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Crime analysis and cognitive effects: the practice of policing *through* flows of data

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ABSTRACT

Crime analysis is the systematic analysis of crime for identifying and predicting risks and efficiently directing police resources. Adopting a social construction of technology framework, we explore the work of crime analysts to understand how they police through flows of data and how their work informs policing practices on the ground. Specifically we look at: (1) the organisational and cultural integration of crime analysis in Canada, (2) the technological support of analytic practices, and (3) the incorporation of crime analysis for policing practices. From this analysis, we argue that organisational understandings of crime analysis combined with the analytic platforms utilised have forced crime analysts to work within traditional police performance initiatives that both respond to and reinforce reactive policing practice. Crime analysis and the practice of policing through flows of data have changed the symbolic nature of policing while reaffirming traditional ways of knowing and policing.

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Crime analysis; ontological security; police culture; police technology; technological frames; police métier; cognitive effects; ethnography

Introduction

The early identification and subsequent arrests of the attempted Via Rail bombers in Ontario and the Boston Marathon bombers in the United States have highlighted the role crime analytics plays in contemporary crime control.¹ Crime analysis is described as the systematic analysis of crime for the purposes of assisting in crime prevention and control, the identification and apprehension of criminals, and evaluation of policing strategies.² The movement towards 'pre-emptive policing' through the identification of targets, risks and threats has led to the development of a new profession of people, crime analysts, with specialised analytical skills in policing.³ Crime analysts turn raw information into 'actionable intelligence' that is used for predicting and managing crime.⁴

The utilisation of data analytics in new policing strategies, such as intelligence-led and predictive policing, is part of a recognition among police professionals that policing has evolved from the traditional model of random, reactive, and response-based activities⁵ to encompass the pre-emptive management of a wide set of problems concerning risks to security.⁶ These new policing missions, therefore, are organised

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around the collection and analysis of flows of data. To date, there has been much research and theorising on the policing *of* flows, such as flows of people, money, and transportation.⁷ However, much less is known about how we police *through*, or by means of, flows. Crime and intelligence analysis presents an ideal setting for empirically studying policing through flows of data.⁸ Adopting a social construction of technology framework, we qualitatively study the sociotechnical work of crime analysts for understanding *how* the flow of data informs contemporary policing practices.

Research in the social construction of technology has identified the importance of attending to the way users' interpret and interact with technology for understanding how technological innovation shapes and is shaped by organisational structures.⁹ It recognises that technologies and users are co-constituted and embedded within sociostructural networks that facilitate and impede users' choices and actions.¹⁰ Objects are not static entities, but instead are shaped by the meaning users ascribe to them and their 'processes of production, translation, circulation, appropriation, experimentation and resistance'.¹¹ For example, research on security devices illustrates how technologies affect and/or reflect 'the logics, rationalities and modes of reasoning of security practices'.¹² Such research has demonstrated how technologies have 'cognitive effects' wherein the normative and political ideals of their designers facilitate and constrain particular modes of crime analysts and intelligence technologies provides much-needed empirical insight into the production of intelligence and the impact policing *through* flows of data has on contemporary crime control.

In what follows, we review the literature on crime and intelligence analysis. We then look empirically at crime analysts' perspectives of: (1) the organisational and cultural integration of crime analysis in Canada, (2) the technological support of analytic practices, and (3) the utilisation of crime analysis and its perceived impact on policing practices. From this investigation, we argue that crime analysis, and by extension crime analysts, occupy a tenuous position in contemporary policing that is shaped by, as well as reinforced through, the integration of database policing. We argue that the division of labour, organisational context, and cultures of policing are configured into police technologies and shape intelligence production. This social shaping of technology, we argue, has led crime analysis to be oriented towards, while also reinforcing, what Manning (2010) refers to as the 'police métier' - a set of habits and assumptions that 'envisions only the need to control, deter and punish the visible and known contestants'.¹⁴The police métier reproduces 'deeply held assumptions about people, society, crime and its causes' that 'sustains the validity' of police practices.¹⁵ Thus, crime analysis and the policing through flows of data have changed the symbolic nature of policing without significantly altering police practices on the ground.

Intelligence technologies and database policing

The available research on crime analysis originates largely from the United States and the United Kingdom, where police training, practices, and policies differ from those in Canada.¹⁶ While scholarship on the *actual* work and *culture* of crime analysts is sparse, the few studies that are available identify a lack of fit and integration between crime analysts and their organisations due to poor analytical thinking, a culture that doesn't

support innovation, and fragmentation and occupational divides.¹⁷ This scholarship has identified challenges for the integration of analytic knowledge in policing due to an occupational police culture that values and relies upon experiential knowledge.¹⁸ Crime analysis, therefore, represents the 'antithesis of traditional action-oriented work, which police officers have long valued over more mundane paperwork tasks'.¹⁹ Cope's qualitative analysis on crime analysts identifies the importance of negotiating the differences between the contextualised and experiential knowledge of police officers and the decontextualised and analytical knowledge of analysts for generating 'legitimacy and respect for the knowledge produced by analysts so they can be viewed as a new generation of crime experts'.²⁰ Her research has also shown the perception of analysts and analytical products to be influenced by the gendered nature and hierarchical structure of police organisations.²¹

A larger body of research exists that focuses on the methodological techniques (such as social network analysis, hotspots, kernel density mapping) and technologies involved in crime analysis and their effectiveness for crime reduction and control.²² Such scholarship, we fear, has become trapped within the 'police métier' by 'reflect[ing] the conventional wisdom about why and how policing works'.²³ It focuses on what works and 'what the police can do' – placing the focus on fighting crime by using measures such as crime rates and number of arrests to evaluate success – rather than studying the means and practices by which the work is being conducted, and the implications these practices have on the citizens they police.²⁴ For example, much of the research available on crime analysis focus on the technological with little attention to the organisational and cultural contexts in which the work occurs and the interpretive work that shapes the analysis.²⁵ Yet, ethnographies of police information technologies have identified 'functional disconnects'²⁶ in the practical implementation of technology because of the organisational and operational (i.e. cultural) contexts of their use.²⁷ For example, Chan nicely illustrates how police culture can act as an impediment to police innovation, technological adoption and police reform, while Sanders et al. illustrate how the police occupational culture of secrecy and silos facilitates and constrains how police officers make sense of and utilise technologies and intelligence-led strategies.²⁸ Thus, understanding crime analysis requires a focus on the interpretive actions and understandings of analysts within the structural and cultural contexts and material realities that influence, shape, and guide them.²⁹

Further, by researchers treating analytic technologies and crime analysts as distinct objects of analysis, the scholarship has ascribed objectivity to analytic products that ignore the 'subjective and interpretive practices ... involved in their manufacture, and the contingencies and limitations of the products'.³⁰ However, as research in the social construction of technology has shown, the 'authority of a scientific fact is socially produced, rather than an inherent quality of the object being studied'.³¹ Objectivity, they argue, is 'tied to a relentless search to replace individual volition and discretion in depiction by the invariable routines of mechanical reproductior'.³² For example, sociological analyses of policing have shown how information stored on police records management systems (RMS) are not objective measures of crime and offending, but are instead the product of police practices and subjective decision-making on the ground.³³

Police data, therefore, is dirty data – often containing inaccuracies that are 'routinely compensated for and often glossed over by crime analysts'.³⁴ Crime analysts spend their

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time doing 'database policing' (Ericson and Haggerty 1997); they find, collect, preprocess, and 'design and conduct analyses in response to ever-changing crime conditions, review and interpret the results of these analyses and exclude erroneous findings, analyse the integrated findings and make recommendations about how to act on them'.³⁵ A central part of crime analysis involves the analyst evaluating information for both its credibility and reliability.³⁶ In fact, the 'importance of evaluation in intelligence production cannot be underestimated as a failure to conduct it properly will undoubtedly result in a failure of intelligence'.³⁷ Joseph and Corkhill conducted a focused group interview with six intelligence analysts to interrogate this evaluation process and found that these analysts do not use formal evaluation processes, but instead rely predominately on informal processes that are self-taught on the job.³⁸ Yet, the interpretive and subjective decisions embedded within these evaluations, and the construction of crime data, become hidden by the use of non-transparent technologies and algorithms.³⁹ Interestingly, while crime and intelligence analysts are perceived to hold a central role within the production of policing intelligence,⁴⁰ there is little empirical research available on the work they do.⁴¹ In fact, Innes et al. were the first scholars to open this line of inquiry by drawing upon the sociology of scientific knowledge framework to understand and make sense of the everyday work and practice of crime analysts.⁴² Their groundbreaking research not only identified the subjective and interpretive work embedded within analytic products but also drew attention to the need for more grounded analyses on the sociotechnical work practices of analysts.

Methodology

In order to conduct a study of crime analysis that is critically attentive to the sociotechnical relations that make up analytic products, we employed ethnographic methods. By studying the *in situ* use of analytic technologies, we were able to uncover the way organisational users 'enact structures which shape their emergent and situated use of that technology'.⁴³ Ethnography provided analytic leverage for understanding how meanings ascribed to crime analysis become embedded within analytic technologies, which in turn facilitate and constrain use.⁴⁴

We conducted 42 intensive interviews with crime analysts from eight different police services across Canada. While both crime and intelligence analysts participated in the study, for the purposes of this paper, we focus only on the perspectives and experiences of the 42 crime analysts (also referred to as district analysts or generalists). Unlike intelligence analysts who are often assigned to speciality units (such as gang crime units, drug units, homicide), crime analysts worked more closely with administration and front-line patrol officers. Whenever possible, we conducted interviews in the work settings so as to see the technologies and skills in action, while being attentive to the 'infostructure' and 'info-culture' that shape analytic work.⁴⁵ Interviews were supplemented with observation at crime analytic workshops and conferences. All data were stored and analysed in NVivo 10, a qualitative data analysis software program, using a constructivist-grounded theory approach.⁴⁶ Constructivist grounded theory prioritises the participants' understandings of their experiences, while incorporating a reflexive analysis that draws upon pre-existing theories and concepts (such as: technological frames, police métier, cognitive effects, and crime analysis) to guide the interpretation and

focused coding. From this analysis, we provide empirical insight into the way analysts construct crime knowledge through flows of data. Not unlike previous ethnographic scholarship on the integration of information technologies and analytics in policing, we argue that the integration of analytics has not changed front-line practice, but instead has altered the *symbolic* nature of policing. Specifically, we argue that the sociotechnical work of analysts has been informed, and shaped, by the broader police métier and thus provides cognitive effects that reaffirm the world as it is known to police.

Defining and understanding crime analysis

Crime analysis is a relatively new and nascent profession in Canadian policing. It was not until 2000 that Ontario police services were mandated to have a crime analysis capacity to enhance intelligence gathering and reporting.⁴⁷ While a crime analysis capacity was mandated, there was little specificity provided regarding its implementation. As a result, there are significant variations among crime analysis units – with some units consisting of 1 crime analyst while others having 20 or more. There are also variations in operational models, with some services having only civilian crime analysts, and others having police officers, while still others include a mix of civilian and police analysts.

Civilian analysts are a heterogeneous group made up of internal transfers from other administrative positions 'where they are already embedded within the culture of policing' (I19) and external applicants. *Police analysts*, on the other hand, have been assigned to the unit. Many police analysts describe their placement in analysis as one of being 'parachuted' (I21) and 'dropped into the position' (I11, I13) or being sent to the 'penalty box' (I21).

The biggest disadvantage for me was that *I was just put into this position* ... it's not like I applied for it and it's not like I really did know exactly what it was about before I came to it, other than the fact that you know *they did some street checks and they sent out a report* ... (111, *emphasis added*).

I'd gotten myself into some trouble ... You get dropped in the penalty box – whether that's the central alternate response unit, where they take the reports over the phone ... or the crime analyst's office where you have no public contact. They get you off the street ... so typically your cadre of crime analysts are typically made up of your troubled coppers ... or they're walking wounded, or they're retirees ... that's pretty much what the penalty box consists of. And we're satisfied with that, because you do no harm in an office, right? (121)

The experiences of the officers above shed important insight into the integration and organisational 'fit' of data-driven practices in policing. The first officer (I11) was placed into analysis after an injury. He was largely unaware of the position and had very little analytic training, skill, or knowledge. The second officer, who also had little analytic training and expertise, described his placement in crime analysis as a form of 'punishment'. His description of analysis as the 'penalty box' illustrates a division between what is perceived as 'real police work' and the work of 'crime analysts'. This perception of crime analysis as a 'penalty box' – a place for injured, ill or 'troubled coppers' (I21) – carries important cultural implications for crime analysis, as it devalues both the work that analysts do and who is doing the work. As the following analyst explains, 'the culture of policing has a "pecking order" and the culture dictates the order, and as an analyst you are down on that pecking order – you are an administrator' (field notes).

Analysts' education background (e.g. high school, college, undergraduate, and graduate school) and disciplinary training (e.g. policing, city planning, social work, geography, computer science, sociology, psychology, and criminology) also varied. Although there are no required training courses, analysts typically complete the Tactical and Strategic Intelligence Analyst courses delivered by the Canadian Police College. As one analyst explains,

We really have no accreditation accepted or unified accreditation program north of the border in Canada. So what we typically do as analysts is either attach ourselves to the International Association of Law Enforcement Intelligence Analysis (IALEIA) and grab their Fiat course and their certification, or you know, you go to the International Association of Crime Analysts (IACA) and get their certification. Either way you are getting some type of training (I21).

For many analysts, and in line with previous research on crime analysis, training, 'experience and expertise were developed' (106) through peer learning.⁴⁸ Services would send one person to a training course and that person would then become the 'resident expert and was expected to walk everybody through it' (119). While there are limited training opportunities for crime analysts, there is even less provided to police officers.

The following field note excerpt highlights how the lack of organisational training provided on crime analysis both constrains and impedes data analytics and algorithmic practices.

The real problem is that the officers are dictating the end product. *The officers are giving us the problem and asking us to verify it.* We don't have the chance to do analysis because the bar set within the police service is low, we are simply 'query clerks'. Even when an analyst is sent away on a workshop or training conference and learns these great analysis skills, how do you develop skill sets when you are forced to continue doing what you were doing before? For analysis to be analysis, we need to stop having them give us the problem and instead let us tell them something. For something to be an analysis product means it must have strategic and tactical utility. Strategic and tactic focus needs to be our goal, but we end up simply 'crime reporting'. Its not that analysts need autonomy within the organization, they need 'creative licence' to educate someone and to educate consumers as to what types of analysis can be done for various types of consumers (Fieldnotes, emphasis added).

The field note excerpt above illuminates how the lack of analytic knowledge provided to police officers both *constrains* analytic development and *impedes* the integration of analysis. As the analyst explains, the police officers that supervise analysts often dictate what the end product is to be, but without knowledge of what analysis is, or what it can do, analysts are often left to provide products that 'verify' and reaffirm problems already known to police. Crime analysis, as a result, has become oriented towards, while also reinforcing, the broader police métier; it is used to report and verify known and visible crimes. Further, while the integration of analytics is *impeded* by a lack of organisational knowledge of crime analysis, it is also *constrained* by this lack of knowledge because analysts are not provided opportunities to utilise and learn advanced analytic skills and techniques.

The lack of organisational investment in analytic training combined with the placement of civilians and 'troubled coppers' (I21) in analysis has rendered it a marginalised field within policing. As one analyst remembers: I had this boss that didn't know, and he was kind of a little bit bullying at first, because he goes, '... how much do you get paid? *Like is it worth having someone like you, what are you, a data entry clerk*?'... And there is a joke that 'oh, you're the civilians, oh, you guys go for coffee and you guys sit pretty up in the office.' And there is that joke, but then they know that no, it's not easy, like we're not kicking up our shoes and watching Oprah all day. ... yeah we're doing *real work* (136).

The analyst's experience above identifies the tenuous position crime analysts occupy within policing wherein they are faced with a cultural perception of their work as being administrative 'data entry' clerical work that is not '*real*' police work. The above quote highlights a lack of organisational understanding around what crime analysis *is*, and by extension, what crime analysts *do*. As another analyst explained, 'it's such an undefined position that anything that has to do with information, organisations will be like, "oh, let's just make a crime analyst do it''(I30). One analyst went as far as to say that police administrators (those with decision-making powers) don't have a desire to understand analysis, but have 'done what the government mandated. They have crime analysts [who can] provide that statistical data, *which they see as intelligence* ...'(I18). Thus, how organisations perceive and define intelligence and analysis shapes how they integrate and utilise their crime analysts.

Crime analysts explained how much of what they do in a day is writing 'crime reports' and 'making pretty pictures' for police administrators and management. Such crime reports focus on,

telling [administration] 'here are your problem areas and your priorities,' *I don't tell them* where their priorities are, but here are your strengths and weaknesses and here's what's going on in the city, long term wise here is how it relates to what's been happening in the past' and from that [they] can choose what [their] priorities and ... focuses are as a department (I30).

Analysts, as described above, use flows of information to develop reports that identify past crime rates and trends. Interestingly, these crime reports do 'not tell them where their priorities are', but instead allow the administrators to 'choose what their priorities and focuses are'. In this way, the analyst has consolidated and synthesised the crime data for her manager, but the analysis – the turning the data into actionable intelligence – is left to the administrator. The use of crime analysts for crime reporting, and not for intelligence analysis is clearly evidenced in the following quote:

Crime analysis *is a necessity for managers to reach their goals*. So I mean crime analysis is *pretty robust* across the board because of that reason. If the manager needs the information, it's Comp Stat, or they need the information to show their bosses their accountability, you will always find a manager who has an analyst at hand to do that kind of work for them. *Intelligence is a frill* ... when you're talking about dollar and cents within departments. It is a luxury to have a good intelligence unit and it's a luxury to have intelligence analysis (I31, *emphasis added*)

The analyst above identifies how crime analysis has become 'robust' because of its perceived managerial and accountability value. He also identifies a clear hierarchical distinction between crime and intelligence ('frill') analysis.⁴⁹ Further, the analyst draws attention to the economic and organisational shaping of analysis by inferring that crime analysis (in this particular case, the reporting of crime) is less expensive than what 'good

intelligence' costs police services.⁵⁰ The little education and training provided *coupled* with the lack of an agreed-upon definition and understanding of crime analysis has led analysts to spend their time synthesising information for the purposes of identifying and reporting on *past* crimes and crime trends, which, as one analyst explained, 'is crime reporting. There's no analysis there – [it] describes things that have happened'(I21).

Interestingly, the emphasis placed on 'report writing' and 'making pretty pictures' is in line with earlier research on crime analysis ⁵¹ and reinforces the argument that 'introducing crime analysis ... may not produce expected returns for new policing paradigms that incorporate these approaches ... unless officers see these alternative approaches as "real police work".⁵² Further, our analysis signals that regardless of the growing discussions and enthusiasm for predictive policing and algorithmic analysis, the everyday practices of crime analysts do not appear to have significantly changed.⁵³

Technological platforms and the shaping of analysis

While many analysts felt that their work was not well integrated or utilised by their organisation, they also believed they were not doing sophisticated analysis because they 'don't have the programs that are capable of pushing that analysis' (110). Questions regarding the functionality of technology are essential for understanding or assessing its effectiveness.⁵⁴ Technical effectiveness is not only about its performance but also includes 'its management and implementation, for example, the adequacy of infrastructure, degree of integration with existing tools, and availability of high-guality training and support'.⁵⁵ Similar to previous ethnographic research on the integration of information technologies in policing, analysts identified numerous technological problems, such as a lack of interoperability with different databases and technological platforms, inadequate technological infrastructures, poor data quality, and poor analytic and technological training. For example, as described above, many analysts noted that they lacked training in important analytic skills and were required to learn through onthe-job training. The lack of high quality training provided to analysts draws attention to user capacity and capability constraints in regards to their analytic skill. Further, the technological challenges facing analysts, we argue, raise important questions about the organisational support and utilisation of analysis, and, more interestingly, the type of analyses being conducted.

Research in the social construction of technology has illustrated how the adoption and rejection of technology is shaped by the definition and meaning users ascribe to their interactions with it.⁵⁶ The perceptions and meanings crime analysts ascribe to their technologies are situated within their particular 'technological frames'.⁵⁷ As the following crime analyst explains:

There is a challenge of us trying to get the information out ... because the operation of Niche and our needs [differ]. Just to give you a small idea, if I'm looking for a male, white, six feet with red hair, I need my query to meet all those criteria. And with Niche it checks each thing individually, so then I will get all the male, whites, and then I'll get all the six foot, and I'll get all the red hair. It won't give me all of them So our hands have ... been tied ... by the fact that our service has decided that everyone shall use Niche and that will be your only resource, which is difficult for the crime analyst because our use is a lot different from other people. It is hard to pull data out of there (I04).

The analyst above identifies the existence of differing 'technological frames' among crime analysts, police officers, and administrators that impact the effectiveness of police technologies for analysis. As another analyst explains, the police RMS has been designed for police services to comply with the Canadian Centre for Justice Statistics (CCJS) for the Uniform Crime Reporting (UCR). UCR codes are 'applied traditionally to a maximum of four violations or offences per incident. Every police service across Canada is mandated to submit their UCR data to Statistics Canada'.⁵⁸ Many analysts discussed the difficulty the RMS and UCR processes pose to crime analysis because 'the 5th and 6th offences, while not perceived as necessary for reporting, are very important for analysis' (I21).

Further, the standardised format for CCJS reporting has placed the *incident/occurrence* as the object of analysis. However, crime analysts are often interested in both the occurrence and the people. The different objects of analysis have introduced a 'fundamental flaw' (I02) in the technologies utilised for crime analysis (Regional crime analysis training workshop field notes, 2014). The following quote illuminates this 'fundamental flaw:'

I can do an occurrence search in Niche, I can tell you how many thefts of autos we had between this date and this date ... [But] who did them? That's a problem because a person query is different ... there is no way to set up a query that'll say 'okay, it relates to charges of the person rather than to the occurrences, so they never meet.' It's like a magnet on the wrong end (I02).

The differing objects of analyses, therefore, have left analysts having to navigate 'orphaned databases' and 'flat files' and to spend the 'majority of their time working to access data and not doing analysis' (I21). Analysts being forced to work with technological platforms that focus on the incident undermines meaningful analyses by 'undercut[ting] systematic and generalisable modes of performance evaluation and analysis of long-term crime patterns'.⁵⁹ Using the incident as the object of analysis, we argue, orients crime analysis towards the police métier, while the intelligence product produced reinforces the police métier.

Presently, there are no standards or regulations regarding technological adoption in Canadian police services. The lack of regulation means that police services not only make individual decisions regarding IT adoption and enhancement⁶⁰ but also create agency-specific IT guidelines. Analysts frequently noted that when technology decisions and policies are made they are not being consulted, and by default, analytic needs and purposes are not incorporated. For example, police IT guidelines dictate what external databases, websites, platforms, and programs can be used and accessed on the police network. Many analysts noted that their services have limited, and in some cases denied, access to social media platforms (e.g. Facebook, Twitter). This is an important insight as our findings above demonstrate how different technological platforms (such as Niche, Versaterm, i2) construct different affordances. If police services are turning to algorithmic analysis for guiding contemporary policing strategies than it is important that analytic needs be incorporated in IT decisions. Further, the IT constraints experienced by crime analysts raise important questions about the size and variety of data sets analysts actually work with when conducting analysis. This is an important finding because it raises questions about the technological, organisational, and cultural capabilities of Canadian police services to undertake algorithmic and predictive analytics that are dependent on large quantities of data.⁶¹

The technological infrastructures crime analysts work with require them to do creative workarounds and 'invisible labour'⁶² in order to find, gather, consolidate, and analyse data. For example, analysts have brought in stand-alone computers, not connected to the police network, to access different platforms, and designed their own databases, such as a 'tactical occurrence database' (I02), 'sex crime Modus Operandi template' (I30) or 'relational database' (I39), in order to overcome the challenges they face when doing database queries because of the 'flat files' (I30) stored in traditional RMS. As the following analyst explains,

The only way you can do a [relational query] is if you pull the unstructured data (intelligence narratives) out of your records management system, compile it into a relational database, and reorganize it ... and draw the table and link relationships so that you can then run these queries against it (I 39).

These technological challenges illuminate the existence of differing, and at times competing, 'technological frames' that impact the effectiveness of police technologies for crime analysis. The existence of differing technological frames and invisible labour reaffirms how analytic reasoning and automated methods appear to run counter to traditionally valued, experiential, action-oriented ways of using information in policing.⁶³ These organisational and technological challenges facing crime analysis, therefore, leave analysts having to 'pull the unstructured data out' in order to conduct analyses (139). Interestingly, much intelligence data are generated in ways that are not necessarily digital or easily digitised and thus require the interpretive work of analysts. It is the 'translation of raw information into operationally viable intelligence that analysis plays its crucial role'.⁶⁴ It is to this invisible and interpretive labour that we turn to now in order to understand how policing through flows of data shapes policing practices.

Cognitive effects and the reappropriation of analysis

Crime analysts construct a variety of analytic products, such as crime maps, crime reports, and linkage charts. As noted earlier, much of what an analyst produces is dictated by his/her direct supervisor. Analysts noted that they spend much of their time creating weekly crime reports and bulletins to assist officers with routine patrols and investigation duties. The weekly report is a compilation and summary of index occurrences such as theft from auto, break, and enter and robbery. The formatting of this data typically covers a designated, previous week, date rage; however, other formats include the previous 30, 60, or 90 days. The weekly report serves to inform patrol of active crime areas and assist with directing patrols. A bulletin is designed to seek out and share information regarding ongoing investigations. Bulletins include information such as suspect photos, target locations, offender modus operandi and trends in date and time of offences. Depending on technological capabilities, including IT configurations and bandwidth capabilities, some services allow officers to access these reports through the patrol car mobile computer terminals. Many of the analysts noted how much of the data incorporated in their weekly reports and crime bulletins come from street checks. Street checks are notes provided by officers on occurrences or activities occurring in their zones that appear suspicious or seem noteworthy for others. As the following analyst explains:

we put out a weekly crime report ... based on all of the incidents the officers do, based on the street checks, so all of our officers have the ability to put in street checks. Which is just intel that they gather together when they're on the street ... so we gather all this data and we do our analysis on all the reports and the incidents. We talk to other police services and we do our maps and our stats and everything and we put these reports together and it goes to the streets and they can access it from their Mobile Data Terminals (I10)

Not only did analysts provide a weekly crime report but they also create crime maps that highlight the major crimes of interest to the district officers (such as break and enters, theft from autos).

One analytic product that analysts believe is highly valued by front-line patrol officers is a map that identifies recently released offenders. As the following analyst explains,

Our IT department created a data base a few years ago that actually pulls offenders, so that's each offender in our system that has a Known Offender number. So it pulls out that entity and it puts them into a report through a cue in COGNOS and it has their address. Their current address – the XY coordinate – so we can map it and then any addresses of crimes they've committed. So then we can throw it onto a map and you know, let's say that we had a couple of armed robberies in a couple of areas. We can pull up a radius around that and show every known offender that is living there now with that crime type Um ... It's ... it's amazing (I10).

Thus, crime analysts, through subjective and interpretive decision-making, pull information out of police records and street checks (which are themselves subjective narratives) and collate, synthesise, and analyse the data to construct 'intelligence' products. Through this sociotechnical work, objectivity is ascribed to the product, because it is believed that the analysis has 'taken the subjectivity out of it' (I21). As one analyst explains,

I can now identify these hotspots ... with certain confidence, statistically speaking. So I can now say that there is something going on there. So the risks ... are greater in these areas than in the areas that are cold (I21).

These crime reports, as a Canadian police chief explains, provide 'analytical evidence, our grounds to be working in the neighbourhood where we need to be'. (field notes) These products are used to 'suggest where to patrol' (I13), and to encourage officers to 'do some directed patrol in their down time ... and do some surveillance in that area' (I05). These reports, therefore, provide suggestions on where to go. They do not tell officers definitively, nor do they explain why problems exist there, but instead they draw attention to areas of concern and/or possible crime trends.

Crime reports and maps, we argue, have 'cognitive effects' that impact the policing of communities.⁶⁵ They 'project ideas, interpretations and representations of space ... that reflect the conventions, norms and values underlying' the technologies and practices used to construct them.⁶⁶ For example, the technological platforms and data used to construct analytic products, as demonstrated earlier, are shaped by traditional police performance initiatives and practices which are not geared towards intelligence analysis but reinforce the police métier. The following interview excerpt with a crime analyst illustrates how her analysis is shaped by the norms, values, and practices of police management:

... I try to keep track of our frequent flyers out of my division that I know of. Because as soon as they get out you know your stats are going up through the roof. Well that in turn is

gonna affect the strategic intelligence meeting and your superintendent having to explain what's going on. And so I'm trying to cut off a lot of stuff from happening month over month by tracking those people or looking for those links. (I18)

The analyst's quote above illustrates how analysis is oriented towards the police métier as it is shaped by the norms and values of traditional policing practices. Thus, analytic products that are derived from street checks and police reports, we argue, 'sustain the validity of [police] practices because they are based on the same assumptions'.⁶⁷ In this way, analytic reports, which are to guide proactive policing, are directed at what Ericson referred to as 'ordering the street' by targeting resources on those identified as being out of order to put them back in order (1981). As a result, the analytic products constructed from police databases and technological platforms *reaffirm* traditional ways of knowing and policing. In this way, crime analysis is not being used for preemptive, pre-crime policing and accountability, but is instead being reappropriated for traditional policing practice.

Crime analysts synthesise, articulate, and visualise crime data for police. The analytic products produced by analysts do not tell police how to address the problem, or explain why it is happening. Instead, the information they provide is *analysed* and made *actionable* through the interpretive work of police managers and officers. As the following analyst explains,

Typically it's not crime analysis that's being done, it's crime reporting. They're reporting things that have happened ... they're articulating, they're visualizing things that have already occurred. There's some value to that, but it's certainly not analytical. It's not analytical value. (I21)

Crime analysis, therefore, does not change or challenge traditional police practices or ways of knowing, but instead reaffirms it while changing the symbolic nature of policing.

Conclusion

By employing a social construction of technology framework and ethnographic methods, we have conducted an analysis that problematises, rather than reaffirms the police métier, by providing a 'sociologically grounded theory of policing as practice'.⁶⁸ We illuminate the tenuous place crime analysis, and by extension crime analysts, hold within contemporary policing in Canada. Our analysis draws attention to the way in which the technological frames of crime analysts run counter to traditional actionoriented practices of policing and ways of using information to make decisions.⁶⁹ By focusing on 'technological frames',⁷⁰ we demonstrate how definitional understandings of crime analysis, as well as the division of police labour and the occupational culture of policing, are embedded within analytic technologies that, in turn, facilitate and constrain the production of intelligence. Further, by being analytically attentive to both the sociotechnical context and cultures of policing, we have uncovered the ways in which crime analysis is oriented towards, while also reinforcing, the broader police métier.

As such, our study challenges many of the claims and rhetoric surrounding data-driven precrime policing. Our analysis, for example, identifies how organisational policies and technological platforms pose significant constraints on the type and amount of data accessible for analysis. Intelligence-led and predictive policing are 'premised on analysing large volumes of data using advanced technology and applying a methodical analytic process that generates defendable conclusions in a timely manner that can lead to a predicted outcome'.⁷¹ While there is a growing literature base across North America concerning the adoption and utilisation of information technologies for the manipulation of intelligence data for intelligence-led and predictive policing,⁷² much of the literature is theoretical or methodological in nature – often analysing the technologies, platforms, and analytic techniques in isolation from their organisational, cultural, and social contexts of use. Yet, as Bennett Moses and Chan argue, in order to assess the suitability and effectiveness of big data and algorithmic practices in policing requires an examination along three dimensions: technical (i.e. functionality and effectiveness of technologies and platforms), social (practitioner update and perspectives towards the technology), and normative (ethics and values of the user).⁷³ Our findings identify how the integration and utilisation of crime analysis are challenged along the technical, social, and normative dimensions of policing, which in turn, raise critical questions about the suitability and effectiveness of contemporary policing driven by algorithmic practices.

Further, our analysis sheds light on the often invisible and subjective labour of crime analysts that becomes hidden within the analytic technologies and algorithms they use.⁷⁴ Injustices, however, can be perpetuated when we do not understand how crime data are being collected, analysed, and interpreted.⁷⁵ Finally, our analysis demonstrates how crime analysis is shaped by and oriented towards the police métier,⁷⁶ which in turn raises concerns that the processes through which crime analysts police *through* flows of data create cognitive effects that can lead to technologically augmenting the policing of usual suspects.⁷⁷ Organisational understandings and perceptions of crime analysis *combined* with the analytic platforms utilised for analysis, have forced crime analysts to work within traditional police performance initiatives (i.e. crime reporting and crime counting) that *reinforce* and *technologically augment* reactive policing practice. Thus, crime analysis, and the practice of policing *through* flows of data, has changed the *symbolic* nature of policing while reaffirming traditional ways of knowing and policing.

Notes

- 1. FCW, "Boston Probe's Big Data."
- 2. Boba Santos, Crime Analysis with Crime Mapping.
- 3. Ericson, Making Crime; and O'Malley, Risk, Uncertainty and Government.
- Cope, 'Intelligence-led Policing or Policing-led'.
- 5. Whitelaw et al., 'Community-based Strategic Policing'.
- 6. Sheptycki, 'Beyond Cycle of Intelligence-led'; and Coyne and Bell, 'Strategic Intelligence in Law-Enforcement'.
- 7. Bedford, 'Whitelists, Jurisdictional Reputation'.
- 8. De Lint et al., 'Controlling the Flow: Security, Exclusivity, and Criminal Intelligence in Ontario'.
- 9. Orr, Ethnography of a Modern Job; and Suchman, Plans and Situated Actions.
- 10. Amicelle and Jacobsen, 'Banking policing in UK and India'.
- 11. Amicelle et al., 'Questioning Security Devices', 294.
- 12. Ibid., 297.
- 13. Grove, 'Crowdmapping Security and Sexual Violence'
- 14. Manning, Democratic Policing in a Changing World, 200
- 15. Ibid., 202; see also Sheptycki, 'Liquid modernity and the police *métier*; thinking about information flows in police organisation'.

- 16. Ratcliffe, 'Crime Mapping, Training Needs'.
- 17. Evans and Kebbell, 'The Effective Analyst'; Cope, 'Intelligence-led Policing or Policing-led'; Innes et al.,'Theory and Practice of Crime Intelligence', Manning, *The Technology of Policing*; Ratcliffe, 'Crime Mapping and Implications'; and Darroch and Mazerole, 'Organizational Factors Influencing Uptake'.
- 18. Gill, Rounding Up Usual Suspects.
- 19. Cope, 'Intelligence-led Policing or Policing-led', 200.
- 20. Ibid., 202.
- 21 Ibid., 198.
- 22. Chin et al., 'Analytical Process of Intelligence Analysis'; Boba Santos, *Crime Analysis with Crime Mapping*; and Prox and Griffiths, 'Introduction to Special Issue'.
- 23. See above 14.
- 24. Ibid., 106.
- 25. Perry et al., Predictive Policing, xix.
- 26. Sanders and Henderson, 'Police 'Empires' and Information Technologies."
- 27. Dunworth, 'Criminal Justice and IT Revolution'; Chan, Changing Police Culture; Chan, 'Police and New Technologies'; Hughes and Jackson, 'Technical, Social and Structural Factors'; Manning, 'Information Technology, Crime Analysis'; Manning, 'Theorizing Policing'; Manning, The Technology of Policing; Manning, 'Information Technology and Police Work'; and Sanders and Hannem, 'Policing the "Risky".
- 28. Chan, 'The Technological Game'; Sanders et al., 'Police Innovations'.
- 29. Sanders et al., 'Discovering Crime in a Database'.
- 30. Innes et al., 'Theory and Practice of Crime Intelligence', 54.
- 31. See above 12.
- 32. Daston and Galison, 'The Image of Objectivity', 98.
- 33. Sanders and Hannem, 'Policing the "Risky"'.
- 34. See above 30.
- 35. Perry et al., Predictive Policing, xix.
- 36. Corkhill, 'Evaluation a Critical Point'.; de Lint et., 'Controlling the Flow: Security, Exclusivity, and Criminal Intelligence in Ontario'.
- 37. Joseph and Corkhill, 'Information Evaluation'; Corkhill, 'Evaluation a critical point'; Marrin and Clemente, 'Improving Intelligence Analysis'.
- 38. Joseph and Corkhill, 'Information Evaluation'.
- 39. Bennett Moses and Chan, 'Big Data for Legal and Law Enforcement'.
- 40. Lefebvre, 'A Look at Intelligence Analysis'.
- 41. See above 38.
- 42. Innes et al., 'Theory and Practice of Crime Intelligence'.
- 43. Orlikowski, 'Using Technology and Constituting Structures'
- 44. Van den Scott et al., 'Reconceptualizing Users'.
- 45. Hughes and Jackson, 'Technical, Social and Structural Factors'.
- 46. Charmaz, Constructing Grounded Theory.
- 47. O. Reg. 3/99, s. 5 (1).
- 48. Cope, 'Intelligence-led Policing or Policing-led'; and Piza and Feng, 'Crime Analysts Evaluations'.
- 49. This is an important insight and one that requires further analysis. For example, what are the similarities and differences between the work and organisational fit of crime and intelligence analysts? What factors facilitate or impede the organisational adoption and utilisation of crime and intelligence analysis?
- 50. This realisation is worthy of further exploration in order to better understand the ways in which economic, political, and cultural contexts shape, facilitate, and impede crime and intelligence analysis.
- 51. Innes et al., 'Theory and Practice of Crime Intelligence'; and Manning, *The Technology of Policing.*

- 52. Lum et al., 'Limits of Technology's Impact', 23; and Bennett Moses and Chan, 'Algorithmic Prediction in Policing'.
- 53. We thank an anonymous reviewer for this important insight.
- 54. Bennett Moses and Chan, 'Big Data for Legal and Law Enforcement'; and Lum, Koper and Willis, 'Limits of Technology's Impact'.
- 55. Bennett Moses and Chan, 'Big Data for Legal and Law Enforcement', 653.
- 56. Oudshoorn and Pinch, How Users Matter.
- 57. Bijker, 'Theory of Sociotechnical Change'.
- Waterloo Region Police Service website, http://www.wrps.on.ca/inside-wrps/corporateplanning-systems#UCR.
- 59. See above 14.
- 60. It is important to note, that depending on the size of the service, IT decisions can be based on an individual service needs (e.g. RCMP, Toronto and Ottawa Police Services or Vancouver Police Department) or on a network of services (e.g. PRIDE network which incorporates Waterloo, Brantford, Stratford and Guelph police services)
- 61. Bennett Moses and Chan, 'Big Data for Legal and Law Enforcement'; and Sanders and Sheptycki, 'Policing, rime, "Big Data".
- 62. Star, 'Invisible Work and Silenced Dialogues'; Star, 'Politics of Formal Representations'; an d Star and Strauss, 'Layers of Silences'.
- 63. Bennett Moses and Chan, 'Big Data for Legal and Law Enforcement'; and Cope, 'Intelligence-led Policing or Policing-led'.
- 64. See above 19.
- 65. Grove, 'Crowdmapping Security and Sexual Violence'; and Ratcliffe and McCullagh, 'Police Perceptions of High Crime'.
- 66. Amicelle et al., 'Questioning Security Devices'.
- 67. Manning, Democratic Policing in a Changing World, 202
- 68. See above 24.
- Bennett Moses and Chan, 'Big Data for Legal and Law Enforcement'; Chan, 'The Technological Game'; and Cope, 'Intelligence-led Policing or Policing-led'.
 See above 43.
- 71. Prox and Griffith, 'Introduction to Special Issue', 100.
- 72. Prox and Griffith, 'Introduction to Special Issue'; and Ratcliffe, 'Intelligence-led Policing'.
- 73. Bennett Moses and Chan, 'Big Data for Legal and Law Enforcement'.
- 74. See also Ibid.
- 75. Bennett Moses and Chan, 'Algorithmic Prediction in Policing'; Innes, Fielding and Cope, 'Theory and Practice of Crime Intelligence'; Cope, 'Intelligence-led Policing or Policing-led'; and Ratcliffe, 'Crime Mapping and Implications'.
- 76. Manning, Democratic Policing in a Changing World; alsoSheptycki, Theorizing the police intelligence division-of-labour; some further contributions to the pluralist perspective in policing intelligence'.
- 77. See above 33.

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