight-month evaluation of the program. Results were then presented to VPD leadership in May 2017. The decision to permanently established the program was made in June and presented to the public in July (VPD 2017). As of the fall of 2017, the program has been continuously running.

The evaluation phase of the program is worth detailing. The assessment of the pilot included interviews with personnel involved in the experiment. Moreover, the PP project team consulted the Operational Review Project division to specifically consider the impact of PP on human resources. As for the efficiency of the program in terms of crime suppression, data from April to September 2016 were compared to an average of the four previous years, in the same months and hours of the day. The team declared the results

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[180] This example was given by Ryan Prox during the press conference launching the PP program, in July 2017 (VPD 2017).

[181] More details on these strategies will be provided shortly.

[182] Temporal displacement evaluation, as was recently done in Philadelphia, was not part of the pilot. The team did, however, hint at positive indications on this front as well (VPD 2017).

were inconclusive for April (-2%), August (-1%), and September (-15%). They were conclusive in May (-21%), June (-27%), and July (-26%).

These raw numbers must be assessed with a certain reserve. One of the classic mistakes of many AI projects (and public policies in general for that matter) is to take results from a short period of time and extend it cognitively as a durable proof of concept.[183] For instance, in reporting the data from the study, the VPD emphasized a significant drop between the first and second quarters of 2016. This was the case in five of the seven preceding years, including a drop of comparable scale between the first and second trimesters in 2009 (Prox, 2020b). Cynthia Koo, co-author of the Citizen Lab report on algorithmic policing added in a TV panel she participated in with Ryan Prox that as overall crime rates in Canada have been going down in the past 20 years, it is difficult to determine how much of this decrease can be attributed to the PP program.[184] In addition, one hypothesis to consider here is that any increased police presence would organically reduce crime rates, PP program of not. These valid points explain the cautious optimism of the service when launching officially the PP program, in July 2017. As per Koo's comment, it is only reasonable to want to avoid drawing exaggerated conclusions from such a short period of time, especially if you look at policing with a certain apprehension given the human rights and social activist focus of the Citizen Lab.

Temporal distance now allows us to assess the results of the PP project in Vancouver over a four-year period. The first realization is that citywide the priority of the program, residential property crime, have steadily decreased since its launch: 2,275 in 2015, 2,140 in 2016, 1,757 in 2017, 1,560 in 2018, and 1,369 in 2019.[185] With 17.9% (2017) and 11.3% (2018) decline rates, this likely cannot only be attributed to the downward criminality trends of the past 20 years. Yes, B&E are cyclical, but variation is rarely of this scale and four consecutive years of declines cannot be ignored.

[183] Other times, data is reported in ways that feed a particular narrative and is not indicative of larger criminality trends. I must admit here that my experience working on the Dominican National Police led me to be particularly careful about this type of practices when looking at year to year data from police entities (Fournier-Simard, 2016). There is no reason to believe this is the case in Vancouver, especially since most crime data is available to the public on the VPD's website.
[184] The Agenda, TVO, Sept. 29 2020. See bibliography for full reference to the transcript of the episode.
[185] 2020 was excluded from this report given COVID completely changed crime tendencies away from residential toward commercial B&Es. This is yet another proof of the cyclical nature of B&Es.

On the other hand, numbers show the VPD has been less successful in thwarting commercial B&Es. This is an area that saw a significant uptake between 2011 (1,735) and 2016 (2,689), before the program was launched. However, after noteworthy drops in 2017 (2,209) and 2018 (2,019), it spiked back up in 2019 (2,483) before hitting record highs in 2020 (2,789).[186]

Nevertheless, residential B&E drops are significant. To help the reader appreciate the implication of such crime reductions, consider that in 2019, there were 44,581 property crimes reported in Vancouver, a 22.3% increase since 2010 (Manojlovic 2020). It is the most common form of crimes in the city. Such misbehaviour impact individuals directly and contribute greatly to the rising feeling of insecurity in the agglomeration (Yoshida-Butryn 2020). Residential property crimes are particularly pernicious as they affect one's feeling of safety in its own home. Their reduction amidst increases in all other categories of property crimes therefore concretely impacts positively the well-being of Vancouverites.

For the police, property crimes are not just statistics. A service needs to allocate important resources to investigate and record property crime instances, from major B&Es to minor theft-from-autos. Consider that in 2015, 2275 residential and 2481 commercial B&E were recorded on the territory served by the VPD, which represents roughly 13 new cases per day. Therefore, reductions of 21% to 27% in any property crime represent significant gains (or lack of loss) for citizens while saving every day dozens of hours of police work.

Granted, these numbers perhaps do not legitimize ethically the use of advance unsupervised ML, but how much algorithmic policing is okay will in the end be a political decision, not a policing one. And the balance will not be the same in every community. In the meantime, these numbers help understand why property crime is a priority for the VPD, and its enthusiasm with its current PP program. While recognizing the PP program is most likely not the sole reason of these declines, this decrease helps build a credible argument that it has contributed to declines in residential B&Es in Vancouver.

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[186] This last year can mostly be attributed as a consequence of COVID-19 lockdowns. Many businesses being closed, coupled with sudden increases in unemployment, is believed to have led to this uprise. This is not unique to Vancouver.

The lesser success in commercial B&Es does, however, raise certain questions. Perhaps this is only cyclical. Alternatively, enforcement strategies developed to thwart residential B&Es might be ill-adapted for this type of criminality. If this is the case, enforcement strategies can be adjusted, and recent studies like the one in Philadelphia might help VPD leaders on this front (Ratcliffe et al., 2021). Another possibility is that this is a data quality issue, and that characteristics that make certain businesses more vulnerable to theft cannot necessarily be translated into feedable data points. Perhaps data volume is the problem, as in all cities, one can assume there are fewer businesses than residences. In such scenarios, data problems would be difficult to catch and even harder to adjust for, as is the case with any a posteriori attempts to fix algorithms and their databases. This is after all the great risk of AI and PP, which is that it must be built on solid grounds from the start. It cannot be rushed into. If not, the AI becomes like a dog slay led by an eclectic wolf.

In any case, it will take a few more years before one can evaluate the program comprehensively. For now, the results are encouraging, but B&Es are categories of crime that notoriously fluctuate between cycles.

In terms of enforcement strategies, the predictive policing team is composed of four dedicated Community Safety Personnel (CSO) and one sworn officer, a number than can fluctuate depending on resource allocations and period of the year (Organizational Planning Unit - VPD 2017). CSO are unarmed agents; often young adults who aspire to become police officers.[187] CSO are assigned to 500m boxes to conduct high-visibility deterrence, mostly on foot. They change location every two hours, based on the AI's predictions. At times, a single sworn officer is also integrated to this first team.

In terms of resource allocation, CSO are considerably less expensive for the service than assigning sworn officers to the same areas. Smaller 100 metre boxes are assigned to the VPD property crime reduction team to focus on targeted enforcement. This is mostly done in unmarked autos, also on two-hour shifts. Select sworn officers can additionally be assigned to forecasted locations during parade briefings and are told to conduct deterrence work in these zones if they do not have higher priority calls. This allows for more granular

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[187] For readers familiar with the Montreal policing landscape, CSO at the VPD are the equivalent of white polo *Cadets* at the SPVM.

complementary crime reduction strategies, through active community interaction and intervention.

Importantly, all patrolling officers have access to forecasts and are regularly encouraged to consult them during parade briefings. Flagged boxes are automatically uploaded on their auto laptop every two hours. This connectivity allows officers to be continuously given the most recent property crime forecasts. In fact, the objective of the PP project is to give an extra tool not only to the property crime unit and dedicated CSO, but all patrolling officers. As Ryan Prox explains, to be successful, crime prevention needs the implication of all officers on duty:

> If they are writing up a report on an incident that they just attended, rather than going to the coffee shop to write it, we tell them: "go to one of the forecasted spots, park your car in the middle there and just conduct high visibility deterrence at one of the spots to enhance what we are already doing."[188]

The algorithm can account for the impact of such sporadic deterrence as it tracks VPD patrol cars. This is one of the data points included in making further predictions.

Note the service can share property-crime forecasts with all patrolling officers because they already have the means to equip them with real-time crime data with GeoDASH, established in 2015. This is considerably more advanced than the original PredPol project in LA. The latter necessitated printing handouts at the beginning of a shift, meaning officers were working out of predictions which were, after eight hours, likely imprecise. The extent of these inaccuracies is hard to determine given one of the shortcomings of many US programs is that little independent scientific research has been done to evaluate their claims (Chan 2021).

This is something Prox himself notes in his PhD dissertation.[189] In fact, an important part of his work engages how his team responded to the many shortcoming's experts have detailed against early PP cases. This is particularly true of PredPol's highly controversial (and now abandoned) association with the LAPD, which Prox is unapologetically critical of. A full chapter of his dissertation is dedicated to the unique transparency and ethical

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[188] Interview with Ryan Prox, British Columbia, September 2020.

[189] Arguably, his dissertation is not a fully independent research either. After all, Prox himself works for the service he evaluates. However, members of his dissertation committee evaluating him did not.

challenges linked to unsupervised machine learning algorithms within the field of policing.[190]

1. Algorithmic & Policing lack of Transparency

In terms of transparency, Prox explains the advantage of unsupervised ML is that by constantly improving itself, the algorithm maintains certain accuracy thresholds through time.[191] This is what allows for regular predictions in smaller boxes during precise time periods. The drawback of this gain is that the PP team cannot explain what criteria are taken into account by the algorithm for any given prediction. This means that by definition, in law enforcement or elsewhere, unsupervised machine learning means impossible —or very limited —algorithmic transparency. Prox vulgarizes this problem in our second interview:

> There are not a lot of unsupervised machine learning algorithm deployments in law enforcement. This is one of them. And it is great because it increases its accuracy and maintain certain accuracy thresholds. But the problem with it is I cannot tell you what it is doing today. I cannot tell you what are the heavier weights on today versus yesterday. What variables are more important and less important. And I cannot tell you how a forecast was generated. I could maybe within the first 48 hours of testing [the algorithm], because at that point the model had not rewritten itself… but now it has been adjusted. It gets adjusted so many times that the core mathematical structure of it is completely different than what it started off with. And nobody knows what that evolution is because it is based on its learning… It would be better to have more transparency, and it is not that we do not want it, it is just not feasible, it is not possible.[192]

In other words, what Prox is conceding here is that the VPD PP program cannot provide algorithmic transparency. He suggests this can be in part compensated with proper accountability mechanisms emanating from police agencies themselves:

> The only way we have any sort of accountability on [predictive policing] is not algorithmic accountability. What we can evaluate is outcome accountability… regardless of what the model is morphed into today… I can tell you if it has an impact on the community. And that is the only way we can hedge against giving some degree of accountability.

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[190] His Police Chief publication likewise dedicates an important section to these ethical considerations (Prox 2020b).

[191] These thresholds are set initially by the authors of the algorithm and are—ideally) periodically reviewed.

[192] Interview with Ryan Prox, British Columbia, September 2020.

Because unsupervised algorithms are by definition untransparent, the VPD suggests that to overcome this problem, services can be accountable by being transparent about the intended objective of their program, and its outcomes on the field. This means that PP evaluation must be based on a predefined system of measurement to evaluate if objectives and outcomes match, a requirement that has not traditionally been met in the United States (Perry et al. 2013; Prox 2020a). In Vancouver, these limited accountability criteria are in part to be fulfilled by the GeoDASH web app being open to the public. With this tool, anyone can assess the success of the service in thwarting property crime in the city. The service also regularly schedules internal audits of outcomes, notably measuring how much deterrence was conducted, with which strategies, and where.

While voluntary transparency measures contrast early PP program, from a policy perspective there are still many unanswered questions in terms of police accountability. Fundamentally, the VPD approach embodies a flawed understanding of transparency unfortunately typical of Canadian police services. In practice, the department is justifying the use of advanced unsupervised ML based on outcomes alone. If we follow this logic, any use of AI by police services would be acceptable if it meant reduced criminality. Yet, a true transparent demarche would have included clear disclosure measures throughout the process, in particular during the cloudy algorithmic development phase, when human intervention is crucial.

Unfortunately, the dismissive attitude of Chief Palmer toward the lone ethical question asked during the press conference announcing the program in July 2017 is revealing of the thin interpretation the VPD leadership has of transparency (de la Giroday 2016).[193] The service is not even willing to disclose how much it has paid to develop the program. The given definition of outcome accountability is likewise unsatisfying. An online app and confidential internal audits are not the same as opening the algorithm to independent external experts.

This is especially the case since the algorithm developed by the VPD was built leveraging "60 'non-crime' factors, such as neighbourhood income, area traffic density,

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[193] One side step was the attitude of Chief Palmer during the July 2017 program announcement press conference, when asked by a reporter if the VPD PP program was alike Minority Report. His answer "there is nothing dark here" was deemed dismissive by commentators (de la Giroday, 2017)

locations of illicit graffiti and even wind speed" (Ballingall 2016). If the core data updated into the algorithm remains based on three criteria (type of crime, place, time), transparency would require more engagement detailing the weight of other non-crime factors on training the initial algorithm, or at the minimum a complete disclosure of what they are. The apparent inclusion of sociodemographic data is particularly troublesome. Simply pointing at crime reduction statistics after the fact cannot be considered to fulfil transparency requirements in a democratic society (Robertson et al. 2020; Moses and Chan 2016; Brayne 2017). Not when the VPD is assigning important human resources to extremely precise locations within its city to conduct enhanced surveillance and crime persecution strategies.

Recognizing the impossibility of algorithmic transparency is a welcome indication that the department did consider ethical questions when developing their PP program. It represents more consideration than almost all departments in the Anglo-Saxon world. The results-based accountability solution proposed is, however, a dangerous, slippery slope toward the development of a surveillance state. It is everything but transparent and challenges the nature of the police enactment of the state monopoly on legitimate violence.

Despite these significant shortcomings, the service has been somewhat more open than most when it comes to engaging with external researchers. It is also true that the mere ability for citizens to access concrete credible crime data is in a way an accountability measure. Other high crime density serving police departments should certainly consider emulating GeoDASH, as any step to make Canadian policing less unaccountable represents a step forward.[194]

It remains problematic that the decision to develop and implement PP in Vancouver was done with virtually no citizen or political oversight. The July 2017 announcement was just that: an announcement. It was not the result of a thorough consultation, and the program was not approved by political leaders or assessed by external experts prior to being announced. It was just another technology, like a vest or new radios. This is the result of Canadian policing being overly tilted to the insular side of the instrumentalization-

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[194] Note this app was opened to the public before the PP program was developed. Using GeoDASH to legitimize PP is therefore in a sense only a rhetorical exercise, as the former could exist without the latter, but not the other way around.

insularity paradigm in policing.[195] Still, one must concede the VPD proceeded with more caution than it was required to. The lack of interest by the public and politicians showed that even this was not necessary. If the decision of what type of AI in acceptable for the future of policing will in the end be a political one, at least in Vancouver it appeared political leaders were not interested in playing their role.

2. PAITI Ethics

The VPD's PP ethics approach is more convincing than its transparency measures. In his dissertation, Prox details precisely why he considers location-based PP less concerning for the public than person-based applications.[196] He demonstrates an understanding of the criminological "blended theory" that grounds such programs (see Perry et al. 2013). An argumentation of how the state of the technology makes it inapplicable to violent crime but ethical for more predictable property crimes is also provided. The overall approach would appease most of Chan and Moses (2016) now classic article listing key principles on the ethical challenges of PP. Data quality checks and other strategies to account for potential biases or data errors are notably provided. One important step taken by the VPD concerns the source of data fed to the algorithm:

> Taken a step further, VPD intentionally excludes the use of police-generated data, and instead processed only citizen-generated property crime incidents. While community-generated data can still contain levels of bias and prejudices, removing police-generated data from the system inputs helps to control any underlying organizational issues, should they exist (Prox 2020b).

Citizen-generated here refers to property crime incidents that were reported initially by the public. Police-generated refers to property crimes that were reported by LEO without being called to service by citizens. The concern with including police-generated data is that past discriminatory policing practices might skew the integrity of historical data, and then be used under the cover of "neutrality" to reproduce the over policing of these neighborhoods. This is a special concern in many United States cities where legacies of racially biased police services make police-generated historical data highly suspicious.[197]

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[195] See Chapter One, Section III, for a review of this concept.

[196] This position is the one held by most social sciences experts of PP, including the author of these lines.

[197] In the USA, this is mainly the case with regards with African Americans, and other minorities be it ethnic, sexual, or religious. In Vancouver, a central concern of activists in terms of police data biases would be

Arguably, citizen-generated data are not perfect either, as the Manhattan Central Park Birdwatcher incident recently showcased.[198] Yet, this measure is seen as best practice by many experts as it at least avoids any systematic historical biases to be fed to the algorithm. While personal prejudice do influence the data, it should not be as impactful as organizational practices over extended periods (Lum and Isaac 2016).

Another measure taken by the team to alleviate potential misperceptions was to exclude the DTES of Vancouver from the PP program. Because of the high concentration of violence, substance abuse and overall vulnerability of populations living in these areas, the agency decided to exclude these zones from the program. If the algorithm makes a prediction in this sector, it automatically refuses it and suggest the next most likely forecast. In place, the VPD has a dedicated to this area a COP team focused on beat policing, proactive bridge building, and problem solving.[199]

A potential concern of some critics was that PP would become "the only game in town" and supplement other valuable crime prevention strategies. As such, the exclusion of the DTES demonstrates organizational agility and integrity in its ability to note the limits of PP. In fact, one of the understated strengths of the VPD program is that it formulated what can almost be conceptualized as a paradigmatic shift: PP is understood at its core as going hand in hand with COP. Aside from adapting its strategy to the specificities of the DTES, the VPD PP program builds from the VPD Block Watch Program. The 30+ years old network engages over 15,000 individuals, 600 groups, and 1100 captains in crime prevention programs within Vancouver (VPD 2017). Each night, a full-time paid Block Watch Coordinator and a dedicated LEO examine forecasted locations. They then communicate to the appropriate community captains by email to let them know of any increased risk. The idea is that as resource limitations only allowed the VPD to staff dedicated manpower to boxes during day shifts, at night the block watch would function as eyes on the ground for the service (Sargsyan & Prox, 2019).

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with regards to Asian and Indigenous populations, in certain sectors where such populations have historically been concentrated.

[198] In July 2020, a Canadian woman dialled 9-1-1 to complain about a black birdwatcher who had asked her to put a leash on her dog, in Central Park. This made the national news, in the aftermath of the May 24th Minneapolis events (Ransom, 2020).

[199] It is unclear if this was the plan all along. Chief Palmer at one point referred to the DTES as part of a control area in the north and east side of Vancouver.

independent oversight and restrictive regulations. This is an issue that we see across the policy board when considering principles-based approaches to the development of AI in many fields. Principles do not constrain like legislation does. No ethical approach can fix the lack of police accountability in Canada, the consequences of which could be amplified when considering PAITI. This was made evident when it was disclosed a VPD officer used Clearview AI facial recognition technologies without internal repercussions (Daflos 2021).

The absence of regulation might be troublesome for the future of PP in Canada. The important but limited transparency and ethical measures taken by the VPD were developed at the express initiative of key actors within the PP team. The service also took time to develop appropriate metrics, standards and tabletop exercises with various groups of academics over many years. Part of this diligence is the result of Ryan Prox developing this project from both a policing and academic perspective. Looking at the LAPD situation, he crafted a program with the aims of leveraging the best of PP while avoiding the undue consequences of the PredPol fiasco. The result, while it has the limits discussed throughout this chapter, is overall satisfying from an ethical standpoint.

The risk is that other services do not take those steps if proper regulations are not crafted. In fact, even Prox recognizes the most likely scenario if PP was to be generalized across Canadian police services would be through the purchase of off-the-shelf suites from private corporations. Such products are becoming increasingly affordable and represent easy solutions for services who want to jump into predictive analytics without having to go through lengthy development phases.

 PredPol (2018) even warns services against such internal undertakings in a 2018 blog post titled "So you Think you can Build your own Predictive Policing Platform." There, it enumerates the hurdles of developing PP in-house for police services and showcases the rapidity with which PredPol can lead to valuable outputs for LEO. The way it promotes its services is especially pernicious as it frames it as if any police service can adopt their suit and get breathtaking results. Yet, not all cities have enough criminality data to warrant the development of a PP program. Moreover, in many cases services cannot guarantee data-quality threshold (uniform, unbiased, subject to data-quality controls, etc.) This means in many cases it is impossible to implement any ethical big-data predictive

approach unless a comprehensive data-quality program is put into place, a process that can be measured in years not months (Kaufmann et al. 2018).

Prox himself implies in his dissertation that most adoption of PP is based on perception of progressiveness within police services. When asked about the lure of ready-made solutions, he explains:

> It is laziness, the 'easy button' effect… Many agencies do not have enough analysts, and so they are stuck… So what you do is you go out and buy PredPol and you say you are doing something, looks like you are progressive, and then you do not do anything for 10 years.[202]

This *easy* solution is the symptom of what experts characterizes as institutionalized technical deficiencies within certain services (Dupont et al., 2018). By *stuck*, Prox refers to his assessment that many services have underfunded and understaffed analytics departments. This is something that cannot be fixed simply with one-time resource allocations. It requires decades of prolonged dedication to analytics to be resolved. In the meantime, absent of such infrastructure:

> Unfortunately, technology is being used as a gap filler for neglect and lack of progress in true use of analytics within organizational structures. And I think artificial intelligence, machine learning, forecasting, they are all being used as short gap solutions to fill in where there are organizational shortcomings…. Maybe [predictive policing] is not the solution for everybody.[203]

The concern with such decisions is that if departments do not have sufficient analytics infrastructure to develop their own PP algorithm, then they likewise will not be able to ensure it is ethically developed by private providers.

The Hunchlab and PredPol of this world would probably answer that all used data remains in the hands of police services, but this by no means ensure that said data is ethically manipulated. These private enterprises do not have the same obligations to the public, and they are not accountable to political leaders either. Another problem we can expect is that once PredPol is purchased at high costs by a service, it will feel forced to use the software to prove its utility. In doing so, it risks ignoring analysts who make their own crime assessments and precision checks on certain algorithms. Ethically implementing an

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[202] *Ibid.*
[203] *Ibid.*

off-the-shelf PP suite can probably be done, but services must be willing to be held accountable to the data it makes available and how it is processed. One cannot expect a private company to take this initiative. Not until legislators accept to play their role.

This discussion on the lure of ready-made solutions underlines that the ability of a service to develop in house a PP suite is highly context dependent. First, they need large volumes of high-quality data (Perry et al. 2013). Second, they need a quality analytics department. Third, the latter must have time, as ethical and accurate PP algorithms cannot be developed in the blink of an eye. All three criteria appeared to have been met in Vancouver. This is why the story of PP in this city does not start in 2016.

The VPD has long had a reputation in Canada for being at the forefront of ILP.[204] Benoit Dupont trace this back to the continued partnership between the agency and the Simon Fraser criminology department.[205] The aforementioned Brantingham familly notably played a key role in developing strategies to help apply location intelligence to address criminality trends in Vancouver. One of their students, Kim Rossmo, was the first sworn officer to receive a PhD in criminology in Canada. He became a precursor in the development of geographic profiling algorithmic techniques.[206] Upon reception of his doctorate in 1995, he founded the first crime analysis section in Canadian policing, an early precursor of the division now led by Dr. Ryan Prox.[207]

The latter recalls that these ties with academia and this analytics prioritization has been continuous since then.[208] This means that in 2013, when the service decides to dig into the possibility of developing GeoDASH, it has access to consistent geospatial data that has been the subject of quality control checks since at least 2001. Its analytical section is also well staffed, meaning it has the ability to assign some dedicated resources over long

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[204] Interview 34, British Columbia, November 2020.

[205] Interview with Benoit Dupont, Montreal, May 2020.

[206] Rossmo famously drafted a geographic profiling conceptual framework that helped catch notorious serial rapists in the United States. The "buffer zone" and "distance decay" concepts describe how a lone wolf offender will choose targets close from his resting site, but far enough to maintain a safe distance from the location of the crime. These dimensions are mechanized in the algorithm he developed, patented, and has with limited success commercialized since then.

[207] Rossmo's division was notably instrumental to the arrest of one of Canada's most notorious serial killer, Robert Pickton, in 2002 (Fournier, 2012).

[208] Prox is in many ways the enactment of these ties, as he is both an active sworn member as well as a professor at Simon Fraser.

periods of time to experimental or developmental programs such as PP.[209] As early as 2013, spatial geographers and statisticians are already trying to develop predictive crime mapping using VPD data (Fitterer et al. 2015).

The same year, *BlueBuzzCanada* (2013) made a revealing video report on a VPD-IBM partnership to conduct big data analytics. The interview showcases the VPD analytics team priorities from its early experiences with AI. Three principles are enumerated: (1) improving the information available to patrolling officers; (2) equipping police leaders with more geographic information about crime trends to implement proactive strategies instead of reactive policing; and (3) give more information about crimes to Vancouver citizens through mapping and email alerts. This message and objectives have not changed since then, as they remained intact when justifying the development of GeoDASH and PP.

This consistency is noteworthy considering North American police inconsistencies due to two-year promotion cycles.[210] It explains why telling the story of PP in Vancouver starting in 2016 would be an incomplete depiction of the program. These circumstances also help understand why the fact the VPD implemented PP did not lead to a spread of adoption across Canadian policing.

IV – The Evolution of Predictive Policing Sensemaking

1. From Ignored to Rejected

The fact AI is increasingly becoming a topic of conversation in societal and political circles is expected to impact actors sensemaking of PP. When asked how launching his program in 2020 versus 2016 would be different, Prox[211] stated that "there would be more scrutiny now." This was said with a degree of relief: that he personally was able to start whilst AI was "not a topical thing in media or with people," but also that it slowly is becoming one, as these are "important questions." He recalls his own experience with ML, explaining that at the beginning during tabletop exercises, the team was not sensitive to social implications

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[209] Prox recalls doing some consulting for a Canadian police service of over 2000 employees that promoted on its website being technologically progressive despite only having two analytics employees. Another interviewee working for a major police technology company was astonished to see in 2015 when transferred from the United States to Canada that LEO still worked with CDs to make copies of files (Interview 45, September 2020).

[210] See Chapter 2, Section IV.

[211] Interview with Ryan Prox, British Columbia, September 2020.

of advance uses of analytics. Through research they realized while developing early versions of the algorithm "potential problematic areas" and took the initiative to "make sure not to inadvertently target specific groups." This was before the pilot project was launched.

At that point, stories criticizing PP in major cities were beginning to appear in specialized media like the *techdirt* platform (Cushing 2013).[212] While it did contribute to changes in how the VPD approached the technology, these niche stories were rarely covered by major media or the object of public debates.[213] Without saying it in these terms, Prox argued that the public sensemaking of AI in policing has evolved since then: there is now a certain degree of "paranoia" toward PAITI.[214]

This contrasts from the limited public interest when the pilot project was launched. The July 2017 press conference was indicative of this reality. Most questions are asked by one curious T-shirt wearing cameraman. A confused journalist even wonders "is that what they call AI?" There is no transparency questions or real engagement with the program from the individuals present.[215] As per news articles that report this announcement, aside from one journalist who remarks Chief Palmer is dismissive when asked about the movie Minority Report, they simply rephrase contents from the VPD press release.[216]

Fast-forward to September 2020. The Citizen Lab report (Robertson et al. 2020) shows a completely different understanding of PP within the general public. Indifference is replaced by suspicion: of the intents of the VPD, how it developed the program, how it is running it, and how it evaluates it. Granted, we can expect academics that study human rights and technology to bring about these valid questions, and to be naturally inquisitive toward the extended state-power potential of big data policing. It is their role. Arguably, they played it wonderfully: their report on algorithmic policing in Canada led to

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[212] Many of these early critics come out of New York, perhaps because of its cloudy history with COMSTAT implementation (Trujillo, 2015).
[213] One exception: in San Francisco, the debates over AI and ML in policing is already pointing its nose within public debates.
[214] When the programmed was launched in July 2017, the team produced an enthusiastic video presenting the results to the public. Said caption was since taken out of the VPD website. Prox explained it had been made on his own initiative but would not go into details.
[215] The complete footage of the press conference is available online (VPD 2017).
[216] One exception is Maryse de la Giroday's (2017) blog post.

significantly more media coverage on PP than the July 2017 launch of the program.[217] Qualitatively, the articles that describe the report show more depth than three years prior, notably discussing—albeit often one-sided—ethical dimensions and critics of PP. As an indication of the VPD's position as a PP leader, its program is mentioned in virtually all articles on the Citizen Lab report. Note this engagement is welcomed by Prox, despite reserves toward some of their conclusions.[218]

We can certainly expect a police press conference announcing the launch of a new PP would, in 2021, receive considerably more media attention than was the case in 2017. Ideally, it would be attended by technology reporters than can ask challenging questions. This shows how quickly community sensemaking of a PAITI can evolve. It is indicative of trends within the public where many went from knowing nothing about PP, so *why not*, to knowing just enough about it, so *absolutely not*.

Internal Reserves

Recent academic literature recognizes this change in public, journalistic, and academic sensemaking of PP toward more skepticism. A perception remains, however, that police members still overwhelmingly support this PAITI.[219] This is explicit for the Citizen Lab, which juxtaposes the fears of the public versus the excitement of police agencies for PP.[220] Most academic literature similarly portrays police services as homogeneously enthusiastic toward the potential of AI in policing. Yet, this might be the case because those that have studied predictive policing generally focused on actors directly involved in the development of ground-breaking cases.

In contrast, interviews for this project discussed various police technologies and were not solely focused on PP. They were principally conducted with members of North American services not directly involved with this PAITI. From this limited sample, a central argument of this chapter is that the growing skepticism—or even

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[217] About five times more news reports, in addition to multiple tv news segments, general interest radio special reporting, and national networks TV Panels during high viewing hours.

[218] His main contention is that the report puts the Saskatchewan PP project on a "pedestal," and omits to explain that person-based PP, whatever the intent, is more problematic than place-based PP.

[219] This is implicitly admitted by Prox (2020b) in the opening paragraphs of his Police Chief article. There, he notes a certain contrast between the excitement of police services and a degree of fear within the public.

[220] On this point, one criticism that can be made about this report is that it does portray an almost caricatural unidimensional police culture.

suspicion—toward PP in society is likewise present within policing circles. This underlines that there are many police cultures within organizations, and that not all sworn officers will welcome AI with open arms.

In terms of proportions, about 40% of my interviewees expressed doubts about predictive policing. Being cognizant of the existence of internal inkling toward AI might become important for leaders developing PAITI programs in the future. Equally important is recognizing the variations in why some members are unenthusiastic about this PAITI. Some expressed doubts about the true efficiency gains of PP:

> In my opinion, and I am just a lowly corporal, if you put a bunch of police officers in an area, then you are going to stop crime from happening in that area, and the crime is just going to go somewhere else.[221]

> I would need to be convinced of [predictive policing]. It sounds almost like science fiction, or like minority report with Tom Cruise. I just do not necessarily see how AI would assist us… and more specifically I do not see how it is any different than data driven policing.[222]

The reserve of these experienced officers can be summarized to the assessment that PP is not a "panacea," [223] and that the buzz around the innovation is potentially overstated. There is potentially a generational dimension to this criticism. Many sceptic actors made the link with ILP reforms of the early 2000s, noting these were also touted as the next great thing for policing, but had limited impact. Younger officers that did not experience these reforms could not make this connection.

For police leaders, effectiveness reserves are important to consider when developing future PP programs, as organizational buy-in is crucial to any successful technological rollout. LEO need to understand the reasons why a certain technology is deployed, and what their individual role is within its associated enforcement operations. Proper training and open question periods can be set up to respond to crime displacement and other concerns. This makes doubts about the effectiveness of PP arguably the easiest internal criticism to be accounted for.

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[221] Interview 27, British Columbia, May 2020.
[222] Interview 57, New Jersey, 2020.
[223] Interview with Marc Parent, Montreal, February 2020.

The same cannot be said about members who cloud doubts upon PP because of more fundamental, principle-based objections (emphases added):

> The police cannot evolve quicker than the society is willing to evolve. The first aspect to any technology really is the social acceptability analysis. I think it is unavoidable. We must always start with that. Sometimes we have great ambitions, great visions, but we need to be careful about perception. In the end we are a police _service_. We have not talked about police _force_ for decades, we talk about police _service_. And the reason why we say police _service_ is because we are at the _service_ of citizens. As such, it is important to be on the same page as citizens… Is technology going to give us net gains in increasing the performance of our organization there? Or is it just a technology to look good? [224]

This objection underlines that for some sworn members, agencies—_services_—tend to at time adopt technological innovations simply to appear progressive.[225] For this experienced leader, technology has too often increased the distance between citizens and "their" police. Once again, this Captain raises the issue of ILP, showcasing how it replaced in the 2000s efforts to establish COP in the 1990s. Timing is also part of his argument. Sensing a lack of trust toward policing during the COVID-19 pandemic, he argues that implementing big data policing in 2020 risk deteriorating police-citizen relations. From his perspective, it is therefore currently undesirable despite potential efficiency gains.

Another officer, more pessimistic, saw this lack of trust as a fatality. He argued against the "fallacy" of attempting to adopt technology to establish "impossible" trust. Instead, courts and politicians should validate any technological uses by police agencies.[226]

In a similar vein, one officer cast doubts about PAITI in general because of their impact on police discretion, which he argues is the key to positive police-citizen relations:

> Human beings make mistakes, and bad apples will get into policing. But if you go with AI, robots and robocops, then you do not have police discretion. You are speeding: you get a ticket. No matter if you are a single mother driving a broken-up car and you are speeding to pick up your kids from school after a double shift, you are getting a ticket. No nuances: you cannot give someone a break. You cannot exert discretion… I am just worried that if we go with more technology with everything going on, will the consequences of

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[224] Interview 9, Montreal, October 2020.

[225] Prox himself noted this was the case with many police leaders' interest for PP (Interview with Ryan Prox, British Columbia, September 2020).

[226] Interview 55, United States, 2020.

> a few bad apples mean more AI for all of us, and less of the good part of policing for people?[227]

For many critics, PAITI risk increasing police power. For this early career LEO, this, however, translates into decreased ability for individual officers to exercise their cherished discretion. Note this is a visible minority officer working in one of the poorest neighborhoods in the USA, and that the interview took place shortly after the George Floyd police murder and subsequent protest movement. His perception is that this call for more technology in policing is a result of increased criticism of the police, and that this will limit their ability to do their job in a "humane" way.

Such viewpoints are harder to respond to for police leaders. They touch core beliefs about what it means to be police officers, and how technology challenges this. For police policy leaders, this is why it is crucial to frame a narrative around PAITI in terms of amplification of the "good" of policing, not a transformation.

If a degree of generational divide was noted for some critics of PP, another split was more striking. That is the distinction between rural and urban LEO. With one exception, PP was perceived as inapplicable, unrealistic, and ill-advised in rural contexts. It is important to consider that in many areas of North America—including most of the Canadian territory—basic police systems such as radios often do not function. These are often low-crime rates areas where community-based approaches are favoured. This does not, however, mean that rural officers are anti-AI. Rather, their technological needs are different. Drones with night vision search and rescue ML functions would be of greater use for a park ranger. More so than PP, or ALPR for that matter.

Taken together, these different sensemaking exercises—which are at times more about AI than PP itself—showcase various internal challenges to successfully implement predictive analytics within a police department. It might not appear as natural for all sworn members as some might have portrayed in the past. This call for precaution should not be read, however, as a claim that most police officers are opposed to PP. A majority of police interviewees (about 60%) were indeed enthusiastic about the potential of PP, particularly younger officers in urban areas.

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[227] Interview 58, Los Angeles, 2020.

The idea that PP could seamlessly help departments proactively thwart criminality was for some influenced by popular TV shows, such as a LEO explaining that when he calls the CCTV operator on his shift he has befriended, he interacted with her like his favourite CSI character.[228] Other early career officers seemed particularly in tune with contemporary debates around AI in policing. Issues such as the distinction between person-based versus place-based PP, violent versus property-based crimes, or what technology meant for victim protection were regularly mentioned. These textured conversations contrast with the often brute-like image some media portray police as. One for instance noted that police officers are members of the society they protect and are likewise concerned by privacy implications of AI in different aspects of their lives.[229]

2. A "technoscientific" attitude

The VPD PP program stands out within the Canadian municipal law enforcement landscape. Technical challenges on data integrity, low crime rates, and lack of federal funding are among the reasons why not many other agencies have engaged with this PAITI. Widening the scope of analysis showcases the similarities of this case, for instance in continental Europe. Notably, a utopian sociotechnical imaginary of modernity accompanies the VPD program development. As in most other PP projects, the PAITI is introduced to the department as a pilot project. This creates an experimental moment where the impact of PP and sociotechnical relations are aligned with organizational priorities. Similar to PRECOBS in Germany, it is also framed in Vancouver as an initial step toward more AI in policing, the first immediate one being auto theft PP.[230]

While under the strict control of a few police leaders, the VPD emphasizes in its communications the role of "geospatial engineers and statisticians from academia who worked in partnership" (Prox 2020b) with the service. As Egbert and Leese (2021) recently demonstrate, this call upon the aura of academia is a strategy to legitimize the program in the eyes of the public. Police leaders participating in research projects believe framing their endeavour in scientific terms will make their work more accountable and transparent.

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[228] Interview 52, New Orleans 2020.
[229] Interview 51, United States, July 2020.
[230] In both cases, this extension has been slowed down, or not announced as per the writing of this chapter.

This technoscientific attitude notably implies increasing the legitimacy of PP by developing associations with universities. In Vancouver this is used to portray the PP program as scientifically sound, but as noted throughout this chapter it does not meet all academic transparency, ethical, and institutional ERB expectations. Palmer's dismissal of the only ethical question received during the July 2017 press conference is indicative of this attitude.

The way the results of the program are showcased by the VPD, moreover, hints at a degree of "gamification" of PP programs (Egbert and Leese 2021). The two months where it was successful are amplified, and the other four dismissed. The results are showcased as highly satisfying, no nuances.

This attitude by police leaders engaged with PP is especially intriguing considering that most of them do not have technical background in AI or ML. This is especially the case in North America, as most police leaders ascend internally and are often chosen based on seniority alone. This means police leaders must make decisions about innovations they cannot understand. On this, one of the most fascinating parts of this research project was hearing how technologist within police services consciously conducted translation exercises to ensure that their leaders would be equipped with sufficient information to make sense of PAITI.

For some, this was profoundly frustrating. One sex crime division officer explained being late for our interview because he had to show a corporal how to upload an Instagram video on his desktop.[231] Said corporal oversaw this service cybercrime unit, no less. The tendency to put sworn officers in authority positions that could be occupied by trained civilians is one of the most common critics of specialists within police services. This is not unique to analytics and cybercrime units. It can be seen in other divisions such as human resources or communications. Even the VPD that employs more civilian technologists than most services essentially staff leadership positions with sworn officers. One can understand the frustration of a trained technologist working under a sworn member in charge of cybercrime despite being unable to complete basic computer functions.

Another LEO with multiple computer science diplomas saw it differently. He explained it is his job to simplify the complexities of his work to his superiors, and that this

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[231] Interview 54, Ontario, 2020.

what he brought "to the table." He did argue that on the counterpart, good leaders must also be "humble enough" to stop technologists when they do not understand their points.[232]

One can imagine that despite the aura of progressivism around technology, explaining PP and ML to VPD leadership in the early 2010s must have been particularly arduous. Prox indeed recognizes this challenge:

> Even if you try talking about simplistic forecasting models that pre-existed before artificial intelligence and machine learning, for instance you just start talking Bayesian economics and using that as a forecasting tool, well you have now lost 99% of the people in the room… If I cannot explain basic statistics, how am I going to explain AI and unsupervised machine learning?[233]

Faced with this challenge, Prox chose a strategy contrasting with that of the previously mentioned interviewee:

> I tried to play down the technology because it is a loss, there is no net return on that. It is more: "This is what it is. This is what it will do. We have to monitor the outcomes to show transparency. This is what we are doing to ensure that there are no negative implications of what we're doing, etc.[234]

Essentially, what Prox is admitting is that most police leaders are not equipped to evaluate these steps on their own. As such, they should trust their staff that processes, and technology, are sound and ethical. In the end, even for the leaders that have a technological inclination, the only element they can fully assess is policing outcomes, i.e. property crime statistics. In other words, if the impact on the patrol is positive and numbers go down, then PP is acceptable—so long as technology people ensure all was done ethically.

Talking in terms of outcomes or simplifying complex technicalities might be the only feasible translations when it comes to advanced analytics. However, when it comes to police accountability, these approaches have limits. Without needing to understand AI and ML, VPD police leaders—not technologists, academics, or private partners—are the ones accountable for PP, and whatever biases or discriminatory practices it might inadvertently cause.[235] They are also the ones responsible for the lack of transparency many police

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[232] Interview 26, British Columbia, May 2020.
[233] Interview with Ryan Prox, British Columbia, September 2020.
[234] *Ibid*.
[235] However, this remark should not be read as a plea for all technical divisions to be directed by sworn officers to ensure a certain degree of accountability. As explained in the previous paragraphs, most actors consider

agencies have when it comes to innovations, which might become highly problematic in this era of big data policing.

The establishment of thorough regular external audit mechanisms during all phases of the PP project could ensure some degree of transparency to services such as the VPD. Random data points check from past decades, regular reviews of databases considered by the algorithm, and detailed qualitative assessments of the consistency of enforcement strategies would increase the redeemability of PP to the public. Still, this would not fix the core issue of algorithms being black boxes.

One solution path has been suggested by Parent et al. (2020). In their article titled: *Designing an **Explainable** Predictive Policing Model to Forecast Police Workforce Distribution in Cities*, [236] the authors tackle the trust problem between predictions, patrols, and police leaders. The model they suggest presents a set of decision trees that can explain algorithmic predictions. The explainable decision tree is then compared with a non-explainable neural network to ensure accuracy. The objective of this strategy is to limit internal skepticism against PP, and insure internal buy-in.

This model is still at the development phase, and it is unclear what would happen if the predictions of both systems do not match. As with many AI projects, the idea is attractive because simple, but the application is not. However, the proposed model ingeniously combines human instincts and desire to understand AI with increased quality of predictions. Such an approach would represent a significant transparency measure for future PP projects. One that avoids the almost fatality of impossible algorithmic explanations. These transcends too many AI applications, and that is by no means unique to policing.

While difficult to create, once established it is reasonable to expect these decision tree models would be relatively low maintenance, similar to their PP counterpart. It would even add a layer of insurance in the accuracy of the ML algorithm. Internally, police technologists might be willing to accept such compromises to limit negative transformative fears of human expertise losses or the lack of confidence in predictions.

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that in many departments too many technology positions, notably in cybercrime and sex crimes divisions, are occupied by career LEO instead of individuals with technology backgrounds.

[236] Bold and Italics added.

3. Big Data Policing and the Change Continuum: Policy Considerations

Advocates of PP have actively underlined how this PAITI is aligned with accepted police practices. From this perspective, while the analytical techniques are transformative "in practice, predictive policing borrows from, and builds upon, policing principles and models that are already well established (Pearsall, 2010). It is an extension of traditional policing practices" (Prox 2020a, 38). Palmer himself frames the technology first and foremost in patrolling terms: "This new predictive technology gives our front-line officers one more tool to use to supplement our traditional policing methods" (VPD 2017). By using terms such as *extension* and *supplement* VPD leadership is emphasizing the amplification side of the change continuum. In practice, for patrolling LEO, PP make traditional crime mapping more precise, making them more efficient.

While this is true, we should not downplay the profoundly transformative dimensions of PP. This PAITI is built on risk-level assessments based on data sometimes irrelevant to the criminal justice system, such as graffiti density. This goes considerably further, for instance, than first generation crime mapping software that simply provided a digital version of old "dots on the map" police strategies. The latter could noticeably be explained to patrolling LEO. As of right now, PP cannot.

As per the surveillance continuum, PP is clearly not direct nor visible to the general public. Despite spikes in media attention—more often than not as a subsidiary theme linked to a facial recognition controversy—this PAITI has not been a central preoccupation of most stakeholders. One exception is the LAPD PredPol case, which was discontinued because of its person-based applications and inability to account for evident racial biases in its forecasts (Haskins 2020). Otherwise, limited information and to an extent prospective nature of PP means many actors do not necessarily have a set mind on the technology.

Intuitively, because PP amplify some aspect of traditional policing and does not enhance direct surveillance, a plurality of police leaders generally make sense positively of this technology. Yet, during the interviews, even police leaders enthusiastic about PP said they were reluctant to implement such a program, as this was both a complex endeavour, and perceived as a public perception risk. This confirms the ways in which police policy leaders translate PP into categories that fit their organizational culture, and how increased

public attention to the policing and AI nexus induces caution in their sensemaking exercises.

The latter scenario is troublesome for police leaders and critics of law enforcement alike, as stagnation does not advance either side's agendas. It does indicate that perhaps sporadic debates over AI in policing have reached a point where the traditional safeguard against police abuse of power that is public supervision is stronger than what early students of big data policing feared (Brayne 2017). As a result, when it comes to PAITI, Canadian police services are proceeding carefully. This is seen by activists as a window of opportunity to regulate AI in the field of policing before its uses become more widespread.

As of right now the AI policy landscape in Canada as a whole is bleak. The only noticeable prominent initiative was taken by the Treasury Board of Canada Secretariat (TBS).[237] The federal agency notably developed a Directive on Automated Decision-Making, and an Algorithmic Impact Assessment tool. This is in part a principle-based approach, but it does establish partial periodic algorithmic impact assessments, outcome monitoring, data quality thresholds, and mandatory employee training requirements. This is a welcome step as it signifies a recognition by the federal government that the integration of AI in public sector services represents risks for citizens that must be accounted for.

Concretely, the directive means any replacement of human elements by AI-induced algorithms in decision-making done to service citizens in the name of the TBS must go through mandatory Algorithm Impact Assessments (AIA). All private vendors who which to be contracted by the federal government must therefore see its technology pre-vetted by federal experts, notably specialized in inadvertent programming languages biases. Such deconstructions of algorithms are by no means simple operations, and these assessments have documented limits. However, it does allow to rise flags about particularly problematic data sets and reduces algorithms' opacity.

Yet, the federal directive does not specifically address PAITI, or even the criminal justice system per se. In addition, its scope only applies to federal government agencies. Since taken effect in April 2019, the directive did, however, have a limited trickle-down effect, as some private companies publicize to municipalities and provinces that they have

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[237] The directive is available online and can be consulted here: https://www.tbs-sct.gc.ca/pol/doc-eng.aspx?id=32592 See bibliography for full reference.

completed federally requested AIA. Still, this is far away from a comprehensive national strategy. Also consider a federal directive has a similar impact as that of legislation, but it is also easier to scratch for the next government.

To put in perspective, this is a pale step compared to European Union's General Data Protection Regulation (GDPR), which presents a comprehensive regulatory framework to private data uses by public and private entities alike. The European legislation shows attention to individual rights to privacy, includes extraterritoriality dimensions, and explicit consent obligations. It also develops concepts such as the right to forget, prosecutable limits to profiling, and equips individuals with tools to protect their own information. Even then, the GDPR has been the object of many virulent critics (Rossi 2020).

While currently insufficient, directives and regulations hold an advantage on what the Citizen Lab report calls the *fate* approach. For a time, actors attempted to have legislators believe in an AI governance model where the industry would regulate itself through ethical principles. The aforementioned Montreal Declaration is the most striking example of this foregone aspiration to avoid regulation with broad ethical statements, guiding principles, and human-centric values. Develop by ML experts (some of which have questionable private interests in AI start-ups) with limited social scientist inputs, it does not provide any specific means of how these codified catchphrases could be enforced concretely. If some of the principles can guide the development of PP, there are no obligations to respect them. Even then, aside from predictive analytics, AI is being integrated into aspects of policing where these yearnings are hardly applicable. The Declaration does not help much, for instance, our thinking on facial recognition and big data surveillance of social media platforms.

Also part of the fate approach are calls by police leaders for the development of an industry code of conduct for AI and big data policing. Prox (2020a, 172) suggest that at the minimum, "there is a need to develop and draft specific guidelines and a certified industry checklist, as a proactive engagement process versus a reactive response to government intervention." This would include precisions on what algorithmic transparency should look like, how to test AI before it is used, the establishment of independent ethical review mechanisms dedicated to algorithmic policing, data integrity verification, and

programming bias checks. Such guidelines would certainly be helpful as services are bound to further assimilate AI into their daily operations throughout this decade. However, this does not fix the absence of enforcement inherent to much of the *fate* approach.

It is revealing that one of the arguments for such an approach is to avoid government intervention. It hardly protects citizens like the GDPR or even the TBS directive. Declaration, code or checklist, this never provides the same obligations for public and private entities than legislation. If principles can help guide action for the development of future technologies, they are insufficient for established uses of AI. Not when it empowers actors to the extent that PAITI do, and with that changes the nature of state surveillance. With the current absence of regulatory mechanisms, any AI deployment in policing can look suspicious from certain lenses, and hinder police-citizen relations. In this sense, an argument could therefore be made that police services should themselves be more welcoming to legislative intervention on PAITI.

At its essence the ethical and transparency approach of the VPD with its PP program is condemned to be trust-based: that the service checked the data for biases, that the algorithm is built professionally, that enforcement strategies are adequate, etc. Even if there are no reasons to believe the VPD would not be genuine in its ethical approach, this makes for an unsatisfying solution. This is especially the case considering where police-community relations stand, notably as a result of the accelerating Americanization of younger generations of Canadians.[238] AI in policing could be great, terrible, or somewhere in the middle for police-citizen relations in Canada. Where it falls will depend on the engagement of the police, civil society advocates, politicians, and the public:

> One of the biggest problems I see with the whole use of machine learning technology in the country is that it is one of these things that you patch in the sound bite in the news, and nobody really gets anything of substance behind that. There is no real understanding. So any sort of engagement—even in a biased level—is better than just this whole cloud of unknown.[239]

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[238] As per Jean-Marc Léger, interviewed by Antoine Robitaille at La Haut sur LA Coline, QUB Radio, in June 2021.

[239] Interview with Ryan Prox, British Columbia, September 2020.

For Prox, the biased perspective referred to here points to some elements of the Citizen Lab report.[240] While the exclusion of the DTES and police generated data from the PP program are welcomed decision, they have not appeased fears that PP risk perpetuating historic flaws and biases of policing elsewhere in the city with the "imprimatur of impartiality" (Barocas and Selbst 2016, 673). As a result, despite the effort to engage with ethical AI principles, the absence of transparency or official legislated oversight mechanisms still led Robertson et al. (2020) to be suspicious of its PP program.

If the current situation prevails, municipal agencies will continue to adopt PAITI without any true engagement with the public or oversight. The current cautious approach of many services toward AI will likely not last forever. A potential scenario in many cases would be the purchase of of-the-shelf software like Calgary did with *Hunchlab*. This is problematic in many ways. First, services could decide to adopt more invasive person-based AI application such as social network analysis or comportment-based PP. Many police leaders were interested in the latter, and different experts expect the next big push for AI in policing would be linked to gang crimes and include larger subsets of data than the ones used in Vancouver.

Second, private providers have no interest in telling police services if they do not meet basic threshold to establish PP programs. This includes whether specific agencies have the technological capacity to use PP in a safe and ethical way. More fundamentally, most Canadian services do not meet data quality checks including volume, consistency, and quality.[241] Any policy proposal to legislate PAITI should therefore specifically address procurement rules. Investing in AI cannot follow the same oversight rules as the purchase of new boots for LEO.

Policies restricting police procurement have started to emanate from municipal governments, mostly on the western coast of the United States. In Seattle, a city council ordinance requires all agencies (including the police) to obtain council approval for any

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[240] See supra note 81 (His main contention is that the report puts the Saskatchewan PP project on a "pedestal," and omits to explain that person-based PP, whatever the intent, is more problematic than place-based PP.)

[241] To put things in perspective, assuming the data entry program M-IRIS has been as successfully integrated by SPVM LEO as their leaders indicate, it fulfilled data quality integrity fulfillment between 2016 and 2018. To launch a PP such as that of the VPD, one would need about 10 years of data. Perhaps even more given low B&E rates in Montreal. Yet, as of right now the SPVM could develop an algorithm based on this unchecked data and run a PP program without much external oversight. Note there is no indication this is currently in the books.

purchase or deployment of surveillance technologies. Requests need to be accompanied with specifics on data collection, use, storage and sharing. This was the consequence of lack of transparency and secretive surveillance strategies by the Seattle Police Department (Crump, 2016). The ordinance applies to surveillance equipment, not data or software, but this is a valuable first step.

In Canada, provincial governments too could play a role in legislating police use of algorithmic technologies.[242] Policing is after all a provincial jurisdiction, something the BC government has historically been keen in reminding the RCMP, as seen in chapter 2. Anyhow, regulating PAITI will likely require many levels of legislation. These are too complex and important issues to be left to the TBS alone.

V – Conclusions

This dissertation dives into police sensemaking of PAITI, and its impact on democratic policing. With ALPR this meant studying how actors make sense of technologies they use regularly across time, and their translations of daily policing practices, police-citizen relations, and principles of democratic policing. In contrast, for most LEO in North America, PP is not an innovation with which they have regular contacts, if any.

The nature of the sensemaking of PP is further distinguishable because most police leaders lack the technical skills to understand how PP works, whereas ALPR are easier to explain. This chapter therefore taps into how leaders make sense of intricate AI-induce law enforcement applications at an earlier stage of their translation of the PAITI. Not that PP is brand new—early experiences are now a decade old—but it is new to the quasi totality of Canadian LEO who do not have a direct experience with the PAITI, which this chapter gives a voice to.

This dissertation argues that faced with complex police policy decisions, leaders make sense of PP by a simplification process centred on how technologies change traditional policing (enhancement versus transformation), and the type of surveillance capacities they build on (direct or indirect). On the change continuum, PP both enhances and transforms traditional policing. Technology experts within services simplify the PAITI

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[242] Note PRIME BC provided the data infrastructure for the VPD to launch its program but was otherwise uninvolved with this project.

to explain it as an enhancement of traditional dot-on-maps policing strategies to leaders. Placed-based PP is especially made sense of as a logical perpetuation of a vast tradition of crime prevention strategies rooted in criminology of place theories. Yet, this is done by using mass data, often irrelevant to the criminal justice system.

As per the surveillance continuum, person-based PP is a direct form of surveillance. Misuses in Chicago and Los Angeles demonstrates the limits and risk of such PAITI. Despite this, departments in Calgary and Toronto are not closing the door to surveillance practices of this nature. Place-based PP is less controversial but carries risks of perpetuating historic social and racial biases.

This chapter introduced a Canadian perspective to the growing interdisciplinary place-based PP literature. The VPD B&E PP unit stands out in Canada but relates to European and United States cases. It focusses on similar crimes and criminology of place theories, but rejects police generated data. In the DTES of Vancouver, a COP unit was put in place of the PP unit to avoid accentuating the perception of persecution toward historically vulnerable populations. Despite these adequate police policy decisions, lackluster transparency measures and absence of external oversight exemplifies how police technoscientific attitudes gamify PP. The VPD fails to recognize that unsupervised algorithms pose considerable ethical and policy dilemmas.

Improperly regulated, PP risk perpetuating historic flaws and biases under a false sense of algorithmic impartiality. This has consequences in terms of our second research question on democratic policing, as PP contribute to the embeddedness of police services in urban infrastructures. It leads to police presence on certain territories based on algorithms and data that cannot be explained to the targeted populations or LEO.

Another lesson learned from this chapter on PP is how it allows us to explore quick shifts in public and police sensemaking of a PAITI. Early applications of PP were received enthusiastically by most stakeholders. However, controversies raised questions on the private nature of non-criminal justice data that feed PP algorithms, and what it meant for democratic policing principles of restraint and transparency. In recent years, as the result of publicized controversial PP cases, the public understood PP is not simply a digital version of old "dots on the map" police strategies. As a result, what was once made sense of as an extension of traditional preventive policing is now under scrutiny from activists,

politicians, academic, and police leaders for the fundamental biases and privacy implications it raises. This reiterates that sensemaking is both a temporal and relational concept: police leaders sensemaking of PP evolves across time and is influenced by experiences outside of their services. This is how despite much direct interaction with PP, USA controversies taint the early enthusiasm for PP in Canada.

A plurality of officers still positively make sense of PP, as the PAITI amplify aspects of traditional policing and does not enhance direct surveillance. Yet, during the interviews, even police leaders enthusiastic about PP said they had reserves toward such a program. PP is understood as a complex endeavour (not a quick fix, as it was once the case), and perceived as a public perception risk. This confirms the ways in which police policy leaders translate PP into categories that fit their organizational culture, and how increased public attention to the policing and AI nexus induces caution in their sensemaking exercises.

Police services that wish to adopt PP in 2022 are under more scrutiny than the VPD was in 2017. This is in addition to needing to develop the internal expertise to engage with such complex analytics, ensuring they have appropriate data, and reorienting their policing priorities. These limit the prospects of PP projects in Canada. Especially since my interviews underline that internally too, PP is no longer perceived as a panacea. In that, a constant of the three PAITI studied in this dissertation is early enthusiasm reality checks. ALPR were never reinvented to their full potential, as seen in Chapter 1. As per BWC, they were promoted as a civilizing tool that would revolutionize police-citizen relations, expectations which we will see in the following chapter were never fully met.

Chapter 4: Body Worn Cameras

In the past few decades, few technologies have so visibly changed the face of policing than BWC. Accordingly, it has received more academic, journalistic, political, and public attention than all other PAITI combined. This chapter explores how local police leaders and other key policy actors make sense of this highly debated, politicized, and visible innovation. As cases multiplied in the last decade, it is an opportunity to study the dynamic sensemaking exercises police leaders continuously make on PAITI. Given the amount of information (and attention) on BWC, one element that will be examined is whether the vast amount of practitioner and academic BWC research has tilted how leaders make sense of the technology. Namely, close to a decade of work on BWC show few of the early promises of BWC have been concretized. But this knowledge does not necessarily mean that the early enthusiasm of PAITI among police and civilian actors has tainted.

The review of this literature is presented in Section I, which notably helps explains how BWC public debates have centred around the role of the police in democratic societies, and questions concerning how it enacts the state monopoly on legitimate violence. BWC were touted foremost as tools for police accountability, a fundamental principle of democratic policing. They were said to improve the precision of evidence gathering, and with that, the effectiveness of the key democratic institutions that compose the judiciary power. Such an argument resonates in Canada, where delays in our judicial system are commonly argued to be democratic failures.[243] BWC were additionally expected to have a civilizing effect on police-citizen relationships. Unfortunately, on most expectations, time has demonstrated otherwise. The changes that did occur mostly did not go the way police critics had hoped, such as the finding that BWC adoption often leads to a reduction of registered complaints against police officers (*Ibid.*) This is far from the transparency, democratizing, and civilizing panacea some hoped it would become (Koen et al. 2021). This chapter will notably examine whether these mild results and the contentious nature of police-citizens relations have changed how leaders make sense of BWC.

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243 This is most notably the case following the the Supreme Court R. v. Jordan rulling (2016 SCC 27), which stipulates that timely justice is a hallmark of a democratic society.

The chapter also dives into BWC technological transformations across time, and how this impacts leaders sensemaking. BWC hardware on its own is not considered a PAITI, but newer generations of cameras are enhanced with a myriad of software permitted by advances in the field of AI. This reality of later generations of BWC poses different policy and political challenges. Think, for instance, of the implications of BWC equipped with facial recognition, which becomes a significant intrusion on the privacy of all, including law-abiding citizens. Not only have early hopes of BWC as a civilizing panacea been disproven, but with AI, BWC have become powerful surveillance tools. The hardware cannot be separated from the software. Body Worn Cameras have evolved and are now part of big data policing. They are *Police AI Technological Innovations*—and must be understood as such.

As a result, a further theoretical contribution of this case (BWC) to the dissertation is that it allows to isolate the impact of AI on police sensemaking of technological innovations. This chapter discusses whether and how adding AI to BWC impacts actors sensemaking of BWC. On the change continuum, cameras mediate and therefore transforms the relationship between officers and citizens, but this is generally made sense of as an enhancement of the quality of traditional *beat* policing. Actors could translate BWC differently now that they are AI-induced. On the surveillance continuum, the technology is already a direct form of surveillance, but the implication of this is of a greater scale now that the footage can be fed to algorithms.

As explained in Section II on methodological considerations, to operationalize the study of BWC across time and technological transformation, this chapter uses the USA as a reference point. BWC adoption south of the 49th parallel north was stimulated by generous federal funding that followed the police killing of Michael Brown in Ferguson, Missouri, on August 9, 2014. It is estimated a majority of the 18 000 agencies in the United States adopted BWC between 2014 and 2021 (Lum et al. 2020). For a time, Canadian police services espoused a wait-and-see approach. At most, a few agencies timidly conducted pilot projects. Experts expected—and still do—this anachronous situation to be temporary. As Brown (2020) predicted, this was more a "for how long" question than a rejection of the cameras.

Section III explores recent evolutions in how BWC have been approached by Canadian policing. For many agencies the wait is over. In August 2020, in the midst of the second wave of BLM mobilization, the TPS started equipping all front-line officers with Axon BWC (Lord, 2021). That fall, the federal government announced 238.5 million would be invested over six years to equip contract policing RCMP officers across the country with BWC.[244] For its part, the Quebec government launched five distinct pilot projects with Sûreté du Québec (2021) agents in Rimouski, Beauharnois, Val-d'Or, Drummondville, and officers of the Corps de police régional Kativik, the only indigenous police service in the province. In the meantime, the Calgary Police Service has equipped all front-line officers as of 2019 with BWC.

The 2019-2021 BWC adoption trend in Canada has similarities with the implementation avalanche in the USA, which peaked between 2014 and 2016 (Lum et al. 2020). Both follow controversial deaths of young black males at the hands of white police officers caught on camera.[245] Additionally, both waves are the result of the leadership of a political figure convinced of the civilizing and transparency effect of BWC: Barack Obama in the USA with his Presidential Task Force for 21st Century Policing, and Toronto Mayor John Tory in Canada.[246] Some evaluations and sensemaking of the pros and cons of BWC have remained stable between 2014 and 2022. Canadian police, media, and politicians sensemaking of BWC are at times entrenched in early perceptions of what first generation hardware was expected to do, not their failed promises. Actors in Canada that support BWC implementation state arguments like those of a decade ago, despite evidence contradicting early, hopeful expectations. Canadian politicians in particular continue to cite the undemonstrated (or disproven) civilizing effect of the cameras to justify the major investments represented by BWC (White et al. 2021).

Yet, while the waves have resemblance, the latter arrives while there is much more research on BWC, and the technology has evolved into a PAITI. This chapter argues there is an emerging ability in the Canadian public debate to make sense of BWC as PAITI. It

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[244] This figure includes data-management costs and is a maximum amount. A Parliamentary Budget Officer report suggested the cost would likely be lower (Wodrich, 2021).

[245] In August 2014, the death of Michael Brown in Ferguson, Missouri. In May 2020, the murder of George Floyd in Minneapolis, Minnesota.

[246] In both cases BLM mobilization triggered the political decision.

discusses the case of Toronto, where AI was a key consideration by the TPS during its BWC rollout. Dynamics in Halifax and Montreal suggest that key police and political actors are likewise starting to understand BWC as PAITI. This starkly contrasts with the Calgary case, which just a few years earlier barely considered AI when it adopted torse cameras.

In section IV, I prospectively reflect on the policy implications of evolving sensemaking of BWC as PAITI. One can find solace in the analysis that select Canadian police AI policy deciders are not underestimating this dynamic. With the right policies and proper consultations, BWC can benefit police-community relations. This is promising for the future of BWC policies, and with that police-citizen relations in Canada. However, for this to be concretized political actors will have to play a bigger policy-making role than they have in past police AI policy cycles such as with ALPR. Bad habits are hard to eliminate, perhaps even more so in policing. Section V concludes.

I – Literature Review

1. BWC as PAITI

BWC are wearable audio, video, or photographic recording equipment typically worn on the torso of patrol officers (*BBC News* 2015). Footage collected by BWC can notably be used as police training material, court evidence, or to assess citizen complaints against officers (Palmer 2016). This fundamentally changes the nature of the police enactment of the state monopoly of legitimate violence on a given territory. Indeed, this equipment addition mediates and therefore transforms the relationship between the citizen and the police. It also bends LEO cherished police discretion in their rapports with superiors and opens their actions to more direct scrutiny.

Historically, drastic changes are not uncommon for police organizations. At the beginning of the 20th century, untrained police officers were sent in the streets for their *beat* with a whistle, a stick, and a set of keys.[247] The adoption of patrol cars and the radio increased the range of actions of police services, and with that their role. For some police

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[247] Set of keys were used to access phone boxes posted across urban territories to call in the central to report ongoing situations.

leaders, pundits, and many of my interviewees, integrating BWC is akin to such a transition.

In the USA, BWC are more established than PP or ALPR. This innovation has rapidly spread across the country following Michael Brown's death in Ferguson, Missouri, in August 2014 (Bud 2016). It was a priority recommendation of President Obama's Taskforce on 21st Century Policing (2015). It is estimated the federal government injected between 50 and 75 million into local agencies BWC programs during the Obama administration's second term (Huff et al. 2018; Lawshe et al. 2019, 80). The most rapid push was during the 2014-2016 period. Hyland (2018) estimates 60% of local police departments and 49% of sheriff offices fully deployed BWC by the end of this cycle. This amounts to about 47% of all agencies in the USA. While the rate of adoption slowed down by 2017, Lum et al. assess that, as of 2020, most departments in the USA are now equipped with the innovation, explaining "BWC are likely the most rapidly diffusing technologies in modern police history" (2020, 3).

The hardware is likewise present in other democratic countries including Spain, France, Israel, Mexico, and the UK. The first pilot project with BWC was conducted in Plymouth, UK, in 2005. Many Scottish agencies followed suit with evaluations of the technology (White 2014), and it is now "likely all of the police forces in the UK have either already purchased BWC or are about to purchase them" (Lum et al. 2020, 34).

As a result of this rapid growth in usage, there is a rich literature on the impacts of BWC on evidence-gathering, police-citizen relations, use of force, police complaints and data management challenges.[248] This was not always the case. Only five studies on BWC were accounted for when White conducted the first review of BWC research in 2014.[249] At the times this was striking, as a third of agencies in the USA had already adopted BWC "despite the lacuna of knowledge about their effectiveness" (Lum et al. 2020, 6).

By 2015, more than 12 completed projects and 30 additional studies were on their way to examine different aspects of BWC implementation (Lum et al. 2015). By mid-2018, there were circa 70 publicly available studies of BWC analyzing over 100 sub-studies (Lum

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[248] See among many: Laming 2019; Ariel et al. 2015; 2016; 2017; Braga et al. 2018; White 2014; Lum et al. 2019 ; 2020.

[249] Among the five, the ODS Consulting study (2011), and the Mesa Police Department Study (2013) became particularly influential for academics studying BWC (Ready & Young, 2015).

et al. 2019). By mid-2019, Lum et al. (2020) had to choose from 549 publications to conduct their meta-analysis of research on BWC impact on police-citizen behaviours.

This uptake in research is noteworthy for this chapter. Most US agencies were so-to-speak blind when adopting BWC. Federal funding was available for a short period of time, so they seized the opportunity to adopt the technology despite its unproven impacts. The reality is different for the current sequence of adoption in Canada. As the next section "A Civilizing Effect?" will detail, studies have now demonstrated BWC can no longer be touted as evidence gathering and transparency miracle formulas (Lum et al. 2020). One could reasonably expect that this uptake in available research and attention to the technology will impact how actors make sense of it.[250]

This literature does however have some limitations. Backman and Löfstrand (2021) note that 69 out of the 90 article that met their research criteria are from the field of criminology. Over eighty percent of them were conducted in the United States. This discrepancy is caused by the fact that, like BWC deployment, BWC research uptake was also the result of the Obama administration funding opportunities. For the authors, this leads to tilted understanding of police-citizen relations and policing problem in academic literature. In turn, it enhances "the representation of BWC technology as a self-evident means of improving community relations and police legitimacy in the United States" (*Ibid*, 14).

My interviews hinted that the impact of this overemphasis on unproven attributes of BWC continues to influence actors' sensemaking of BWC. As such, I concur with Backman and Löfstrand's critical assessment. I will, in addition, underline that most authors fail to consider BWC as the PAITI it has evolved into. Granted, on its own, BWC hardware is not considered a police AI technological innovation. Standard camera operations do not require algorithmic interventions. However, ongoing developments in BWC technology are such that the technology is becoming dependent on AI intervention to reach its full potential.

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[250] Please do not read this as an assumption that scientific work is a key determinant of all police policy decisions. This might not be the case. It could be that even if BWC studies were extremely promising, Canadian cities would still not have adopted them, notably for cost justifications. This lattermost paragraph merely aims to state that Canadian police services are likely aware hundreds of BWC studies have been conducted in other contexts (mainly the USA), and that this could impacts *to a degree* police leaders sensemaking of the PAITI.

BWC manufacturers sell their hardware in packages that include training material, data-management cloud solutions, and a multitude of AI-induced software. These components intervene both during data gathering and processing. In terms of the data gathering (*live*) dimensions of the technology, previous BWC products included non-AI automation, for instance triggering cameras as soon as patrol car emergency lights are switched on. Recent BWC models can be equipped with advanced mechanisms that incorporate gunshot or office down recognition systems to start recording automatically (Dombkowski 2019). Most can also be set up to save the record up to 30 or 60 seconds prior to officer activation, either in video, audio, or both. BWC footage from all cameras of a service can finally be fed *live* to different hot lists, be it licence plates, object recognition, or facial recognition software.

This latter application is perhaps the most striking. The end goal of such AI integration is to inform police officers in real-time on the citizens they encounter in any and every situation. For surveillance specialists, combining BWC and facial recognition technology is an unprecedented threat to the police-citizen power balance:

> As a surveillance device, body-worn cameras are unique in terms of their mobility and flexibility. Unlike CCTV[251] cameras, which tend to be static and mounted on walls or ceilings, body-worn cameras are unique in the sense that they are extremely mobile, interactive and flexible. The watchful gaze of a CCTV camera can be easily evaded by stepping out of its field of view. However, by clipping a body-worn camera onto an officer, the camera becomes more mobile and versatile in its capacity to record the surrounding area. The flexible mobility of body-worn cameras combined with biometric technology[252] can lead to unprecedented levels of citizen surveillance. These cameras have the potential to become a new police surveillance device aimed at gathering personal information and intelligence (Bud 2016, 118).

The AI could for instance indicate through an ear plug to LEO automatically if a car is stolen, or if a citizen is being truthful about their identity,[253] or if a *beat* officer runs into an individual on a wanted list. Importantly, all these applications are possible with the current state of AI. They are at different degrees being integrated by BWC providers, which all include at least one AI intervention to their standard product and services.

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[251] Closed-circuit television, also referred to as video surveillance.

[252] The term biometric technologies refer in this context and point in time to facial recognition software.

[253] Such an application would use controversial speech recognition technologies, which are both unproven and carry gender and racial biases (Feng et al., 2021).

From an investigative standpoint, object recognition algorithms allow services to rapidly scan through hours of BWC footage to locate objects of interest – for example a blue handbag that might contain a bomb during a terrorism alert. These tools are crucial for efficiency-seeking and financially strained police services.

The complementary nature of AI and BWC technologies is likewise prevalent at the evidence processing level. One limitation of non-AI induced BWC systems was that administratively, drafting reports and transcriptions of footage was time-consuming. It kept LEO away from their primary patrolling duties. This is one of the reasons the SPVM decided not to move forward with BWC after its 2016–2019 pilot project (SPVM 2019). Today, BWC are sold with sound and voice recognition software which allow for time efficiencies of six to one[254] in automatic detection of meaningful events and textual transcription of BWC footage (Axon 2020c). In fact, this component was tested, launched, and showcased by Axon using the Frederickton Police Department (New Brunswick) pilot project.

While some of these AI applications might appear like science fiction-like abilities, these are all existing integration of AI to BWC. This is to state that the hardware is only a fraction of how BWC can enhance and transform police work. Although it is hard to know how many services in North America use such abilities, all these applications are possible with the current state of AI. They are at different degrees being integrated by BWC providers, which all include at least one AI intervention to their standard products and services.

Conceptually, BWC standard packages fit the nominal definition this project posits as a PAITI. Cameras equipped with GDS or pre-recording algorithms impact police decision-making practices, as the decision to start recording is made by a sound recognition algorithm.[255] The integration of algorithmic intervention to BWC hardware and data management has transformed what the innovation looked like a decade ago. Cameras and evidence record management systems that are sold today cannot fulfill minimal organizational expectations without some forms of algorithmic intervention. Including

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[254] Axon publicized eight to one efficiency gains, but most assessments suggest a six to one ratio. This is still a significant help for report making.

[255] Still, a distinction of note must be made. AI is complementary to BWC (although arguably essential), whereas AI it is fundamental to ALPR or PP.

BWC as PAITI for the purpose of this dissertation is therefore a reflection of the fact they are becoming dependent on AI.

Nearly all experts agree that, barring legislative intervention, AI will continue to be integrated to BWC. Upcoming applications could for instance include object recognition that detects in real time hidden weapons on suspects or suspicious voice patterns. Perhaps even more controversial is that Axon, which dominates the BWC market, planned on incorporating facial recognition software to their services (Joh 2017a) before revisiting its policy (Axon Ethics Board, 2019b) amidst heated academic critics (Joh 2017a; Crawford 2019) and media reporting (Jackman 2020; Chokshi 2019; Lohr 2018). Smaller providers have not made the same commitment. Even without facial recognition, BWC already implemented direct identifiable surveillance of citizens and creates a visible barrier that transforms the relationship between citizens and the police (Meyer & Tanner, 2017; Ready & Young, 2015). AI integration risks distorting this transformation.

To summarize, there are two distinct elements that are expected to impact actors' sensemaking of the current BWC adoption cycle in Canada. First, now that BWC are AI-induced, the potential disruptive and transformative nature of this technology for Canadian policing could be exponential. Second, the 2014-2016 USA adoption cycle was based mostly on expectations of benefits: that BWC would have a civilizing effect on police-citizen interaction, lead to a reduction in the use of force by the police, and improve drastically evidence gathering and the quality of criminal prosecution. We now know much more about BWC impacts. This means Canadian policy makers could now be making decisions based on hundreds of articles rather than beliefs alone. The next subsection reviews this literature.

2. A Civilizing Effect?
Complaints

The hope that the integration of BWC would improve police-citizen interactions was one of the most prominent arguments for their early adoption in the USA. For citizens, recording encounters with police was expected to ensure both sides would be civil in their interactions, which was dubbed the *civilizing effect* of BWC (White 2014). Unfortunately, the only indication of appeased police-citizen relations due to BWC is that the hardware reduces the number of complaints against police officers. This is perhaps the most

consensual finding of the impact of BWC in the literature (Ariel et al. 2015; 2016; 2018; Braga et al. 2018; Braga 2020; Koen et al. 2021). Despite one exception (Groff et al. 2020), this effect was determined to be statistically significant in the meta-review of BWC impact conducted by Lum et al. (2020).

Complaints against officers are resource heavy to deal with for police services, and mentally draining for officers targeted by such grievances. Yet while their reduction is potentially a positive sign, the research on this impact is biased by the assumption that the number of citizen complaints is an accurate measure of the quality of police-citizen interactions. This can be debated. The reduction in complaints does not necessarily mean a reduction in the use of force by officers. Complaints against LEO are rare events that only give insight on one aspect of police interactions. By itself complaints cannot be used to determine BWC have had a civilizing impact on police-citizen relations. This is especially true since the scientific community is not able to explain the reasons behind this decline (Lum et al. 2019).

News and academic reports on the current state of police-citizen trust levels in the USA arguably do not indicate much positive changes since BWC were widely adopted. Aside from reduced complaints, there is no consensus in the literature of other civilizing effects of BWC. There are, however, positive findings for police professionalism. Many front-line officers assess cameras are helping them become better at their job, for instance using footage to improve how they deal with citizen resistance (Jennings et al. 2015). Another study found that BWC made officers feel more focused during their interaction with citizens (Guzik et al., 2021).

Use of Force

A second major expected benefit of early BWC implementation was diminished use of force by police officers. The academic community is still uncertain about this issue. Some research notes reductions in officers' use of force following BWC adoption (Ariel et al. 2015).[256] Others suggest the exact opposite (Ariel et al. 2016a; Yokum et al. 2017). Most quantitative or experimental research problematically does not define use of force. Also

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[256] The Ariel, Farrar, and Sutherland piece from 2015 is commonly known in the field as the Rialto Study, from the city where the randomized controlled trial took place. It is one of the early studies that had a significant impact for those enthusiastic about BWC in the USA.

questionable is the assertion that less force is always a positive sign for police-citizen relations. In some cases, studies have found BWC lead to a 15% increase in use of justified force, and no increases in uses of unjustified force (Ariel et al. 2016b).

Other researchers developed the concept of *de-policing*, arguing that BWC can make officers passive at the beginning of interventions, but that this leads to increased escalades of violence and major uses of force (Ariel et al. 2018).[257] If this is true, overall use of force diminution is not necessarily a good sign since it increases major uses.

The concept of de-policing is an ambiguous construct. In initial phases of BWC deployment in the US, many officers feared that mediating interaction through BWC would lead to self-initiated restraints by officers. These sentiments were encouraged by the perceived anti-police context in the USA.[258] Some studies do demonstrate that in certain cases, BWC wearing officers are less likely to stop, check, or arrest citizens, and more likely to have positive interactions with them (Groff et al. 2020; Ready and Young 2015; Lawrence and Peterson 2020). Nonetheless, quantitative research on officer practices has mostly provided anecdotical evidence of such behavioural changes.

For now, any civilizing or de-policing impact found by studies has been mostly context dependent. This is another way of stating that BWC has led to better citizen-police relations in some cases, worst in others, and stagnation in most. The very concept of de-policing can be good or bad dependent on the context: proactivity and increase self-initiate contacts are not necessarily a sign of civilizing relations between the police and citizens if police use of force does not also diminish (Wallace et al., 2018). In the end, aside from complaints reductions, findings on a suspected civilizing effect or on the use of force were not deemed statistically significant by Lum and colleagues in their meta-analysis (2020).

One element that appears consensual in the literature is that activation policies have an impact on officers' use of force—although it is not clear in what direction. Ariel and colleagues (2018) argue that the more police officers can deactivate their cameras (or can decide not to activate them), the more they will use violence. However, Lum et al. (2020)

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[257] Note that Wallace et al. (2018) contest altogether the finding that de-policing increases violent uses of force by the police.

[258] This narrative is present in Canada too. Many LEO have expressed they succumb to such self-restraining attitudes, including in my interviews. The Quebec National Police Academy recently launched a research project on this "priority" issue (Gendron & Faubert, 2021).

note this finding contradicts other BWC studies. Ultimately, increases or decreases in use of force linked to BWC are mostly case and organization dependent. If the extent of police use of force is still deemed problematic by civil society groups despite BWC implementation, this is likely due to underlying structural problems that preceded cameras. BWC are an (unproven) solution to inappropriate police enactments of the state monopoly on the use of force, not its cause or consequence.

Judicial Efficiency

In addition to a civilizing effect and a reduction in use of force by the police, a third major expected benefit of BWC was its utility in terms of evidence gathering. BWC footage contribution to prosecution timelines has been for early and late adopters alike one of the most common narratives of both police and judicial stakeholders (Goodall 2007; Jennings et al. 2015; Wallace et al. 2018; Gaub and White 2020). This was notably the case in Calgary. Perfecting evidence collection and securing convictions are even the central justification for BWC in certain countries (Palmer, 2016). Some of the early literature suggests that this expectation is met: research in the UK found BWC led to quicker case resolutions, notably by increasing the proportion of guilty pleas versus criminal trials (White et al. 2019 citing Goodall 2007; ODS Consulting 2011). This finding was reiterated by later comparative research (Morrow et al. 2016).

While the impact of BWC on the judicial apparatus is not directly studied by this project, the judicial dimension does impact actors' sensemaking of the PAITI. It is as such worth reviewing the literature on this aspect of BWC policy. Officers using BWC felt their reports for courts were more accurate (Koen et al. 2021), and that BWC increased their efficiency while on patrol (White 2014). LEO particularly appreciate the possibility to "narrate" events for evidentiary purposes (Braga et al 2018). Some research also found that for intimate partner violence cases, criminal charges increased when officers were wearing cameras (Owens et al. 2014), although this has not been further demonstrated since this early study. In fact, research finds that BWC do not necessarily lead to more conviction. For instance, White et al. (2019) find significantly shorter adjudication times for alcohol and drug offences, but no impact on guilty verdicts.

Note no meta-analysis was conducted on the specific issue of BWC impact on evidence gathering and prosecutions. Globally, most studies do, however, point toward

positive changes within the judiciary linked to BWC footage. One could suspect actors who promote BWC in 2021 will emphasize evidence gathering more than those doing the same in 2014, as this is an area where research has generally confirmed early hopes. The same is not true for use of force and civilizing impact.

It is, however, important to underline and emphasize the complexities of integrating BWC footage within the judicial apparatus. Merola and colleagues (2016) surveyed 321 prosecutors' offices around the USA, finding that BWC footage led to perceived increased case preparation time, complicated discovery processes, and privacy concerns about the redaction of BWC video. Logistically and technologically, managing BWC has also become increasingly complex for all actors involved. For instance, both judicial and police entities usually have independent cloud infrastructure. Without an established process, transferring a file from one to another might change the format or name of the recording, which in some instances could impact the legal validity of a given footage.[259] In addition, some judicial entities might not have the proper infrastructure to receive massive amounts of camera footage. This is to say that collecting BWC footage is not an end in itself. The data still needs to be stored, shared and managed, which presents noticeable challenges for judicial actors.[260]

Moving on, better evidence collection does not mean more transparency and accountability from police agencies. This is especially true for the treatment of complaints, which are still mostly managed internally (Henstock and Ariel, 2017). Moreover, if organizations appreciate narrating BWC footage—especially for mediatized controversial events—this is criticized by some as attempts by services to control BWC information and impose their sensemaking of certain events (Backman and Löfstrand 2021; Koen et al. 2021). The inability of the public to access rapidly footage diminishes the positive impacts of BWC. So does the fact many police agencies do not make their use and data management policies available publicly. Non-regulated deactivation by officers is especially problematic. Combined, these use-policy decisions equate to a lack of transparency which

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[259] Interview 56, United States, 2020.

[260] Coordination between judicial and police actor challenges in part explain the decision by the Quebec government to launch a pilot project with the provincial police instead of with a municipal agency.

in part explains why the innovation has not led to generalized increased trusts toward the police.

Acceptability

A final element of the literature to review is that of police and public acceptance. On the former, much early thoughts on BWC assumed police actors would resist BWC. One early study in Arizona suggested police support toward the PAITI varied significantly between services (Gaub et al., 2016). However, the difference was later attributed to the timing of data collection. The fieldwork for each case study was done at different points of BWC implementation. In one case, officers were interviewed during the pilot project. In another, six months after cameras were adopted. Nowadays, the literature generally suggests that LEO overwhelmingly support BWC. This does not mean there are no pockets of resistance to cameras. Some elements do cause tensions within services. For instance, Pickering (2020) found many officers that had footage showed in court room expressed feelings that the judiciary over relies on BWC footage. This was done at the expense of officers "word," in turn diminishing in their eyes the value of their expertise and credibility.

As per public acceptance, early scholars assumed citizens would support BWC as a tool for police accountability. This was true a decade ago, as civil rights activists were great proponents of BWC. Civil society discourses on BWC have however changed since the period of adoption in the USA. Today, given the limited results of such programs and the cost they represent, many expressed reserves toward this avenue. This is especially true given calls to "defund the police," which is in many ways antithetical to the idea of investing millions into BWC hardware and data management. A plurality of my civilian interviewees expressed such reserves. Others were strongly in favour. Policy-wise studies have determined that citizens are skeptical of giving officers' discretion in the activation of cameras. Likewise, it appears public polling generally overestimate citizen support of BWC programs (Bromberg et al. 2018).

This change in BWC support (from almost unanimous to timid) demonstrates how the sensemaking of a PAITI evolves. In most cases, early doubts about cameras were rapidly replaced by overwhelming support within services. Going the opposite way, public support toward them gradually moved toward skepticism. This directly contradicts the technological frames theory (Orlikowski & Gash, 1994), which asserts paramount

importance to early impressions of technologies into framing processes. Koen et al. (2021) for instance demonstrate through qualitative interviews within the Pennybridge Police Department how administrators' early enthusiasm toward BWC was gradually tainted by technical shortcomings and logistical burdens. Unpredicted data management cost was also problematic. As per LEO, a "flashpoint" event where a colleague was disciplined wrongly (in their translations) using BWC footage drastically changed their framing of the technology. These evolutions led to the abandonment of the service BWC program.

In this case, sensemaking of BWC went from positive to negative within a service. For police policy leaders, it demonstrates that actors' translations and framing of BWC can unpredictably evolve over time. This means that administrators, if they study cases such as Pennybridge, can better understand how to avoid similar situations. Studying USA experiences might help change negative views and select the appropriate use policies for Canadian upcoming BWC adoptions. One key lesson that can be drawn from our neighbors in the south is that trust in BWC is context dependent: on policy, organization, and history of police-citizen relations in each community. This means accepting that:

> "…techno-fixes by themselves will not resolve underlying issues of fractured community–police relations, including ongoing issues of racial and ethnic antagonism and colonialism, and may even exacerbate these tensions. True reform requires establishing bonds of trust between communities and police that acknowledge the importance of procedural treatment, which may be supported by—but are not dependent on—BWC" (Saint Louis et al. 2019, 312).

This is another way to state that BWC are not a panacea that will automatically bring about police legitimacy, transparency, and accountability. BWC can only contribute to better police-community relations under appropriate circumstances—and the right policies. For the police, this means understanding that, on its own, a PAITI does not provide accountability to the public. Especially if services are secretive about how they use said technology.

For the moment, BWC are poorly regulated in Canada. Use policies are generally not public, and services still maintain control over footage, dismissing the hope that they are being implemented in the name of transparency and accountability. In some regards, this chapter will suggest early Canadian adopters are repeating some of the mistakes' services in the USA have made.

To summarize, first, the vast US-centric BWC literature has not found a civilizing effect of BWC but did find it decreases complaints against officers. Second, there is no demonstrated consistent impact of BWC on officers' use of force. Third, most evidence suggests that BWC are welcome additions to evidence gathering and judicial procedures. Fourth, more research is needed to confirm what policies lead to the greatest benefits of the PAITI, notably on transparency measures, data protection, and deactivation. Finally, contrary to initial expectation, police officers are generally open to BWC, but their public acceptance is reducing, and dependent on policies. As per the connection between AI and BWC, this is at time mentioned by authors in passing but has not been a focus of the literature. The complexity of data management has however been well documented.

Analytically, this evidence should not be confused with the sensemaking on which this evidence is based. Two people can read the same report and draw conflicting conclusions, as early translations of BWC impact how one understands a study. One way to examine whether BWC literature impacts police sensemaking is to look at how agencies approach the PAITI. For instance, are pilot projects and use-policies different from early BWC projects. This and other methodological precisions proper to this chapter are detailed in the next section.

II – Studying BWC

In contrast to what I did in chapters 2 and 3 regarding ALPR and PP, respectively, I selected to discuss BWC as PAITI in Canada from a general perspective instead of presenting a detailed case study. This is the result of the different role AI plays in this innovation, the compounded nature of the data, and timing considerations linked to the Canadian BWC landscape in 2019-2021. This macro approach facilitated methodological flexibility. Noticeably, most of this chapter was written by the time the TPS had adopted BWC. Eight months later, the service published its use policies. Not studying how the TPS recognized BWC as PAITI and the way it adapted to privacy concerns linked to AI would have limited the analytical insight of this chapter.

Studying BWC as PAITI in Canada posed different challenges than the previous empirical chapters of this dissertation. A first reason is that it studies an innovation that was not initially considered a PAITI. In contrast, PP and ALPR are since their appearance

AI-induced. This evolution in BWC influences how actors make sense of it, and what it means for policing. A second challenge was linked to policies. Most police services in Canada do not publish their internal practices documents, including BWC procedures. In addition, given the salience of BWC in the public debate and continuous journalistic and academic requests, services are less inclined to discuss this PAITI than less controversial technologies, i.e., ALPR. This meant that while select interviews were still important to my démarche, I had to lean on content analysis more than for previous chapter. This includes the published evaluations of BWC by services between 2015 and 2020: Calgary, Edmonton, Halifax, Hamilton, Montreal, and Toronto.[261] These provided useful insights on whether AI has been integral to BWC sensemaking.

The assemblage of data, the nature of the PAITI, and the prospective angle of my contribution contrast the empiricism of the ALPR and PP chapters. When this project started, Calgary was the only major police service who had decided to adopt BWC for all front-line officers. It was determined as the key focus for this chapter. Yet, access difficulties in Calgary contrasted efficient data collection elsewhere, notably in Montreal, and later Toronto. Moreover, almost all interviewees in Canada at least at one point discussed BWC. Systematic collection of documents from various services likewise provided fruitful insights on aggregated translation of the PAITI. As a result, I selected to write what the data allowed me to carve out: a macro perspective on the inability of most police services in Canada to recognize BWC as PAITI. The analysis is textured by dives into a variation of complementary moments, with an emphasis on Calgary and Toronto.

Calgary is stressed as it was the first major police service to adopt BWC for all front-line officers in 2017-2019. As per Toronto, this case was not initially prioritized for this research project. [262] Yet, the situation rapidly evolved, with the TPS adopting BWC amidst a range of police reforms in the summer of 2020. Interviews, data collection, and

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[261] In other cases, not enough information is public, for instance in Fredericton. This is even criticized by other Canadian police services (Worster & Moore, 2019). The rare information on Fredericton BWC AI-application was found on the Axon website (Axon, 2020c). Other pilots were conducted in a pre-AI era, such as Victoria in 2009, and was as such excluded.

[262] Toronto was initially included as a potential research locale in my proposal, defended in December 2019. Following discussions with my committee, it was no longer prioritized, but options were kept opened. Given how similar it had been with the Montreal case, it was strategically more efficient to keep the latter, which was already included for ALPR. However, the situation evolved in 2020, inciting me to re-integrate Toronto in the chapter.

analysis for this PAITI were almost completed at that point. But the developments begged to be addressed: not only is the TPS the first service to reveal its BWC policies, but it also refers directly to machine learning and facial recognition in its BWC Frequently Asked Questions (FAQ) page. This is a first in Canada, and a major contrast with early adoption cases, namely Calgary. It indicates that AI is becoming a consideration proper to BWC adoption in Canada.

Touching upon non-adoption examples was a priority as the great majority of Canadian police services do not use this technology. None of my interviewees who work north of the 49th parallel had experience with cameras. As such, a chapter on sensemaking of BWC as PAITI in Canada in 2020 focusing exclusively on the rare occasion where the technology is used would have a limited analytical insight. Before August 2020, there were many similarities between the Montreal[263] and Toronto cases. In both instances, pilot projects demonstrated unsatisfactory methodologies, and rejection was based primarily on money. Montreal had been favoured, and will be included, because multiple interviews on ALPR were scheduled with members of the SPVM.[264] Having two technologies to contrast during discussions was a helpful strategy to dig into actors sensemaking. Hamilton and Halifax are other cases of non-adoption included. There, the active political role of police boards concerned with AI considerations is what gathers inclusion in this chapter.

In terms of corpus, this chapter is first based on over 40 interviews that touched on BWC as PAITI. Most of these interviews were either focused on AI in policing generally, or a specific AI application, for instance ALPR in Montreal. Others were specifically dedicated to BWC in Calgary, or in the police service in which the LEO operated. If Canadian police departments tend to be discrete on BWC, individual LEO were generally enthusiastic to discuss this subject.[265] Cameras are now a reality of policing in North America, and a subject on which many officers have developed their own sensemaking.

[263] These points will be expanded in sections IV and V of this Chapter.
[264] Montreal will not be a central subject of this Chapter. However, a plurality of the interviews conducted on ALPRs also addressed BWC. This allowed to contrast sensemaking of two technologies within the same context. The service notably published a 240 pages document on a pilot project conducted in 2017 on BWC (SPVM, 2019). This report, and the pilot, were discussed with various SPVM members. This report is complemented by experimental research conducted by CICC scholars (Boivin et al., 2017; Boivin & Gendron, 2021). One evaluation was conducted jointly with an SPVM researcher (Boivin & D'Elia, 2020). News articles and press releases emanating from Montreal were likewise assessed.
[265] The confidentiality or anonymity of most interviews likely helped officers speak freely.

One of the key reasons to include USA officers in this project was to contrast their sensemaking with that of their Canadian counterparts. One interview was conducted with the officer in charge of the procurement and roll-out of BWC in his major rural police service department in the USA.[266]

BWC evaluations from services across the country were collected, notably in Montreal, Halifax, Edmonton, and Hamilton. Privacy commissioners BWC guidelines, news reports, and police press releases will also be referenced. Local and national outlets were systematically investigated to study whether the media makes sense of BWC as a PAITI. Select police technology companies' website were also reviews. AXON notably publicized its new AI-induced transcription service by showcasing the Fredericton police, in New Brunswick.

As per the two deeper dives that will be taken, the CPS was particularly hard to access for an external researcher. Many documents elsewhere public are not published online.[267] For instance, the BWC pilot project report is not available, contrary to most services. However, the service conducted in 2020 an evaluation of BWC implementation, which it eventually published (Budd, 2021). In addition, many media appearances and releases showcase CPS sworn officers discussing BWC implementation. For instance, Staff Sergeant Travis Baker, which led the BWC project in Calgary, participated in a 75-minute special panel with Axon Canada (Axon, 2020b). This allows to tap into CPS sensemaking of the technology, or at least what they want to project. Note that, as is usually the case in Canada, BWC use policies in Calgary are not public. In term of interviews, of note for Calgary is a high-ranking member of the CPS, a member of the police commission, and six members of the community, including a former police officer.[268]

Finally, Toronto is the case that has received the most academic and media attention in Canada. It is also a city where we see initial BWC rejection in 2016 when AI is not truly debated, and in contrast later adoption in 2020 where AI is prominent. In the latter, very few articles do not mention the issue of facial recognition or automatic transcription. In

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[266] Note this interview was anonymous, at the request of the officer.

[267] The fact most procedural documents are unavailable to the public contrast with the emphasis on transparency on the CPS website.

[268] Unfortunately, no member of the team in charge of this project was able to be interviewed, despite numerous efforts.

terms of documentation, the absence of AI dimensions in the 2016 pilot report of the TPS is also noteworthy, whereas the 2021 TPS BWC FAQ section answers multiple questions on BWC AI applications. BWC documentation on the Toronto case also includes use policies (published in 2021), a first in Canada. The Toronto Police Board likewise passed recommendations in the summer of 2020, which are integral to understand BWC adoption by the TPS.

III – BWC in Canada (2014-2021)

1. Calgary Police Service

In 2013, the Amherstburg Police Service became the first department in Canada to adopt BWC. This agency of fewer than 30 sworn members is located in the suburb of Detroit, Michigan (south of Windsor, Ontario). It was since amalgamated with the Windsor Police, which terminated its BWC program.[269] The first major police service to announce its intention to standardize BWC for all front-line officers in Canada is the CPS, in Calgary, Alberta. Its initial attempt to launch a citywide pilot program dates to the first trimester of 2014. This first BWC program put to tender by the CPS aimed at procuring over a thousand units. Their technical particularity was that it linked chest-mounted cameras with Motorola two-way radios. This desired featured proved to be the doom of this first BWC program. The hardware exhibited repeated technical failures which jeopardize the citywide police communication infrastructure. Local news outlets reported police-issued media radios at time broadcasted personal conversation between patrol officers discussing paperwork, or, anecdotally, the latest American Idol episode (Passifume, 2020). Camera rollout citywide started in 2015, with an expected citywide implementation to be completed by 2017. Yet the difficulties proved to be unsurmountable, and the 1,3 million $ program was scrapped in September 2016 (Grant 2016). The city sued Safety Innovations Inc. for close to half of this amount (Passifume 2018).

By February 2018, the CPS was ready for a second try. Only this time, it approached the PAITI more carefully. A three-month trial period comparing three different vendors including 47 cameras was launched. Such procedures are considered best practices in the

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[269] This case has little in common with what is happening in the rest of the country, notably because of the proximity with the USA, the short span of the program, and the size of the agency.

USA for BWC adoption. The idea is that a selected group of officers in different areas served by an agency experience, over a few weeks, three different cameras to see how they pass the test of reality. South of the border, this real-life test is usually coupled with additional experimental scenarios (a use of force arrest, a foot race, a night raid) which allow for services to compare cameras in straining contexts.[270] Out of the three potential vendors, the CPS selected Axon. A second pilot-project phase[271] was conducted in the fall, with close to 100 Axon cameras. This lasted three months. In November 2018, a citywide rollout was approved by the Calgary Police Commission (CPC). As of May 2019, 1515 cameras were progressively integrated to all LEO at the CPS over a six-month period (Budd 2021).

A year later, between June and November 2020, a CPS analyst conducted an internal evaluation project of the BWC program. A recent hire, which was not involved in the rollout of the program, was put in charge of this review. The Budd BWC Report was made public in 2021, contrary to most content related to previous phases of the rollout. This document and two interviews help draw a portrait of how actors in Calgary make sense of its BWC program. One is with a high-ranking member of the CPS. Another is with a member of the CPC.

A first element that comes up from this combination of sources is the level of support in Calgary among a wide range of actors for BWC. According to the Budd report, there are no pockets of resistance toward the technology. This is something the CPS leadership had feared when launching the original BWC program in 2014. The report notably references the continued support of the police leadership, a wide proportion of LEO, the CPS investigative units, and the CPS Professional Standards Section (PSS). Yet, the first year of BWC did create some turbulence amidst front-line officers:

> Although officers are supportive of BWC use for its evidentiary benefits and power to efficiently resolve formal complaints, they are critical of how BWC video is used internally to discipline members. Perceptions of unfair accountability with how BWC is used by PSS and a lack of support from leadership externally on public issues has led many to say they have more

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[270] Interview 56, United States, 2020.

[271] To be precise, the CPS uses the terminology "research phase" instead of pilot project. Standardized vocabulary is used to ease the reading.

stress and worry on the job, less trust in leadership, and has contributed to a reduction in morale (Budd 2021, 4).

The ranking CPS member did mention uneasiness amidst members with how the video evidence was managed, and that at times the front lines felt unsupported by the hierarchy with regards to public perception. He argued such apprehensions were mostly expected given the transformative nature of cameras for police work, and that the transition was overall a success. In his opinion, the quality of the relationship between the police leadership and the front line in Calgary facilitated this transition.

Such a remark is not unprecedented. One element I learned interviewing dozens of police leaders and LEO is that leaders typically consider they are close and attentive to the front lines. The latter, however, generally feels they do not have enough ways to have their grievances heard by leaders. [272] The disciplinary dimension of the previous quote refers to the fact police superiors can review footage of police interaction and evaluate the performance of front-line officers. This could lead to disciplinary action, none of which was indicated as of the time of the report. All in all, despite some unease about performance reviews, the main element to underline internally is the reported almost unanimous support toward BWC among sworn members.

Externally, the BWC program evaluation report affirms the support for BWC is likewise widespread, citing Crown Prosecutors, and the Alberta Serious Incident Response Team as favourable partners. One mental health emergency expert likewise express strong support to the technology.[273] Another key ally to the BWC rollout was the provincial police union. Media reports indicate this influential organization voiced strong support to the CPS during all phases of the rollout (Passifume, 2020). Note police unions do not have direct decision-making power in procurement decisions. However, they play a role in how members make sense of leaders' decisions. Referencing the continued support of the union

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[272] As I was not able to secure an interview with a CPS front-line officer, I cannot speak to this tendency in Calgary. I will note the police union representatives indicated having a good working relationship with the CPS leadership (Passifume, 2020). This contrasts with some personality conflicts over the years in other Canadian cities. One case comes to mind naturally: the tumultuous character of the Montreal Police Union leader, Yves Francoeur, which is an example of how unions and services are not always on the same page.

[273] Interview 44, Calgary, October 2020.

to the BWC deployment, the CPC member noted "I do not know how you would do it without it." [274]

The Budd report also argues that the cameras are supported by citizens, and that they improve citizen-police relations. This assessment is based on surface survey data and limited empirical research. A notable feature of this PAITI implementation is the lack of involvement of the public in the process. For this chapter, eight interviews were conducted with an ensemble of community organizers, BIA chairs, involved citizens, and non-CPS actors involved in public security in Calgary. Most actors were not aware the service had adopted the cameras. One interviewee deplored the absence of public consultation on the issue of BWC.[275] When asked about the program, all interviewees supported BWC and assessed that most of their network did as well.

Note Calgary is one of the bedrocks of the conservative movement in Canada. Many actors argued that the city, in comparison to the rest of the country, was more "pro-police." This translation was potentially ever more apparent to these interviewees as the virtual fieldwork was conducted while the defund the police movements in major cities like Toronto was at its highest point. This dimension was often brought up by interviewees to explain public deference—a word used by two interviewees—toward the CPS.[276] Many pointed ALPR, radars, and red-light cameras were considerably more present in Calgary than in other major Canadian cities, arguing this was a result of this conservative environment.[277]

In any case, there was very limited opposition from community actors in Calgary toward BWC. When questions were raised, it was on use policies or citizen privacy, not the cameras themselves. Granted, the role of conservatism and whether citizens in Calgary are more pro-police than elsewhere is not the focus of this research. But this perception does impact CPS officers sensemaking. On this, the ranking CPS officer argues that public support has been a driver of technological change in Calgary:

> Public support certainly helps technological innovation… The police have historically had very high public support, even more so than our neighbours to the north of Edmonton… Obviously in recent days that does not seem this

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[274] Interview 38, Calgary, June 2020.
[275] Interview 35, Calgary, September 2020.
[276] Interview 42, Calgary, July 2020; Interview 39, Calgary, June 2020.
[277] Interview 41, Calgary, July 2020.

way, but I think the silent majority still supports the police… To have this type of public support helps in that, for instance, we do not get a lot of pushbacks when it comes to police budgets. Although the last couple of months that has changed, but that is everywhere. Still, this support has allowed us to make the type of investments in technology we have made.[278]

When probed about what he referenced to when mentioning "the last couple of months," the officer mentions two elements. First, the second wave of BLM mobilization, in the summer of 2020. The ranking officer explains that even in a city that strongly support the police, the service would have had to proceed with more caution in its BWC implementation in a post-Minneapolis world. "The last couple of months" additionally references the state of the Alberta economy. Highly dependent on oil prices, the financial situation of all levels of governments and agencies were depleted as a result of Covid 19 stay at home order and travel restrictions. This is a new reality for the CPS, for whom funding was never a problem—frustratingly so for some community services in the city.[279]

This continuous funding, along with conservatism/law-and-order propensities, was brought forward by almost all actors during our interviews. Combined, these two factors explain, for local actors, why BWC were implemented in Calgary before elsewhere in Canada. Both the officer and CPC member consider this played a key role in BWC adoption in Calgary:

> It was a fairly significant capital investment, which was made based on a fairly affluent city, and affluent police service. I do not know that we would make that same investment at this time, because well, the financial environment, the economic environment, has changed drastically. So I think money is probably a factor. I mean, I am sure it is. I look at it today from an organizational standpoint and I think we could not afford it given our revenues today; these kinds of opportunities would not be considered, let alone come to fruition.[280]

> Calgary has had an economic climate that has allowed it to take advantage of technological opportunities. Basically we had the money. There is nothing much now, but five, ten, fifteen years ago, there was a strong economic environment in Calgary, so paying for things like new technology has not

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[278] Interview 40, Calgary, July 2020.
[279] Interview 39, Calgary, June 2020.
[280] Interview 40, Calgary, July 2020.

been a barrier that it might be in another environment, or even that it might be today here.[281]

Interestingly, both actors describe the services' affluent fund's role in the decision to implement BWC in contrast to the reality of 2020. One element to consider is that the cost of maintaining this PAITI program is higher and less predictable than the procurement itself. The cost of purchasing hardware and running a pilot program is somewhat easy to foresee. Services regularly run such evaluations, and BWC companies usually provide the hardware for evaluation periods for free. The cost of administering a service-wide BWC program is harder to evaluate—in particular if yours is the first program in the county. It includes data storing and management dimensions, training, replacement of hardware, and other administrative expenses. Cost of programs is also context dependent, as privacy commissioners reports and reactions from legislators or judicial actors after BWC pilots are established can induce variations in expenses.

In the end, the annual cost of the CPS BWC program is evaluated at about 5 million dollars (Budd 2021), a useful information for other Canadian police services. Note the CPS was careful in not announcing how much they expected the program would cost once fully establish.[282] In any case, whether this annual cost is higher or lower than expected, five million in 2020 when police budgets are contracting is probably a harder pill to swallow than in 2017 when budgets were expanding.

At the time of the interviews with Calgary actors, the TPS had indicated signs toward BWC adoption. When asked if he had any advice or lessons learned from implementing BWC in Calgary, the CPS ranking officer said half-jokingly: "Have somebody else pay for it." This is part the result of the higher-than-expected cost of running the program once established. But cost is not the only reason behind this advice. The one-year evaluation report underlines that many of the early complications of the BWC program—and unexpected costs—were linked to judicial uses of BWC data.

While the police enact the state monopoly on legitimate violence, it is only one part of the complex criminal justice system conceptualized by Weber. The CPS officers argued that an efficient BWC program should be crafted from the beginning to the needs of the

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[281] Interview 38, Calgary, June 2020.
[282] Once again, the CPS prides itself with transparency on its website. This was not my experience.

judicial apparatus. Adapting police practices to meet judicial expectation is arguably easier to do than reforming judicial procedures to meet imperfect BWC data. As such, the CPS leader argued BWC implementation should be spearheaded by provincial governments. This is, after all, the jurisdiction that fund and manages both the courts and police services.

From a public administration perspective, having provincial governments direct BWC pilots is likely the most efficient way to assess comprehensively the impact and costs of the PAITI on the judiciary. It also avoids the complications of having multiple police services adopt BWC from different providers and asking distinctive alterations from judicial actors. Provincial governments can also be perceived as impartial actors in the development of such programs, an added benefit given the current suspicious climate toward police services. It is also where the money originates, as municipal police services are creations of provincial governments, which funds them.

In Quebec, the SPVM failed to convince the provincial government that BWC in the province should start in Montreal.[283] Instead, the provincial government decided to develop pilot projects with different sections of the provincial police force (SQ), in both rural and urban environments. This is likely the easiest way to insure BWC programs are crafted both for the police and the courts.[284]

In terms of policy, Calgary's one-year evaluation notes important inconsistencies in training, use policies, and practices related to BWC. The report suggests areas to work on, notably to standardize activation policies, and clearer definitions of what compliance to these policies represents. Without going into the details of the policy suggestions, the CPS leader underlined the importance of the mere existence of the report:

> I think that is often forgotten in some police agencies, they get the shiny new toy and then they forget to check to see if it actually works… Here we finally understood that we need to evaluate acquisitions afterward, and not just jump to next one.[285]

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[283] The SPVM argument was based on its size and the fact it evolves in an urban environment (SPVM, 2020).
[284] We are still, however, very early in this process. One thing to note, for instance, is that the SQ is a FR user since 2020. Nothing has been announced as to whether BWC footage collected in trials could or not be scanned through FR software.
[285] Interview 40, Calgary, July 2020.

Adopting technologies and then forgetting to do follow-ups is common in policing, and by no means unique to the CPS.[286] The officer contrasted this careful approach with the first abandoned BWC program in Calgary. One of the problems he underlined was the lack of "understanding" and "expectations*"* of actors involved in the initial process, which was why "the second round around" the process was more "robust." This once again points to the potential benefit of having a provincial actor mediate BWC transition with the police and judiciary actors alike. It also raises doubts about the desire of the RCMP to swiftly adopt BWC across Canada (Wodrich, 2021). The RCMP is renowned for not working well with other agencies (Lunney, 2012), as noted with the ALPR case study in BC.

Moving on, the report is limited in terms of policy suggestions for training, policy and best practices, often merely stating they need to be revised. It does, however, give more information on unpublished BWC activation and use policies, as well as on officer compliance. On this last point, LEO not regularly using cameras represent a marginal proportion of CPS officers. Yet, it still points to the fact that activation in Calgary remains in the hands of officers. As seen in the literature review, this considerably limits the potential for the PAITI to be used as a police accountability measure. Automatic activation is accepted as a necessary condition to ensure all situations are filmed, not only those handpicked by officers. This is especially problematic since the CPS manual activation policy is deemed too vague, even internally (Budd 2021).

To be fair, the CPS officially adopted BWC as evidence-gathering tools, not for accountability. But there is no reason it could not do both. Even if they control activation, many CPS officers still grumbled about how the data collected is used by the service. LEO expressed wishes to control how the material is managed once collected. The frustration comes from reviews superiors make of BWC footage to assess the work of their front-line officers. Note this cannot be considered as anything other than a mild accountability measure, as the data is still controlled entirely internally.

The desire of many within the CPS to implement BWC but to limit accountability measures associated to the technology perhaps stems from the lack of clarity over what the services define as transparency and accountability. This is noted by the internal evaluation

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[286] Multiple SPVM officers made similar statements with regards to their LPR program. See chapter 2 for details.

of the program. It is likely the least provocative way the analyst authoring the report found to state that it does not suffice to say BWC increase police accountability, appropriate policies must follow. This is especially true since the one actor supposed to act as an overseer of the CPS, the CPC, has no role in technological use policy. The interview with its member made it clear that its role was limited to approving the budget on BWC, not questioning the appropriateness of the procurement decision. This high-level governance of the CPC contributes to the constate that the transparency discourse of the CPS when it comes to BWC is simply that, a discourse.

For instance, the CPS still has not revealed its activation policies or its data-preservation regulations. The only information on both issues had to be glued together from different sections of its one-year report. The latter unveiled that all BWC footage is preserved for 13 months, up to 10 years for non-criminal traffic cases, and 40 years for other major cases. Still, it is unclear how and when the service makes decisions on the release of footage to the public. Internally, this creates a degree of frustration for officers toward the CPS leadership. In terms of policymaking, the mere fact the service controls the data and is not clear about how it deals with it is problematic. It opens the door for the perception of footage being plausibly tempered, which conflicts with positive potential impacts of the PAITI.

In terms of AI, there are no guarantees that the service does not scan BWC footage with different software, for instance to blur non-implicated faces or to find objects quicker in hours of footage. Considering the service has declared significant difficulties in vetting and redacting citizen private information from its footage, one can assume such uses are not the norm, but that it could become. Indeed, the absence of transparency makes it impossible to take this scenario off the table.

One area that proves particularly tedious to handle for the CPS communications teams is that of facial recognition, and how it connects with BWC. As a reminder, in the early months of 2020, the Clearview AI controversy shook many Canadian police services. The CPS had been the first service in Canada to use FR, as early as 2014 (City of Calgary, 2014). Using the biometric software NeoFace Reveal, CPS officers can compare videos, photos, and CCTV images of people of interests with their mug shot database. This is very different than Clearview, which used social media images. If officers can scan CTV

footage, they could be tempted to also scan BWC footage. One could at least wonder what would stop them to behave this way. This possibility became ever more troublesome when it was made clear at least two CPS officers had used Clearview AI on separate occasions (A. Smith, 2020). No internal safeguard stopped them. Since then, the CPS has pledged not to use FR for social media images, but it has not done the same for BWC.

To be clear, there is no indication the CPS has used FR to scan BWC footage. However, the service has not established or revealed its policy on the matter. Neither did it make any pledge in this area, contrary to other police policy leaders in Canada.[287] Granted, Axon decided not to include FR software with its suites, but the CPS has ownership over its data. As early as 2016 it investigated ways to automate the blurring of images of bystanders captured by BWC footage for privacy matters, a time-consuming process they would prefer to outsource to an AI. Once this is achieved (which is likely already the case), there is no reason to think the CPS would treat BWC footage differently than CCTV footage and use NeoFace reveal to scan it with its local mugshot databases.

The ambiguity of Canadian police services on FR has contributed to public uneasiness toward BWC. Both PAITI are often discussed jointly, notably in media coverage. The CPC interviewee even argued that reticence toward BWC is often the result of this confusion. This is something the TPS expressively attempted to avoid.

2. Adopting BWC as PAITI: Toronto

Another NeoFace client amidst Canadian policing agencies is the TPS. It happens to be the second major police service in the country to adopt BWC, in the summer of 2020. This is a few months after the controversy over Canadian police services uses of Clearview AI FR software. The TPS felt the need to address FR in its BWC FAQ section, explaining that "the technology does not automatically identify individuals using facial recognition, or compare images to any database." [288] The key word here is *automatically*, meaning the service does not close the door to scanning BWC footage later with FR, for instance with NeoFace mugshot databases. Granted, scanning for mugshot matches is different than using social media databases, as was the case during the Clearview AI. Still, it is a reminder

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[287] Most notably, any FR uses by the SPVM has to be pre-approved by the local police board (Ducas, 2020).
[288] Toronto Police Service (2020), URL: https://www.torontopolice.on.ca/body-worn-cameras/

that BWC hardware cannot be separated from AI: once footage is collected, any AI capacity a service possesses can be used to scan it.

A notable feature of the communications content that surrounded BWC adoption in Toronto is the attention given to AI policy dimensions. The FAQ section that accompanies the TPS BWC program website is indicative of this. Aside from the FR remark, it includes six questions on data storing. This covers issues such as minimal data preservation periods to reassurances that it is stored in a Canadian cloud. Privacy considerations are even more emphasized, receiving its own subsection and seven questions. Innocent bystanders are reassured in this section that AI would be used to protect their privacy:

> Officers will make every reasonable effort to capture only the relevant incident for which the body worn camera is in operation. Machine learning is used to blur out parts of the video which could compromise the privacy of members and the public.[289]

Other questions notably indicate to the public that the technology has AI induced voice-to-text automatic transcription capabilities.

The prominence of AI-related topics in the TPS BWC FAQ section is indicative of how both police and the public are now making sense of BWC as PAITI. The hardware is no longer understood primarily as an accountability and/or evidence-gathering tool. Yes, it does those things. But it is also an instrument that, when enhanced with different AI applications, can considerably increase police powers. At least this is how it was made sense of in Toronto.

The attention given to AI policy dimensions in Toronto necessitates some contextualization. The Canadian metropolis was the locale of the main BLM mobilization in the country in May 2020. In many North American cities this momentum led to minimal policy changes. The same cannot be said about Toronto. On June 29, 2020, the City Council adopted 36 *decisions* on police reform (Changes to Policing in Toronto, 2020). On August 18, 2020, the TPS Board adopted 81 *decisions*[290] (*Virtual Public Meeting*, 2021). The latter put pen to paper to the police accountability, public safety and crisis response intentions

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[289] *Ibid*.

[290] The term *directives* might better describe the latter. They are binding for the service, and its leadership does not have a choice to adopt them. The City Council decisions, in contrast, were not.

set by the City Council in June. BWC were adopted as part of this increased attention to policing in the city, as a separate measure.

Perhaps the most significant recommendation for police accountability is the 36th, which states:

> Direct the Chief of Police to post on the Service's public website, as soon as feasible and on an ongoing basis, up-to-date copies of those procedures of public interest that govern the interaction of police with the public, in a form that will not endanger the efficacy of investigative techniques and operations (*Virtual Public Meeting*, 2021).

Concretely, this means that citizens not satisfied by the answers given on the TPS BWC FAQ website are also given the option to consult the agencies use policies for BWC. Other relevant internal documentation, such as the policy on the use of force, was also made available to the public.[291]

The TPS BWC procedures details much of what was announced by the service when cameras were rolled out, notably in relation to data preservation, self-activation, and privacy. While it does not per se ban the use of FR software on select BWC footage after the act, it does provide the public an understanding of the framework in which such applications would take place. This means it would be easier to hold officers accountable if lines were crossed.[292]

Publishing use policies also allows for experts to note its inconsistencies and know where to focus their appeals to the TPS. For instance, the fact that camera activation is not automatic is one area that has already raised eyebrows. This is the same policy as in Calgary. At least in Toronto, we know when officers are expected to activate cameras. By itself, divulging the procedures might incite more of them to do so. Publishing a wide range of internal policies is a level of transparency common in the USA. It is however a first in Canada. The CPS, for instance, has yet to publish its own BWC policies.

It is revealing that in this context of increased scrutiny, the TPS focuses, when adopting a new technology, on police AI policies. This confirms that in the early 2020s in Canada, AI applications are central in how the public translates the impact of BWC on policing. It is my contention that the centrality of AI in the Toronto case needs to be taken

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[291] Toronto Police Service (2021), URL: https://www.torontopolice.on.ca/procedures
[292] For instance, if a BWC was scanned by a social media FR software such as Clearview AI.

in consideration when projecting further BWC adoptions in Canada. The TPS rollout could lead to a wave of BWC adoption *a mari usque ad mare*. If this is the case, it will be distinguished from the 2010s waves in the USA and Europe in that debates over its adoption will not be focus on the hardware. Rather, discussions appear to be centring on the AI-induced adds on that optimize the potential of this PAITI.

This transition of BWC as PAITI is worth illustrating, still using the Toronto case. The TPS was among the first department in Canada to launch a BWC pilot project, in 2014. In total, 85 officers were equipped with cameras in different departments and areas of the metropolis (TPS 2016). Little guidance was given to officers or their superiors. Most notably, the service did not set up a plan for outcome measurements. Because of this, experts following the TPS assessed, once the evaluation was published in 2016, that the TPS "wasted" their pilot project (Laming, 2016b).

The service admitted in the report that some of its results could not be extrapolated. Notably, indications of increased complaints against officers and decreases in officers' use of force. These were based on imprecise and insufficient data collection. The absence of outcome measurement planning hinders a pilot project from the beginning. It opens the door the subjective interpretation of data. This is exactly what Dr. Ryan Prox, from the Vancouver Police Department, wanted to avoid with the VPD PP program.[293] Police leaders pride themselves on being rational actors that make decision based on facts. Developing a study that does not allow to collect actionable data is therefore, from a policing standpoint, an unproductive mobilization of resources.

On the other hand, from a political science perspective, an argument can be made that the study was a success. The study indeed demonstrated the social acceptably of cameras, both inside the service and with the public. In total, 91% of survey respondents, which included both TPS officers and members of the public, supported BWC adoption in Toronto. Within the members of the public, 94% believed BWC made the police more accountable (Toronto Police Service 2016).

These findings are in themselves important from a policy perspective. The TPS expected, when the study started, that important pockets of resistance would be found

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[293] Granted, in the case of PP, outcome measurement is perhaps the only accountability option, as the ML algorithm itself is unreadable to those that have created it. See chapter 3 for more details.

within the service. The same was true for the public. The study made it clear to police policy leaders they did not need to focus on social acceptability.

This reality allowed the service to focus on cost, administrative and technical challenges. On this last element, one of the critics of the TPS pilot project was that it did not provide much substance in terms of how to integrate optimally BWC into daily practices, both administratively and technically. It could also have given a more detailed portrait to political deciders of the challenges related to adoption. These points are valid, but no cameras in action in 2014-2016 are still on officers' torsos in 2020, making the absence of technical "real life" tests not that concerning. Plus, there were sufficient use cases of Axon body cameras in the USA (or Calgary) for the TPS to continue its preparation toward BWC in the background after 2016.

One valuable element of the report is its lengthy discussion of the administrative challenges that the service needs to respond to in the event of an at-large adoption. The political decision to adopt the PAITI came around in 2020. By that time the TPS had four years to figure out the administrative weight and technical challenges reported in the pilot project. The service indeed did not simply publish the report and stopped working on BWC. The rapidity between the June 2020 decision by Mayor John Tory and the beginning of the rollout two months later indicates that work in the background continued after the pilot project was completed.

A strength of the rollout process in Toronto is the recognition that the technology evolved between 2014 and 2020. BWC are now considered PAITI, with potential capacities unheard of a few years ago. In addition, police-citizen relations have evolved since then. On one side, the Clearview AI scandal. On the other, the summer 2020 BLM mobilization. Combined, these two factors likely have impacted the degree of social acceptability demonstrated half a decade ago by the TPS. In fact, during a virtual townhall meeting held in the summer of 2020, 95% of attending Torontonians expressed disbelieve BWC would fix racially discriminatory practices of TPS officers (Worster & Moore, 2020). Cost increases amidst the defund the police movement was also an apprehension. The prudent emphasis on transparency and AI-related concerns when launching the program reflects this evolution in social acceptance.

In contrast, one of the most striking points when examining the 2016 report on BWC in Toronto is its complete absence of AI.[294] This is in part because the technology was not at the time AI-induced. The section on technology services focuses on hardware failures, notably unreliable docking stations. One section of the report laments on the time-consuming task of redacting by hand videos to insure bystanders' confidentiality. Another mention having to burn DVD copies of BWC footage to share with judicial actors. Both these problems are fixed by the launch of Axon's cloud solutions. It includes a ML blurring software, and secure footage sharing with other actors within the criminal justice system.

The conversation on AI in Canada likewise evolved between 2016 and 2020. In five years, the population knows more about AI, notably through the work of social scientists, whistle blowers, and journalistic work. The issue of facial recognition is especially salient in Canadian media. In fact, a plurality of articles on BWC rollouts in Toronto touch on this form of AI, if only to mention it will not be fed *live* to BWC footage.

3. A Before & After Toronto?

The emphasis placed on AI in the BWC rollout in Toronto contrast with previous pilot projects in Canada. This is in part because most studies were conducted around the same time as the 2016 TPS study, at a time where the technology has not yet morphed into the powerful PAITI it is now. BWC were for instance last considered by the Edmonton Police in the first half of 2015. After a comprehensive review and pilot of the technology, the service decides not to go forward with the technology. While the EPS report touches on few elements indirectly linked to AI, it does not mention AI or ML directly. We are after all in 2015, before Canada adopted a national AI strategy. The study is however the first in the country to give attention specifically to storage issues. Technicalities linked to the management of the footage are also touched upon.

Around the same time, the Hamilton Police Board orders the local police service to start conducting yearly reviews of the state of BWC research and adoption in Canada, which it did since 2014. These 15-20 pages state-of-the-field reviews are shorter than the 241 pages Edmonton pilot project report. They notably provide yearly summaries of BWC

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[294] This does not mean that there were no AI-add on tested by TPS officers during the pilot project. Only that none were reported.

pilot projects and adoption across Canada—a helpful timeline for a PhD candidate. This is a rare case in Canada of a police board acting upon its responsibility to hold police services accountable to political actors. It allows to examine the progression of BWC policy in Hamilton, a mid-size city of 600 000 located in the Greater Toronto Area (GTA). The sworn officers authoring the reports notably present academic literature reviews to make their recommendations.

In 2019, for instance, the report notes that BWC studies are marked by inconsistency in their findings. The authors conducting the review argue that police services in North America tend to adopt upcoming technologies without proper evaluations of their effects. Giving these two factors of inconsistency in research and tendency to adopt "new shiny toys" without proper evaluation, the report recommends not adopting BWC. The recommendation is also based on an evaluation of pilot projects conducted in other Canadian services such as Edmonton and Durham (GTA), who both conducted comprehensive reviews and opted for non-adoption. The Hamilton authors—both sworn—then criticizes the police services in Fredericton, New Brunswick, and Kentville, Nova Scotia, for adopting BWC without releasing reports of their pilot project (Worster & Moore, 2019).

One interesting part of the 2019 review for this project is the section on technology evolution, where the authors examine characteristics of newer generations of BWC. The discussion focuses on hardware: cameras now have longer battery spans (12 hours instead of 8) and can function until minus 20 degree Celsius. This is an important dimension for Canadian law enforcement giving the CPS difficulties with button getting stuck in the winter during their failed BWC rollout in 2014. What this section on new BWC characteristics does not touch upon, however, is the AI capacities now included in BWC packages.

AI is also absent a year after in the 2020 review—earlier than schedule given developments in Toronto. The context of police-citizen relations at that point influences the nature of the report. In 2019, the review concludes against adoption because less than 1% of calls lead to complaints by citizens. Therefore, there is no need for the cost, change to infrastructure, and privacy implications of adoption. In 2020, the review suggests that the Hamilton Police should consider developing a BWC pilot to the board for approval.

One that includes systematic outcome measurements. The review bases this recommendation notably on an evaluation of how citizens in Toronto negatively perceive the TPS (Worster & Moore, 2020).

The 2020 Hamilton report is published before the TPS policies are made public and addresses AI on its FAQ page. Still, it underlines that the sensemaking of BWC as PAITI in Toronto cohabit with the one where cameras are translated as police accountability measures, such as was the case in earlier BWC adoption waves. The way AI became a central component to account for in BWC rollout in Toronto between 2016 and 2020 could be indicative of upcoming trends in Canadian policing. Yet, it is important to underline that AI was still a late consideration for the TPS. One it only really started to investigate once the decision to adopt was final. Hamilton, still at an early stage in its consideration of BWC, had not yet gotten there.

Another case that merits attention is that of the SPVM. In September 2015, Chief Marc Parent did not renew his mandate at the head of the service. He made sure to explain this was a retirement from policing and not a resignation. However, one can note that BWC was a point of discord between Parent and then mayor Denis Coderre, the former being unconvinced of the added value of the technology, and reluctant of the costs.[295] In October, the municipal administration approved the launch of a pilot program, virtually the first action taken upon by Parent's replacement.

The Montreal BWC pilot project has many similarities with the Toronto case. First, it presents outcome measurement limits. Only 78 officers were equipped with cameras in five different postings. The number of incidents captured was insufficient to make any clear statistical conclusions on BWC impacts on police-citizen interactions. Second, it allowed to test the grounds for acceptability, especially internally.[296] Third, administrative weights and procedural problematics with judicial actors were documented. Once again, these elements likewise noted in Toronto are not futile. They notably confirm that the SPVM is not willing to adopt BWC without at the minimum AI-induced redacting software, and more efficient means to share footage with judicial actors.

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[295] Interview with Marc Parent, Montreal, February 2020.
[296] Interview 9, Montreal, October 2020.

While the Toronto and Montreal pilots were similar in terms of scope and limited outcome measurements, the process was more comprehensive and consultative in Montreal.[297] It was conducted over a longer period, and different stakeholders participated in the project. The first phase of the pilot was planification, from October 2015 to June 2016. Then, a lengthy field evaluation from June 2016 to April 2017. Another 13 months were taken to analyze the data and write the report, which was submitted to CSPM in the summer of 2018. Said report was made public in 2019, over three years after the project was launched (SPVM 2019). It is at that point that Mayor Valérie Plante announced BWC would not be adopted, citing mainly long-term cost considerations.

The 235-page report details a thoroughly thought through project, which contrasts with the incomplete Toronto report. It is also humbler in its findings, recognizing the inability to draw statistical significance from the study. The document states clearly methodological omissions and inclusions decisions. It for instance mentions on multiple occasions the project specifically excluded using the footage for any FR, ALPR, or other available AI technologies. It also argues in its analysis section that any decision linked to BWC adoption should consider such technologies. Finally, it specifically argues that the BWC adoption decision is not one to be made alone by the SPVM. It necessitates community involvement and political leadership.[298]

The SPVM BWC document specifically uses the words "artificial intelligence" on numerous occasions. The inclusion of AI is potentially a benefit of consulting scholars with expertise in the field of PAITI throughout all phases of this pilot.[299] Perhaps it is also the result of the—often overblown[300]—status of Montreal as a world-renowned AI research hub. Nonetheless, it is still a secondary element considered by SPVM leaders. They centre their attention on other dimensions of the technology, a commonality of most BWC research.

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[297] For instance, a complete cost evaluation was conducted, not solely focused on procurement but program management costs as well.

[298] Perhaps this is strategic, as the SVPM would later argue that BWC adoption should be funded by the provincial government (SPVM, 2020).

[299] The Montreal study is led by sworn officers but is notably distinguished by the consultation of academics during the entirety of the process. This led to valuable complementary academic literature (see for instance Boivin and D'Elia 2020; Boivin and Gendron 2021). This is notable when examining the omissions and inclusions section, but also in the statistical limits recognized to project.

[300] Interview 62, London (UK), September 2020.

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This last remark means my contention that the technology is increasingly being translated into a PAITI by police leaders should not be understood as if BWC are only made sense of this way.[301] The groundwork done by the SPVM and the emphasis of the TPS on AI indicates that police services that do go forward with the technology will no longer be able to ignore its AI applications. BWC can no longer only be understood as police accountability measures—a lesson the Halifax police learned the hard way.

The Halifax Regional Police (HRP), in Nova Scotia, was the first *great north* agency to tackle the question of BWC after Toronto completed its AI-sensitive rollout. There, the police service submitted a BWC rollout strategy proposal document in December 2020 (HRP 2020). However, the local police board deemed the document insufficient, and requested a supplemental report. The latter was submitted in January 2021 (HRP 2021). Both documents are like the one in Hamilton: not based on a pilot project, and present overviews of BWC technology in Canada. The first document (10 pages) focuses on costs, and a roll-out proposal. AI is not discussed. The supplemental document (53 pages), at the request of the police board, addresses what policies would be associated to BWC in the service.[302]

The January supplemental document is quite informative in terms of the state of BWC policies in Canada, notably detailing data protection and activation procedures. One section specifically addresses the need to develop flexible policies that can account for BWC as PAITI (emphases added):

> As an emerging police technology, there are additional considerations related to BWC use that have been rarely, or not yet,[303] included in Canadian BWC directives. It is *important for police services to prepare BWC directives* that consider and comment *on the future capabilities of this technology.*
>
> *Examples may include*, but are not limited to, commenting on: *transcription expectations and procedures*, live streaming, video enhancement or augmentation possibilities (e.g., clarity of image or sound), or *exposure of*

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[301] It did not reach *zeitgeist* (see chapter 1).
[302] It was notably drafted in collaboration with Dr. Alana Saunier, specialist in BWC policies who authored one of the annexes included in the report.
[303] At this point in time the TPS FAQ page is up, but the directives are not yet made public.

data collected to immediate or subsequent analysis by human analysts *or artificial intelligence algorithms.*[304]

While it is notable that the service addresses AI directly, this is still a very general statement. This passage is the only reference to BWC as PAITI in the January supplemental document. It contrasts the details provided for other policy priorities. Evidently, they struck more questions than reassurances for the police board. As a result, the absence of clear policies on "the future capabilities of this technology" contributes to the decision by the Halifax Police Board to delay its decision by a year so that the service could further precise its BWC policies before adoption (Moore 2021).

In its December 2020 push for rapid adoption of cameras, the HRP primarily portrays cameras as accountability measures. This is the more established sensemaking of BWC. Yet, this one section on future capacities reveals that the service is starting to make sense of BWC as more than just a hardware for police accountability—at least the Halifax Police Commissioners are. While it is too early to determine if this is a trend, it is noteworthy that the first policy proposal post-TPS rollout feels the necessity to address AI dimensions. It shows the growing tension between BWC sensemaking as a civilizing hardware, and that of it as a PAITI.

IV – Sensemaking, AI, and BWC

1. The Change and Surveillance Continuums

AI is not neutral. Technology is socially constructed by the actors that use it, and those that it impacts. In Canada, the Winter 2020 controversy over police uses of Clearview AI challenged the way many understood Police AI Technological Innovations, or PAITI. It also impacted how the public understood other police technologies previously not necessarily thought of as AI-induced.

A few months later, Toronto adopted BWC for all front-line police officers. Questions related to AI were noticeable in the use policies and communication strategy of the rollout, who underlined on numerous occasions that no FR software would be used "live." Arguably, this adoption was still mainly translated as an accountability mechanism, the

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[304] This is part of Section (13) Additional Considerations Relevant to BWC Directives (HRP 2021, 23). Note the supplemental report is a living document.

initial sensemaking of BWC. However, the attention given to AI policy dimensions contrasted with its absent consideration in the original pilot project of the service. This transition hints that the sensemaking of BWC as PAITI is progressing.

This is reflective of evolving AI literacy within the Canadian public, media, and policy leaders. A few years back, AI knowledge of most Canadians wedged on a few media articles in awe of eminent AI scholars and *unicorn* startups. There was not much critical assessments on AI. The early enthusiasm toward the potential of AI progressively gave way to more realistic portrayals. Despite its potential, algorithms alone will not solve fundamental human problems, such as inequalities or climate change. Not only were the initial hopes of AI rapidly tempered, but a combination of scholars and journalists additionally revealed potential dead angles of AI. Pertinent to our study are those linked to algorithmic biases, as well as the power imbalances it gave those that have access to it.

In parallel, the distrust toward police services likewise progressed. Neither phenomenon is the direct cause of the other, but they are not completely isolated either. The Clearview AI controversy exemplifies this reality. There, officers use of a FR software amplified the distrust toward both police services and AI. This relates to BWC in that mistrust toward the police can be intensified by revelations that it is attempting to increase its surveillance capacities and transform its role with certain AI-induced software.

It is in this context (police distrust and AI skepticism) that my assertion that BWC are progressively being translated by Canadian police services as PAITI should be read. Whether BWC are made sense of as PAITI or as hardware indeed directly impacts its reception by the public. Consider how it impacts the transformation and surveillance continuums.

First, BWC as hardware only. In terms of the surveillance continuum, services tend to downplay the AI-induced nature of BWC, and how automatic recognition software can increase its investigative efficiency. They continue to portray cameras as investigative tools or accountability measures, despite contradictory research on the matter. Many citizens and political leaders will likewise see BWC in a similar light. The average citizen rarely interacts directly with police officers. This means that when BWC are only understood as non-connected hardware, they are mild forms of surveillance. One that has limited impact on the average citizen, and innocent bystanders.

As per the transformation continuum, BWC hardware are typically built into a civilizing effect narrative. In this sense cameras alone are an enhancement to policing, as they improve the quality of interaction between both parties, or at least decrease the lack of cordiality on both sides. Note this narrative of civilizing effect was stronger in early adoption cases in the USA. Time and research have disproven this expected outcome (Lum et al. 2020). However, civilizing effect was still one of the main arguments used by my police interviewees in favour of BWC. It was also a central claim to justify adoption in Toronto (White et al. 2021). In summary, non-AI-induced BWC are a minor form of direct surveillance that helps investigations, and mostly enhances police work by civilizing relationships with citizens.

Consider now how perceptions of BWC are challenged when it is made clear that the hardware can be enhanced by different AI applications such as gunshot detection systems, ALPR, facial recognition, automatic transcription, or ML blurring applications. These AI-treatment can be applied for years after footage is collected, as the police maintain ownership of all BWC data. BWC are suddenly not benign evidence gathering tools, they are PAITI. Instead of civilizing relationships between the police and citizens, it dramatically tilts the police-citizen power balance. BWC footage indeed represents an unprecedented level of police data collection on citizens, not just criminals.

In terms of the surveillance continuum, cameras become increasingly invasive and harder to evade (as they are moving, contrary to CCTV). There are no guarantees innocent bystanders will be efficiently blurred from images. As a result, any encounter in the eyesight of an officer can lock your face in police databases for years, even if a given service currently does not use FR.[305]

As per the transformation continuum, the hardware does not transform drastically the patrol. However, in the most advanced cases, officers equipped with earplugs can receive information fed by ALPR and FR on individuals and cars encountered. This is not science fiction; the technology is already present for live BWC footage to be used this way (Doffman, 2019). Understanding BWC as PAITI therefore means translating this

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[305] Even if departments do not have powerful AI software, they could still acquire some in the future and scan historic footage once they do. Given how quick AI is developing, who knows what this means for privacy and civil rights.

technology into a potentially power tilting, transformative form of direct dragnet surveillance of all that encounter front-line officers.

Contrasting both ways BWC can be made sense of highlights the importance of comprehensive public debates on the technology. One where BWC AI applications are openly discussed. With the first translation of BWC as hardware, the technology enhances police evidence gathering and corresponds to a limited form of surveillance. Enhanced with AI, footage from BWC can be treated through powerful algorithms that transforms police-citizen relations. It becomes a direct dragnet surveillance practice. The first sensemaking present cameras as enhancing police accountability. The second amalgamates and intensifies the potential issues of police and algorithmic unaccountability, with the risks this entails for the systematization of biases, and abusive surveillance practices.

2. Policy Considerations

Earlier in this chapter, I exposed how the cases of Toronto and Halifax indicate the sensemaking of BWC as PAITI is gaining grounds within police leaderships. In addition, it appears political masters in these major centres are becoming prudent about the technology. This evolution of BWC sensemaking has implications for the policies developed when adopting the technology. On this, a footnote in the supplementary Halifax report merits mention.[306] There, Alana Saunier, a surveillance expert who has previously worked with David Lyon, discussed in large terms the issue of AI software treatments of BWC footage. She explains that, given the different algorithms that can leverage video evidence, a PIA is necessary for each individual AI application pertaining to BWC footage. This is based on a recommendation by the Ontario Privacy Commissioner (Kosseim, 2020a).[307] If the HRP was to adopt this policy, it would mean the PIA on the cameras themselves would not allow the use of AI on its footage. As such, any use of FR software, or a blurring ML algorithm, is conditional to an individual PIA. In contrast, only one PIA was done for the CPS.

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[306] Note the appendix to the Halifax Regional Police 2021 supplemental report is a living document which can be revised in the future. In its original version, the note is included in the Appendix B: Body-worn Camera Policy Summary - Section (1) Privacy Impact Assessment.

[307] Also relevant are Kosseim (2020b), and most importantly: Office of the Privacy Commissioner of Canada (2015).

The recognition that cameras and software are separate innovations is likely to reassure privacy and civil rights wary groups in Halifax. Adopting such a powerful tool as AI-induced BWC might increase the apprehensions of citizens toward the armed arm of the state. As such, the evolution of BWC into PAITI has become a necessary dynamic to consider for police policy leaders. This is especially true given that citizen apprehensions are exactly what BWC were supposed to combat in the first place. With the appropriate policies, cameras can have positive impacts on data gathering, investigations, training, and even police-citizens trust in some contexts.[308]

In the USA, BWC adoption and policy development was generally an internal affair to agencies. This led to significant accountability shortages, notably on the issues of data storage, and activation policies. The same was true in Calgary, which was driven by CPS leadership. The local police board merely approved budgets.

Canadian political actors have however recently increased their prominence in the BWC policy discussion in Canada. In Toronto, the decision to adopt BWC was made by Mayor John Tory. The police board likewise played a key role in the development of the use policies of the PAITI. In Halifax, the police board delayed the adoption process by at least a year. In Montreal, one mayor encouraged the service to launch a pilot project, and his successor took the decision not to adopt. It was also debated during the 2021 mayoral race which re-elected Valérie Plante.

This interest of politicians in the decision and policy making over PAITI is a novelty, especially when contrasting with ALPR and PP. Granted, BWC are not yet fully understood as the PAITI they have become. Nonetheless, the textured discussions about BWC in law enforcement can arguably be regarded as a positive sign for the health of our public debates. These are after all not just about BWC. Fundamentally, they are stepping-stones to better understand what it means to enact the state monopoly of legitimate violence in the era of AI.

Cynics might say, on the other hand, that political involvement in BWC policy decisions is more about money than about rethinking the role of policing in the 21st

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[308] By no means should this analysis be read as discouraging the adoption of BWC by Canadian Municipal police service. Rather, services must ensure they account for AI when developing their BWC policies.

century.[309] Brown's (2020) argument that the wait-and-see approach would eventually cede place to gradual adoption is based on the assessment that politicians cannot continue to reject a technology overwhelmingly supported by the public and police alike. Cost was the true hurdle, not receptivity. BWC undoubtedly represent an important long-term investment for police services. Nevertheless, one element to note is that BWC are becoming increasingly more affordable. In 2016, the TPS expected BWC to cost 8.5 million annually a year to taxpayers. Their 2020 contract estimate this cost at 6.8 million, as data-management costs were reduced over this period. A few years earlier, the CPS launched a program with the same provider for an estimated non-fixed cost of 5 million a year. Giving the CPS is about the third of the size of the TPS, it appears to wait has proven cost-effective for the Ontario metropolis.

Part of this reduction in cost is linked to hardware discounts given by Axon,[310] but this might be a double-edged sword for services. For companies like Axon, hardware (tasers, then cameras) is the past. They are transitioning their business model toward selling subscription-based AI-induced software that make the cameras more efficient, as well as cloud storage services.[311] The Axon 3 suits for instance includes subscription-based software upgrades available for purchase, such as GPS tracking, automatic activation, automatic gunshot detection, and live stream capabilities.[312] This is a new reality that police policy leaders need to be aware of: hardware procurement now represents a fraction of the total cost of BWC, which was not true a decade ago. This makes it even more challenging to budget for BWC rollout.

In addition to financial considerations, the local context is a necessary dimension to consider when examining jurisdictions BWC policy decisions. Not all communities are willing to accept AI in policing the same way. Neither are all police boards sufficiently equipped to ensure the right balance is met. In Montreal, even consensual uses of AI such as ALPR raised eyebrows of city councilors. In Calgary, where they are more present, it has never been an issue—aside from niche libertarian bloggers ("PSA" 2019).

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[309] Money was the main factor advanced by Montreal Mayor Valérie Plante when justifying not to adopt the technology, in January 2019.
[310] As of right now, Axon is the only major BWC provider in Canada.
[311] Initially Tasers, then the company was renamed Axon, and focused on BWC.
[312] Axon has pledged not to develop FR software, but footage can be treated this way through other means already in the hands of the CPS and the TPS.

Local context likewise help understand why BWC hardware procurement has not been deemed problematic in Calgary. Nor did the purchase of Palantir software that has the capacity to conduct person-based PP. My non-police interviews in Calgary underline that most perceive CPS relations with Calgarians and political leaders as generally positive. One grumbled at the funding the agency got versus other municipal services, in particular community organization. Conservatism was often used as an explanatory factor by actors to explain this deference toward police technological acquisition. Therefore, although the service has not demonstrated much transparency on this front, it is safe to assume BWC in Calgary is and will be enhanced with AI-induced software, without much oversight by the police commission. This can include FR software, as the service is one of the main users of this technology in Canada.

This contrast with Toronto, where FR-induced BWC is virtually off the table. In the Canadian metropolis, there is no such deference toward the local police, and the city council made it clear it intends to continuously overview its BWC program. In Montreal, all uses of FR are under strict political overview (Ducas, 2020). The point here is that not all BWC uses in Canada will be induced with the same software and have identical implications for police-citizen power relations. Services interactions with AI is context dependent. It can range from flexibility in Calgary to regular overview in Toronto. Even in the latter case, AI is used at the minimum for automatic transcription and the blurring of bystanders. It is a PAITI.

On this latter point, one common claim amidst critics of the police is that AI and policing necessarily decrease police accountability. This does not have to be the case. PAITI, including BWC, can increase police answerability with the right policies, notably in terms of automatic activation and transparent data sharing regulations. What is emphasized with this argument is that any complete BWC policy framework needs to include directives for AI applications that will be used on the footage collected by cameras. This includes how to deal with AI uses that are not yet developed or procured by police services. The Halifax Regional Police acknowledgment that each BWC AI application needs its own PIA in early 2021 is a positive sign toward such a transparent accountability process.

V – Conclusions

This dissertation looks at police leaders sensemaking of PAITI. Few technologies have so visibly changed the face of policing in the last 20 years than BWC. Signs indicate that after most USA departments adopted cameras in the 2010s, many Canadian services will do the same in the early 2020s. This adoption cycle poses different challenges than those presented to early adopters. Hopes of cameras as a civilizing panacea have been disproven and BWC evolved as powerful surveillance tools. They contribute to big data policing. They are *Police AI Technological Innovations*—and must be understood as such.

The assumption-based preference model develops in chapter one helps us understand how the police make sense and simplifies this technological evolution. From a theoretical perspective, studying BWCs helps us isolate the impact of AI on police sensemaking of technological innovations. I argue sensemaking of PAITI is influenced by how police leaders use their foreground ideational abilities to translate the impact of these innovations on the place of police in society (transformation, surveillance), state-police-citizen relationships (accountability), and the reaction to these technologies for various stakeholders. In other words, facing complex challenges, police leaders use inferential shortcuts to simplify how they make sense of PAITI.

Concretely, my argument is that police leaders favor PAITI which *enhance* traditional police work and develop *indirect* surveillance capacities. On the change continuum, cameras, with or without AI, are generally made sense of as enhancing the quality of police-citizens relations. As for the surveillance continuum, inducing BWC with AI alters the scope and nature of the surveillance of innocent bystanders. This has implications for my second research question on democratic policing. It reduces the cost and systematically widens the scope of police surveillance, whereas police resource limitations have historically been a prime restraint mechanism to police power. BWC enhanced with AI gives an informational advantage to the LEO, tilting its power relation at the detriment of the citizen.

This chapter examined how despite this paradigm shift (Hall 1993), several actors have not altered how they translate BWC technologies. Many discourses on the pros and cons of BWC have indeed remained stable between 2014 and 2022. For a long time, Canadian police, media, and politicians sensemaking of BWC were entrenched in early

perceptions of what first generation hardware was expected to do, not their failed promises. In Calgary, cameras were adopted citywide with no consideration of AI—or public consultations for that matter.

Yet this situation is changing. There is an emerging ability in the public debate to understand BWC as more than just hardware. This chapter discussed the case of Toronto, where AI was a key consideration of the TPS during its BWC rollout. Dynamics in Halifax and Montreal likewise suggested that key police and political actors are starting to understand BWC as PAITI. Torso camera adoption is often done in the name of increasing the trust between citizens and their police. By associating BWC with AI, the police are equipping itself with powerful surveillance tools that risk having the exact opposite consequences.

Even without AI, BWC failed on its many promises. With AI, it brings big data policing to an unprecedented level, posing privacy challenges police services a decade ago did not need to account for. One perhaps can alleviate its anxiety in the finding that select Canadian police AI policy deciders are understanding this dynamic. This is promising for the future of BWC policies, and police-citizen relations in Canada. BWC can contribute to better police-community relations. But this can only be achieved under appropriate circumstances—and the right policies.

Conclusion

In 2022, on the Axon website homepage, an advertisement focuses on a diverse group of families.[313] Three of their members encounter that day, as a black female police officer aids a white homosexual man facing a mental health crisis. The video titled "Everyone Gets Home Safe" calls for "reinventing modern policing" and presents Axon as a company that provides "tools to help officers protect life, without taking life." This advertisement checks many boxes of previous Axon material, such as "software that reduces paperwork" and "Body Cameras that capture the truth." But the tone contrast with the 2012 Axon Signal commercial, which introduced this dissertation. In this newer advertisement, the story is one of a service that wants to present itself differently to communities, notably emphasizing Axon Virtual Reality empathy training. The narration is slower, almost reassuring. The intervention is one moment in the advertisement, not the entire focus. Before getting the call for action, you see kids laughing around with the officer.

North American policing in the 2010s has been marked by two phenomena: the repeated videotaping of police brutality against young black man, and PAITI. Early enthusiasm for the latter has been replaced by a realization by police leaders that it would not solve all police-citizen misunderstandings. In some ways, this second Axon advertisement attempts to reconcile AI with a police service that emphasizes de-escalation and community relations. After all, officers can have all the technology in the world, it does not mean much if seeing a patrol car in the street scares parts of the population.

It is perhaps imbalanced that some people across the USA and Canada fear all police officers because of incidents in Los Angeles, Ferguson, Minneapolis, or Atlanta. It is likewise all too cliché that a PhD in Canadian politics ends with the discussion of USA cases. In this era of social media and viral videos, isolated incidents can lead to political mobilizations that far surpass their immediate, local, consequences. The police murder of George Floyd in Minneapolis in May 2020 lead to police reform in Toronto in August, and citywide BWC adoption. Police technology companies' advertisement and officers'

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[313] Axon. 2017. "Everyone Gets Home Safe." Accessed October 1st, 2022. https://www.axon.com/news/why-axon-wants-to-get-you-home-safe

misbehavior across the continent accordingly impact the PAITI sensemaking of Canadian police leaders.

Yet this dissertation is not about police gadgets. Neither is it about current social movements. Discussion of the policing and AI nexus is about power and the role of the state, two central considerations for the field of political science. To paraphrase Weber (2020), the police is the armed branch of the state entitled to legally exert power using coercive means forbidden to other members of society. This monopoly over the seemingly legitimate use of physical force is a key form of power in society. As such, the way the police engages with technological innovations to enhance this power—or not—and how society, private corporations, and governments responds, are crucial political dynamics illustrative of the challenges AI pose for policymakers. What is at stake is the future, and present, of democratic policing. By extension this impacts the type of society we aspire to develop into.

The continuous public attention and contentious nature of policing makes it a prime locale to examine how the "fourth industrial revolution" of AI (DL) is transforming our democratic societies (Schwab 2016). PAITI promise to reduce the cost and visibility of police surveillance of citizens while exponentially increasing its scope. Technology is the product of the environment in which it operates and is socially constructed by the actors with which it interacts. But if there is no interaction between the police and citizens, if trust continues to fade, and police presence continue to tame, then the turn to PAITI means the end of community policing. It means policing civilians instead of protecting them. No previous police technological innovation has had such a potentially overwhelmingly disruptive impact.

What is particularly striking in the field of police AI policy is that decisions often rely on few select actors centred around police chiefs. Impactful set of policies regarding how much information police services (and therefore government) gather and exploit on citizens are decided primarily by local police leaders. The complexity of the challenge posed by PAITI is especially imposing at the municipal policing level, on which this project focuses. With limited information or technical background in AI, local police leaders are tasked with making sense of complex technologies; weight accountability, budgetary, and public perception considerations; assess the needs and receptivity to change of their

members; and consider how various stakeholders will be impacted or respond to policing's AI turn. This leads to vast differences in approaches, at times with unexpected consequences for citizen privacy, and the way they interact with law enforcement.

As per local political masters, this dissertation details how traditional accountability mechanisms are seldom equipped to overview AI-induced police technologies. As a result, the increased capacity to surveil citizens puts in jeopardy the very nature of police restraint. The rule of law in a democratic society is protected and enforced by the police, but this can only be guaranteed if the police acts with restrain and is held accountable for its action by political masters.

This hints at the complexity, uncertainty and evolving nature of policy making in the era of AI. The inability of political masters to regulate their own armed arm to capture the benefits of AI without hindering principles of democratic societies would not bode well for their ability to craft sensible policies in other sectors. It is with this consideration in mind that I study here police policy making in the era of AI.

The main contribution of this dissertation has been to explore how local police leaders (the target of the contrasting Axon advertisements) and other key policy actors make sense of different, multiplying, and complex PAITI. This dissertation focused on the dynamic sensemaking exercises that police leaders continuously make on PAITI, what type of actors influences them, and how these can evolve across space and time. Furthermore, this dissertation examined how this sensemaking impact the very principles of democratic policing: that police services obey the rule of law (not tyrants), limit interventions in people' lives, and are ultimately accountable to citizens.

These research questions are grounded in the theoretical assumption that the way individuals and organizations continuously translate AI technological innovation into terms that make sense to them is key to understanding how innovations are prioritized, evaluated, and rolled out by municipal police services. In turn, this impacts the nature of policing in democratic societies. It helps understand whether it is feasible to develop a model of policing that embraces AI without discarding the principles of democratic policing.

To this end, this dissertation developed a conceptual framework of analysis of PAITI policy rooted in a constructivist ontology of policing. It demonstrates sensemaking provides a processual analysis of how sworn members continuously translate and simplify

in a way that makes sense to them the unique position of the police within society. In complement to this ideational explanation, the bounded rationality argument allows to flesh out the psychological mechanisms that contribute to how police actors digest abundant information and make sense of uncertainty in their environments. AI is indeed an open slate, the arena of a political struggle where many decisions are based on critically limited information.

Drawing from these theoretical grounds, this dissertation argues against the idea that police leaders make sense of PAITI based on purely rational thinking. Rather, sensemaking of PAITI is influenced by how police leaders use their foreground ideational abilities to translate the impact of these innovations on the place of police in society (transformation, surveillance), state-police-citizen relationships (accountability), and the reaction of procuring these technologies for various stakeholders. In other words, facing complex challenges, police leaders use inferential shortcuts to simplify how they make sense of PAITI.

What is developed here is an assumption-based model to explore how the police simplifies PAITI according to its preferences. It is rooted in STS and police sociology literature on how the police traditionally approaches innovations and organizational changes. It demonstrates this simplification process is centred on (1) the impact of technologies on traditional policing (enhancement versus transformation), and (2) the type of surveillance capacities they enhance (direct or indirect). I introduce these simplifications under the form of the change and surveillance continuums. Coupled with accountability, budgetary, and public perception considerations, these are central features of police leaders sensemaking.

Concretely, the argument of this dissertation implies that police leaders favor PAITI which enhance traditional police work and develop indirect surveillance capacities. This means PAITI touch the very fundamentals of democratic policing as they make the police less visible to the public but empowered with unprecedent capacity to surveil citizens. This puts in question the very nature of police restraint and complicates the ability of the public to keep law enforcement accountable.

This very preliminary conclusion will first discuss sensemaking as a key tool to understand police sensemaking of PAITI. Second, wider implications of the continuums

on democratic practices will be fleshed out. Third, general AI policy recommendations will be presented. Fourth, limits to this research and potential areas for further inquiry will be explored. The fifth section reiterates the implications of this research and expands on what it teaches us on the way our democratic societies are adapting to AI, both in perils and promises.

Sensemaking

Sensemaking is a key analytical tool to understand how police policy leaders translate AI into digestible information. This ongoing process refers to how members of organizations decipher and simplify their suggestive position within society in a way that commonly makes sense to them. Conceptually, it provides a processual analysis of how actors translate changes in their environments, and links structural elements external to actors with their habitus. In the context of law enforcement, this is referred to by Chan (2007, 324) as police culture. The latter refers to an ensemble of traits and values proper to sworn members of police organizations that are conceptualized as shared at diverse degrees by all (i.e. us versus them mentality, crime-fighting mentality, loyalty, conservatism). A contingent of any agency adheres to these values, but their size, level of adhesion, and influence vary between organization. By recognizing that police culture is not monolithic, the empirical chapters of this dissertation enabled us to better understand the fluctuation in sensemaking of PAITI between and within Canadian municipal police services.

In addition to being diverse, police culture is also malleable. This CI framework provides analytical tools to help weight actors' ability to change or maintain police institutions within which they operate. By making sense of changes in their environment, actors are continuously constructing the ecosystem that will in turn constrain their future sensemaking exercises. Institutions are therefore simultaneously constraining and constructed by actors.

CI allowed to underline the unique position of police leaders in this ongoing construction, acting as sensegivers. Sensemaking is after all a social process where competing interpretations with different sources of legitimacy are in negotiation over a narrative. As such, because of their symbolic and political capital, the way PAITI are approached, defined, and simplified by police leaders is central to understand how police

organizations adapt to the fourth industrial revolution of AI. Shocks and interruptions correspond to great study opportunities of readjustments of organizational sensemaking, and how actors read situations and construct tangible meaning from uncertainty. In the field of policing, this process can be eminently ambiguous.

As previously mentioned, neither this dissertation nor the Axon/IBM advertisements that introduced it are about police gadgets. What is at stakes here is the political struggle over the future of law enforcement, democratic policing, and the scope and nature of mass surveillance in our democratic societies. Sensemaking of PAITI is at the centre of this arena, as it hints to trends in other sensible AI policy areas, notably healthcare and welfare. Whereas technology simultaneously enacts both symbolic and material dimensions, an innovation alone does not have a social role until it is adopted. The impact of technology on social life depends on various sociocultural factors (Sanders and Henderson 2013; Sanders et al. 2015; Moses and Chan 2018). Interpretative framing conflicts between groups can lead to significant difficulties in technological transitions (Chan 2007). It is in this context that this dissertation underlines the importance of police leaders' translation of individual PAITI into continuums that fit traditional police analytical grids.

What the Continuums Teach Us

To reiterate, sensemaking provides a processual analysis of how the police continuously translate and simplify in a way that makes sense to them its unique position within society. Because of their symbolic and political capital, police leaders play an important role in this ongoing construction of police culture, acting as sensegivers. Examining how they approach, define, and simplify PAITI is central to understand how police organizations adapt to the AI turn in policing. Yet these ideational constructs are distorted, which is where bounded rationality helps us systematize the analysis of police leaders sensemaking. To frame it using Parsons' (2007) terminology, this is how the psychological logic of explanation that is bounded rationality complements the ideational logic associated to constructivism. The argument allows digging into the inferential distortions that account for the limits to human and organizational rationality. This is another way of stating that the AI turn in policing is not based on rationally calculated

needs and crime statistics analysis. It is influenced by key police leaders and policy actors' sensemaking of PAITI. I argue that police leaders facing complex decisions regarding police AI technologies make sense of them through a simplification process centred on two distinct, complementary continuums.

First is the change continuum. Police leaders facing complex decisions regarding police AI technologies make sense of them through a simplification process centred on the impact of technologies on traditional policing. Innovations that enhance what is valued by police culture as "real" police work by making it more efficient and systematic will be more likely to be adopted than innovation that fundamentally transform the nature of police work. This is because it could lead to cultural clashes within the organization or with the public, which leaders tend to avoid. Most innovation will trigger both transformation and enhancement, the distinction being which PAITI tend toward which end. Importantly, what matters is how police leaders make sense of the change potential of a given innovation on policing, not its actual transformative impact. The latter is an argument advanced by Brayne (2017) in her study on big data policing, which was confirmed by my examination of ALPR.

Second is the surveillance continuum. An innovation that develops police surveillance capacities in a way that is visible to the public and habilitates the police to identify individuals directly is less likely to be favoured by police leaders. This is because citizens are more prone to contest surveillance apparatus if they are directly concerned. What would be favoured, reversely, is an innovation that develops police surveillance capacities in a way that is not visible to the public and that habilitates the police to spot trends without directly identifying individuals. Both cases enhance traditional police work, but organization leaders are subject to *identity construction phenomena*, where if an institution's reputation is threatened, individuals have a personal motivation to protect it. Because of public and political concern regarding citizen surveillance, police leaders are expected to intend to avoid a public backlash and as such favour technologies that increase police surveillance capacities while limiting potential backlashes.

Leaders therefore favor PAITI which enhance traditional police work and develop indirect surveillance capacities. Faced with internal reserves of transformative PAITI and external suspicions toward increased direct surveillance of citizens, leaders' approach to

the AI turn will be one where their institution is simultaneously less visible to the public but empowered with unprecedent capacity to surveil citizens. This puts in question the very nature of police restraint and limited intervention in citizen lives. What's more, traditional police accountability mechanisms are seldom equipped to overview police use of PAITI. This means PAITI impact not only the nature of police-citizens relations, but also some fundamentals of democratic society. It opens the door to big data surveillance society in which the police are undistinguishable, embedded.

This dissertation demonstrated the impact of PAITI on the change and surveillance continuums is not absolute; it is mediated by technological frames, organizations, and environments. The dominant technological frame of technical efficiency can translate the same PAITI in different contexts as an enhancement or as a transformation. From a technical standpoint ALPR, studied in the first empirical chapter, enhance agents' capacities. Not only does it allow officers to read considerably more plates than if done manually, but readers can also process licence plates at high speeds and at night, which was not previously possible. Yet running plates is only one of the many duties an officer can do while patrolling, and it might not be considered "real" police work by some. It limits police discretion, and as such is akin to *cheating*, as one SPVM officer put it.

Technological transitions perceived as ineffective or reducing front line discretionary time to increase reporting tend to be resisted, because of the mythological dimensions of patrolling for the police. This helps understand the gradual evolution of ALPR from multifaceted tools to mostly road safety instruments in Montreal. By putting the technology in the hands of road safety agents, the SPVM focused its use on targeted goals uses instead of wider criminality trends. This underlines how actors in Montreal purposively made sense of ALPR to accentuate their amplification dimensions and limit the instability caused by the transformative dimensions of the innovation.

As for the surveillance continuum, ALPR transition police surveillance practices from query-based to alert-based, meaning the determination of who is suspicious and deserves to be further scrutinized by the police is no longer done through investigative work but by AI. This dragnet surveillance practice reduces the cost of police surveillance, whereas police resource limitations have historically been a prime restraint mechanism to police power.

Yet, if experts can mostly agree on the impacts of ALPR on police surveillance practices, different populations might not perceive the threat of police surveillance similarly. Nor do police services have (or are perceived to have) the same technical capacities to act upon new surveillance opportunities, or the same level of self-restraint. To comprehensively analyze the impact of AI on our democratic societies, we must go further than straightforward analyses of technical dimensions. Debates over RCMP contract policing coupled with increased Olympic surveillance are amidst the contextual factors that led to strict ALPR data suppression policies in BC, whereas this was not the case in Montreal. On this point, this study strengthens the finding by Merola et al. (2019) that the more the public knows about ALPR, the less favourable they are to the technology.

The second empirical chapter studied a less mature and less widespread PAITI: place-based PP. Accordingly, police and non-police actors' sensemaking exercises of this innovation are not as established, allowing to explore variations in actors' forecasting of how this open-ended PAITI will impact police-citizen relations. In terms of the change continuum, police leaders will argue PP is an enhancement, not a transformation. The VPD leadership purposively portrays Geodash as an extension of traditional policing. Chief Palmer emphasizes that for the patrol, PP merely make crime mapping more precise.

While this is true, we should not downplay the profoundly transformative dimensions of PP. This PAITI is built on risk-level assessments based on data sometimes irrelevant to the criminal justice system. This goes considerably further, for instance, than first generation crime mapping software that simply provided a digital version of old "dots on the map" police strategies. The latter could noticeably be explained to patrolling LEO. As of right now, PP cannot. As a result, PP both enhances criminology of place while transforming the core data sustaining this traditional policing strategy. Nonetheless, what matters is that for police leaders, PP generally corresponds to an amplification, not a transformation.

As per the surveillance continuum, place-based PP is not direct nor visible to the public. Because it is rooted in traditional policing theories and does not enhance direct surveillance, a plurality of police leaders positively makes sense of place-based PP. Yet during the interviews, even police leaders enthusiastic about this PAITI say they are reluctant to implement such a program because of institutional capacity and technological

maturity, notably the availability of data and the complexity of the transition. The perception of potential public perception backlash also raises red flags. Granted, most of the bad press in Chicago or Los Angeles was about person-based PP, which is outside of the scope of this dissertation. Yet these events do influence sensemaking about place-based PP. The study of PP confirms the ways in which police policy leaders translate PAITI into categories that fit their organizational culture. Likewise, it demonstrates how increased AI literacy in the public and controversial police violence cases in this era of social media have led many police leaders to adopt a cautious approach to AI.

The third empirical chapter demonstrates BWC are now PAITI, which impacts both continuums. In the USA, BWC hardware was adopted massively between 2012 and 2017. Canada, as of 2020, is entering its own trend of BWC adoption. The difference between both sequence is the technology has evolved and is now AI dependent. Non-AI-induced BWC are a minor infringement on privacy that helps investigations and enhances police work by potentially civilizing relationships with citizens. In contrast, on the surveillance continuum, AI-induced BWC can be direct forms of surveillance if the footage is live fed to AI. On the change continuum, this provides a transformative informational advantage in favour of the officers, distorting the projected civilizing impact of BWC on police-citizen relationships.

This paradigmatic transition allowed to isolate the impacts of AI on actors sensemaking of BWC technologies. That is, what inducing BWC with AI means for police sensemaking of its power, relationship with citizens, and accountability. This dissertation found through the study of BWC policy in Toronto there is an emerging ability in the public debate to understand BWC as more than just hardware. Dynamics in Halifax and Montreal likewise suggested this is indicative of larger trends in how political and police actors approach this innovation. This sensemaking development announces changes for PAITI policy in Canada that go beyond BWC.

Beyond 2023 PAITI: Policy Recommendations

In the second half of the 2017 Axon Signal advertisement, a police public information agent examines the footage from the successful domestic violence intervention. The latter was automatically updated to the cloud while the BWC was

recharging. A news headline appears in the background: "more police brutality." In moments, the agent uses Axon's automatic blurring technology to anonymize the footage and forward it to the journalist. The headline changes: "officers rescue family." The message: AI allows services to protect its officers from bad press. The subtext plays into the us versus them narrative that is strong in some police cultures. By extension, that police mistrust is the result of public misunderstanding, not organizational problems. The same footage is then shown to the culprit: "video evidence has increased guilty pleas by up to 20%." AI is therefore portrayed as an allied of police services not only during interventions, but also for public perception and prosecution.

One could read from this advertisement that police policy leaders, just like Axon, are entrenched in a utopian view of AI as a panacea for all law enforcement challenges. This dissertation demonstrates a more nuanced reality. Their sensemaking, between the middle of the 2010s and 2022, has evolved. Yes, police leaders primarily make sense of AI through traditional policing grids of analysis that are the change and surveillance continuums. Likewise, the technological frame of technical efficiency remains an important characteristic of police cultures. However, contrary to an at times caricatural depiction of the police, leaders also recognize limits to AI, as well as the necessity to account for public reactions to PAITI adoption. This is how in 2020, AI was at the forefront of stakeholders' debates during the TPS BWC rollout, whereas it was an ignored dimension three years earlier in Calgary.

For police leaders, it comes down to determining if the transformative dimension and privacy cost of PAITI is outscored by its benefits. This is easier said than done. Police leaders rarely have the technical training to understand AI or ML. Precisely projecting the impact of any innovation is likewise a risky endeavour. In this context, leaders translate PAITI intro grander policy and organizational goals rooted in traditional policing grids of analysis. For torso cameras, it is to increase the trust between citizens and their police. Similarly, PP ambition to increase the precision of patrol has a greater goal: to stop crimes "before it happens." The calculation here is to determine if this amplification is worth the risks this entails for citizen privacy, as well as that of systematization of bias.

The public, too, makes similar cost-benefit calculations. If ALPR databases are restricted to stolen vehicles and wanted criminals, they generally approve of it. If it includes

data that could affect lower offences, such as unpaid parking violations, they are less supportive. These preferences influence police leaders sensemaking of PAITI.

The latter is based on a continuously constructed idea of what policing in the era of AI should be like, and limited information on the concrete impact of individual innovations or how they will be received. Translations increase in complexity as our understanding of the multifaceted transformative impacts of AI on police-citizen relations evolve. The recent public attention given to PP and BWC policy versus ALPR a decade ago demonstrate that Canadian police AI policy deciders are now making sense of AI as potentially profoundly transformative. This is promising for future police technological transitions beyond current available PAITI. Algorithmic policing can contribute to better police-community relations. But this can only be achieved under appropriate circumstances—and the right policies.

One key argument of this dissertation is that sporadic debates over AI in policing have reached a point where the traditional safeguard against police abuse of power that is public supervision is stronger than what early students of big data policing feared (Brayne 2017). Both PP and BWC cases point to how current attentiveness to police misconduct and increased public AI literacy induces caution in police leaders sensemaking of PAITI. The same cannot be assumed, however, in other AI policy fields which do not receive as much media and academic attention as policing does. Nonetheless, the prudent approach to PAITI can be seen as a window of opportunity to regulate AI in the field of policing before its uses become more widespread. Given the continuous attention to policing in contemporary society, one can hope regulations on this front have positive repercussions in other AI policy areas.

It is never too earlier to start thinking about the future of policing, especially when it is about the present. Canadian policing's AI transition might be taking more time than their southern counterparts, but this dissertation provides an analysis of three complementary PAITI case studies which demonstrate that it is resolutely engaged in it. ALPR have been in use by police officers for over a decade. PP is sparsely adopted and made sense of by police actors as a technology of the future, despite being already used by the VPD. BWC is entering a Canadian wave of adoption as it has become dependent on AI.

One teaching of the social construction of technology literature is that people tend to overestimate the impact of innovations in the short term but underestimate it in the long term. It is useful, in this context, to look at early PAITI, and how their policy patterns evolve across time. This dissertation provides the first detailed case study of ALPR in Canada. This is likely the most common form of AI amidst Canadian services, and among the first PAITI adopted in Canada. In that this dissertation fills an important gap in our understanding of algorithmic policing on our side of the 49th parallel north.

A lesson from this case concerns the concept of technological re-invention, which refers to how actors use an innovation for functions different than its original implementation goals. ALPR are prone to re-invention because of their low level of complexity, the observable results it delivers, and that it provides data that can be recycled for other PAITI uses. Yet, contrary to cases in the USA, ALPR have not been re-invented in Canada for contextual factors, lack of organizational buy-in, bad training, and sensemaking as exclusively road safety tools. The counterpoint to this is that ALPR have generally not become a distraction or a destabilization factor, something police leaders fear when considering PAITI.

The seamless and uncontroversial adoption of ALPR in Montreal cannot, however, be used as a roadmap to predict what will happen with other PAITI. BWC are prone to re-invention given they produce data that can be scanned with a variety of AIs. Even without AI, BWC failed on its many civilizing promises. With AI, it brings police surveillance to an unprecedented level, posing privacy challenges services a decade ago did not need to account for. Those that support adopting torso cameras must therefore understand it as a PAITI and be willing to develop policies that address it this way. It is the nature of big data surveillance in democratic societies that is at stakes if they do not.

Another element that stands out from studying ALPR in Canada is that of policy stickiness. Initially, BC adopted strict data suppression policies, while the SPVM did not. These policies remain untouched a decade later. It underlines the importance of the ongoing discussions on BWC uses in Canada. This is especially important since services are better equipped than in the early 2010s to leverage the data it collects from the hardware. In this context, for citizens to trust AI, data privacy and security has to be at the forefront of the agenda. This applies for many fields of AI policy. For instance, some provincial

governments are now debating sharing aggregated health data with private AI in health industrials. One can understand the appeal for the government of leveraging these industry leaders for the benefits of our public health sector. Yet if the government is to surrender such delicate data, it must impose appropriate safeguards on these private actors. Despite what authors of the Montreal Declaration hoped, calling for ethical uses of AI has often been just another way for industrials to avoid regulation.

Given how sensemaking continuously evolves, Canadian services should regularly reconsider their PAITI policies. By putting ALPR in the hands of AQSR, the SPVM focused its use on illegal road uses instead of wider criminality trends. As of 2022, these deterrence objectives have mostly been met. However, SPVM ALPR are rarely activated because of lack of information available for LEO, and the negative perception of some veteran officers. Before purchasing new PAITI, the SPVM should offer ALPR training to more officers on a rolling basis.

In addition, the service should allow patrolling officers to decide which alerts to activate. For instance, LEO not used to ALPR could select to receive alerts for stolen cars and amber alerts only. This would allow officers to get used to the PAITI and would be less likely perceived as a hinderance on police discretion.

Regarding ALPR data retention policies: in California, 92% of ALPR data searches by officers reviewed by the Auditor General concerned records that were less than six months old (Howle 2019, 30). The two members of the SPVM road safety team that have access to ALPR data noted the same trend. Yet, ALPR data is saved for five years by the SPVM. Granted, the data is considerably less accessible in Montreal (less than 10 people have access to it). It is also less invasive of privacy, as it is not linked with other datasets. Still, Auditor Howle's recommendation to establish non-hit data suppression policies after six months could be applied to the SPVM without significant consequences for its current ALPR uses.

The latter recommendation would correspondingly set a precedent for PAITI policy. Clearly stating data suppression directives appears particularly important for direct forms of surveillance, such as BWC. The systematic suppression of unflagged camera footage

after a determined period[314] might alleviate citizen privacy fears. It would also reduce considerably data conservation costs. In all cases, data suppression cannot be outsourced to another agency: it must be done internally (contrary to early ALPR policies in BC).

BWC must also clearly state policies for: activation and deactivation; order of access to the footage (before or after the report is written); storage security and location; and procedure of access to footage for members, citizens, civil society, and experts. In the USA, BWC adoption and policy development was generally an internal affair to agencies. This led to significant accountability shortages. The same was true in Calgary, which was driven by CPS leadership. The local police board merely approved budgets. Yet, Canadian political actors have recently increased their prominence in the BWC policy discussion in Canada. One common claim amidst critics of the police is that AI and policing necessarily decrease police accountability. This does not have to be the case. PAITI, including BWC, can increase police answerability with the right policies, notably in terms of automatic activation and transparent data sharing regulations.

In addition, police policy leaders need to account for BWC as PAITI. Adopting such a powerful tool as AI-induced BWC might increase the apprehensions of citizens toward the armed arm of the state. Directives for AI applications that will be used on the footage collected by cameras need to be clear, especially given that citizen apprehensions are exactly what BWC were supposed to combat in the first place. This includes how to deal with AI uses that are not yet developed or procured by police services.

Given the different algorithms that can leverage video evidence, PIA of the cameras themselves should not allow the use of AI on its footage. Policies should clearly state that a PIA is necessary for each individual AI application pertaining to BWC footage. This is already the case in Halifax. In contrast, only one PIA was done for the CPS. In addition, BWC policies should specify that PIA are to be approved by police boards to ensure AI use on captured footage is systematically conditional to political approbation.

With the appropriate policies, cameras can have positive impacts on data gathering, investigations, training, and even police-citizens trust. The recognition that cameras and

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[314] This period could range from six to twelve months. It should be established by political actors after consultation of stakeholders prior to camera adoption. Judicial actors must be included in these consultation to discuss prosecutorial delays, as well as experts, civil rights representatives, and police leaders.

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software are separate innovations is likely to reassure privacy and civil rights. But this necessitates active supervision by political authorities.

For PP, the data issue which police policy leaders must address most pressingly is related to input, not output. Police leaders—not technologists, academics, or private partners—are the ones accountable for PP, and whatever discriminatory practices bad data might inadvertently cause. The establishment of thorough regular external audit mechanisms during all phases of PP projects could ensure some degree of transparency to services. Random data points check from past decades, regular reviews of databases considered by the algorithm, and detailed qualitative assessments of the consistency of enforcement strategies would increase the redeemability of PP to the public. But traditional police boards are not equipped to conduct these accountability measures alone. They will need to develop new expertise on PAITI.

Lackluster transparency measures and absence of external oversight by the VPD PP program exemplifies police technoscientific to PAITI. The VPD portrays PP as a mean to make crime mapping more precise and omits to recognize that unregulated unsupervised algorithms pose considerable ethical and policy dilemmas. This risk perpetuating historic biases of policing under a false sense of algorithmic impartiality.

For now, the increased public scrutiny limits the prospects of other PP projects in Canada. But this is not only due to external pressures. A central argument of this dissertation is that the growing skepticism—or even suspicion—toward PP in society is likewise present internally. Not all sworn officers will welcome AI with open arms: 40% of my interviewees expressed doubts about PP, at times for contradictory reasons. Wrongly assuming internal support could complicate technological transition. Police policy leaders must therefore conduct internal consultations and address internal inkling toward PAITI.

Currently, Canadian police policy stakeholders are unprepared and unenthusiastic about regulating comprehensively PAITI. This scenario is troublesome for police leaders and critics of law enforcement alike, as stagnation does not advance either side's agendas. Actors that benefit from unregulated technological systems are generally specialist in policy delays. The AI industry is no exception: that providers will self-regulate is one of the persistent myths of the utopian sociotechnical imaginary. Yet, my interviews demonstrate that the police want the benefits of AI, but not at the cost of tarnished public

perception. In that, the police are distinct from many of those that benefit the most from AI, notably GAFAM, which are unbothered by the absence of regulation.

Nonetheless, legislators must renounce to the *fate* approach (Robertson et al. 2020), which supposes an AI governance model where the industry self-regulates. Declaration, code, or checklist, this seldom provides sufficient obligations for public and private entities. Not when it empowers actors to the extent that PAITI do. Comprehensive legislation is needed. With the current absence of regulatory mechanisms, any AI deployment in policing can look suspicious from certain lenses, and hinder police-citizen relations. In this sense, an argument could therefore be made that police services should themselves be more welcoming to legislative intervention on PAITI.

Given the insular and decentralized nature of policing in Canada, PAITI regulation will in the short to middle term likely take the form of organic initiatives such as the TPS on BWC. While incomplete, these represent building blocks for municipal agencies *a mari usque ad mare*. As is often the case, movement on big tech in the USA might trigger debates on big data and AI in Canada too. If this arises, it will be important to not only think of private corporation duties and responsibilities, but also that of public organizations. Especially the police, and its rights restricting powers.

Policies regulating police AI procurement have started to emanate from USA municipal governments, notably in Seattle, Oakland, and San Francisco. In Canada, TBS directives have established a good starting point by forcing private vendors to go through mandatory independent algorithm impact assessments (see Chapter 3). Provincial governments too could play a role in legislating police uses of AI. Law enforcement is after all a provincial jurisdiction, something the BC government has historically been keen in reminding the RCMP (see Chapter 2). Anyhow, there is no one simple solution to regulating PAITI. It will require all policy hands on deck—i.e multiple levels of regulation. These are too complex and important issues to be left to the police and technology industry alone.

Where to Go from Here

This constructivist framework underlined that there are many coexisting police cultures between and within law enforcement agencies. The same can be said about

sensemaking of PAITI. This is but one perspective of how AI was—in part—being translated in Canadian law enforcement at the turn of the 2020s. It focused on a few cases and, given COVID-19 restrictions, could only be accompanied by a virtual fieldwork. Smaller police services do not necessarily have the same technological infrastructure as Montreal, Vancouver, or Toronto. Sensemaking of PAITI could hitherto be influenced by this limit.

The context of the virtual fieldwork, in the early months of COVID and the summer 2020 BLM mobilization, likewise had an impact on officers who were being interviews. This emotionally tumultuous moment likely enhanced a temporary change to their sensemaking of police-citizen relations. In any case, the anonymity of interviews helped make officers open and resolutely self-critical of their own organizations. Yet interviews can only go so far into actors sensemaking, and without COVID, observation of how officers interact with PAITI on the daily would have increased the quality of my investigation. Also note the first version of this dissertation was completed in the spring of 2022 on data collected up until the spring of 2021.

Methodologically, this research presents drawbacks relative to the tensions between depth and breadth. With this dissertation, I do not pretend to have conducted in-depth ethnographic work of PAITI. Neither do I pretend to have studied all instances of their utilization by Canadian municipal police forces. My argument about the challenges that AI poses on policing and by extension our democratic societies means that, to understand police AI policy, I spent less time trying to explain the causes of the emergence of particular PAITI.

Alternatively, I spent more time developing a framework that accounts for a contextualized understanding of innovations in policing to enhance our understanding of the unique effects of AI on police decision-making and surveillance practices. I did so by grounding my work in different disciplines such as political science, public policy, police sociology, and criminology. The results of this interdisciplinary led to a dissertation structure that may appear to some as distant from classical political science. This is a price I was willing to pay to deepen our understanding of AI, power, and democratic policing in Canada.

In accordance with the quasi-totality of work on algorithmic policing, this dissertation focused on urban cases. The few interviews with rural LEO underline how PAITI was an abstract concept in non-urban contexts. On much of the Canadian territory, basic police systems such as radios often do not function. These are generally low-crime rates areas where community-based approaches are favoured. This does not, however, mean that rural officers are anti-AI. Rather, their technological needs are different. Drones with night vision search and rescue ML functions are of great use for park rangers. More so than PP, or ALPR for that matter. AI could appease human resource limitations of rural agencies, while representing a limited privacy threat. PAITI sensemaking in rural context is an area that merits more investigation.

Because I focus on police leaders and the impact of AI on the patrol, few civilians working within services were interviewed as part of this research. Yet financially strained services are relying more than ever on civilians, and they might have different sensemaking of AI in policing.

As for PP, the research currently focuses on USA cases and tells us mostly what not to do: person-based applications and rapid expansion of private companies' software with limited oversight. In Europe, anti-terrorism predictive analytics has been a complete failure (Munk 2017). The cross-national and interdisciplinary PRECOBS is, however, an encouraging PP study that includes social scientists, police actors, and independent data scientists (Leese 2021; Egbert and Krasmann 2020). It benefited from mistakes in the USA, and merits more attention from North American scholars. So do current attempts to develop explainable PP based on decision tree models (Parent et al. 2020). This would tackle the trust problem between predictions, patrols, and police leaders, and help avoid the almost fatality of algorithmic black boxes. While still at the development phase, decision tree models would alleviate societal anguish with AI. It is by no means unique to policing.

The research community must overcome what I labelled here the "killer-robot syndrome." Prospective work on PAITI has overly focused on hypothetical questions of moral or philosophical nature. We must not be dumbfounded by GAFAM funded Partnership on AI narratives that distract scholars toward abstract issues with limited implications for police policymakers. PAITI are not theoretical constructs about the future: they pose immediate challenges to democratic policing. Our knowledge of the implications

for local government of PAITI, or AI for that matter, is especially sparse. PAITI policy needs to be continuously reassessed. On BWC, many have studied their early adoption, but few have investigated their reinvention and policy evolution five or ten years later. On ALPR, few have studied either early or late stages. Studying PAITI in the intermediary to long term is yet another area that must be further investigated, especially given current enthusiasm toward BWC in Canada.

Such inquiries need to account for long-term social impacts of PAITI. The embeddedness of policing which my argument suggests represents a fundamental transformation for police-citizens relations. But it is also a reflect of how AI is profoundly transforming many aspects of democratic societies, as similar shifts are happening in other policy areas. The intertwined nature of bias and privacy noted with PP for instance notably resonates in welfare and healthcare policy.

The "fourth industrial revolution" of AI and Deep Learning (DL) is an era of great promise, where AI is being leveraged to solve fundamental human issues such as world hunger or the environmental damages caused by previous industrial revolutions. But it is also an era of great perils. Power shift favoring those that control technologies drastically increase inequalities and fragment societies. This is exemplified by the Chinese authoritarian regime leverage of AI to control populations and supress freedoms. As we are entering what appears like a new cold war, it is imperative to strengthen the democratic alternative to this putrid model. With proper regulations and active engagement of all stakeholders, we can capture the benefits of AI in a way that makes it compatible with democratic life. In policing and elsewhere, this means designing algorithms with the rule of law, restraint, and transparency at its core. This dissertation should be considered with this greater goal in mind.

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