Police adoption of body-worn video technology in England and Wales: A socio-technical analysis of change

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Abstract

Using qualitative methods in the context of policing in England and Wales, this doctoral research examines how police and body-worn video (BWV) technology shape one another. It explores the impact of the technology, the technology as a product, and the process of interaction between police and BWV systems. The research responds to both the rapid development of BWV technology systems and their widespread adoption across UK policing organisations since their first trial in 2005.

Most studies on police adoption of BWV technology have been conducted in the United States, are quantitative and experimental in design, and focus primarily on behavioural outcomes (Lum et al., 2019; O'Neill et al., 2024). Consequently, there remains a need for qualitative inquiry into how BWV technology adoption has influenced policing in England and Wales, at organisational and potentially regional levels. As Flight (2020) notes, when it comes to body-worn video and policing, *technology matters.* It is therefore necessary to identify and understand significant shifts in BWV technology development and use within policing organisations, including potential diffusion (Rogers, 2003) to new users and function creep into new applications shaped by these technological developments. Moreover, the design and functionality of BWV systems, and their patterns of police use, have broader implications for public interaction, institutional arrangements, and academic research on police technology adoption (Fan, 2017; 2018a; 2018b).

To address these questions, the research combines qualitative data collection with secondary sources to examine the impact of BWV technology adoption and to describe the mutual shaping process between police organisations and BWV technology in England and Wales. In-depth semi-structured interviews were conducted with members of police organisations, a BWV technology vendor, and a third-sector organisation, complemented by field observations of officers responding to emergency calls. Data were analysed thematically using a socio-technical analytic framework to describe how BWV technology and police organisations influence one another and to examine the implications that may result for society.

Given that technical components (materiality) of BWV technology have been largely neglected in prior research (Flight, 2020; see also Ariel et al., 2016; Willis, 2022), a socio-technical analytic framework was adopted to give equal consideration to social arrangements and technical systems. A dual-nature view of technology (treating it as both a product and

process) was used to ensure that the technical components were examined in theory and in practice. Recognising that analytic approaches grounded in relational ontologies, such as actor-network theory and 'new' materialism, tend to focus narrowly on the *process* of organisational technology use (Roberts and Grabowski, 1999), this research integrates insider interview data, BWV guidance documents, and policy analysis to extend the focus by examining *impact.* In so doing, this research describe shifts within policing organisations and, where relevant, in regional policing more broadly.

The data are analysed and the findings articulated to narrate the story of change arising from BWV technology adoption and to explain the mutual shaping of police organisations, officers, and the BWV technologies they select, implement, and use. Empirically, the research identifies shifts in policing in England and Wales relating to transparency, accountability, and police protection. Theoretically, it contributes by synthesizing and critically analysing existing BWV technology research to reveal conceptual and methodological imbalances, advancing criminological debates on the relationship between police and technology. It also introduces a conceptual toolkit that integrates socio-technical theory and dual-nature perspectives of technology, providing analytic categories for examining both the design and material components of BWV systems (technology as product) and the social arrangements that shape their use (technology as process). Central to this framework is the concept of (mis)alignment, which highlights how certain organisational practices and interpretations correspond more closely than others with the technology's design and intended purpose. Together, these insights support future research on police technology adoption and the mutual development of technical and organisational systems.

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Author's declaration

I declare that, except where explicit reference is made to the contribution of others, that this dissertation is the result of my own work and has not been submitted for any other degree at the University of Glasgow, University of Edinburgh or any other institution.

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List of abbreviations

ACPO – Association of Chief Police Officers of England, Wales, and Northern Ireland.

APP – Authorise professional practice.

BSCC – Biometrics and Surveillance Camera Commissioner. Replaced the SCC.

BWV – Body-worn video.

CAST - Home Office Centre for Applied Science and Technology.

CoP – College of Policing.

CSP – Community scrutiny panel.

DPA - Data Protection Act 1998.

FOI – Freedom of Information request.

FRT – Facial recognition technology.

ICO - Information Commissioner's Office.

IOPC – Independent Office for Police Conduct. Replaced the IPCC.

IPCC – Independent Police Complaints Commission.

MOPI – Management of police information.

MS – Motorola Solutions.

NDM – National decision model.

NPCC – National Police Chiefs' Council. Replaced the ACPO.

PCSD – Home Office Police and Crime Standards Directorate.

RCT – Randomised control trial.

SCC – Surveillance Camera Commissioner.

UK – The United Kingdom of Great Britain and Northern Ireland.

US/USA – The United States of America.

Chapter One: Introduction

There has been rapid development and police adoption of body-worn video (BWV) technology in the United Kingdom, specifically England and Wales. This region was the first to trial BWV technology in 2005 and to develop both procedural (PCSD, 2007) and technical (CAST, 2014) guidance for its implementation. Since then, BWV technology has been deployed across all 43 territorial and special police organisations, with diffusion to new users and expansion into new functions and operational contexts. These developments have produced technical modifications to the BWV systems and devices themselves, changes in patterns of use, and broader organisational and regional impacts on policing practice.

Much of the police technology adoption research has tended to 'tilt' (as described by Jackson et al., 2002) towards privileging the social arrangements involved in police technology adoption, with little examination in practice around the technical systems and their relationship to change in the organisations, policing, and the public (see Manning, 2008; Adams and Mastracci, 2017; Stoughton, 2018; Sandhu and Simmons, 2022; and Willis, 2022). This has led for calls to examine the technical components of police technology (Dymond, 2016; 2020), despite criminological research increasingly adopting sociomaterial approaches (Milovanovic, 2022), which, in theory, provide equal weight to social arrangements *and* technical systems. The rise in popularity of sociomaterial approaches using a relational ontology (process-based approach) and relying on agential realism (the notion that technology derives its agency from the humans who interact with it) has received criticism for tending to ignore the phenomenon under study by fixating on theory-building (Holz, 2021) or, overly focusing on the emergence of technology uses instead of longer-term structural impacts of the technology (Roberts and Grabowski, 1999; Mutch, 2013).

This research addresses this gap by both identifying and describing the impact of technology as well as detailing and explaining the process of technology use. Accordingly, the research asks firstly, what is the impact of BWV technology on policing in England and Wales and secondly, how do BWV technology and policing shape one another. Answering these questions requires paradigmatic expansion to include literature from a range of disciplines that usually lie outside the ambit of social sciences such as applied cognitive science, design engineering, and applied ergonomics. Adopting a socio-technical approach, this research considers social arrangements and technical systems to be two separate entities - that is, a critical realism approach is adopted. This allows for the inclusion of a wider body of

scientific literature without lapsing into technological determinism (the notion that technology deterministically shapes humans).

This dissertation provides equal consideration to technical systems in practice and dedicates a findings chapter (Chapter Five) to the impact of the technology on police organisations and policing in terms of legal, guidance, policy, operational, and structural shifts within the region. It then explains the operational considerations behind use of the technology for frontline officers (Chapter Six) and how this shapes its technological development in turn. In addition to the impact and process, the epistemic chapter (Chapter Seven) examines BWV technology as a product, specifically the role of vendors in designing, constructing, and marketing the technology. Such an examination allows for a detailed analysis of the technical components of the technology and the development of a conceptual toolkit for police technology adoption.

The subsequent chapter provides the first theoretical contribution of this dissertation by synthesizing and critically analysing existing BWV technology research to highlight conceptual and methodological gaps. It is these gaps which the research aims to address. The chapter also contains the conceptual and scholarly debates underlying the themes in the findings chapters, including transparency, accountability, and physical protection. Chapter Four provides the relevant historical and regional context as a platform from which the rest of the dissertation builds. This includes a detailed breakdown of the vendor landscape of police adoption of BWV technology in England and Wales, with data drawn from pre-existing Freedom of Information requests (FOIs) in combination with public records on police technology expenditure. The chapter also includes a proposed categorization of BWV technology which fully captures the technical system beyond the current focus on the device and footage, as found in the literature.

In terms of research findings, the impact of BWV technology on policing in the region contributes, empirically, to the body of criminological knowledge by focusing on the co-constructive themes of police transparency and accountability. Specifically, Chapter Five examines changes within the organisation, policy, and law in the region, leveraging BWV technology as an enabling tool and shaper to serve the public interest. While the chapter focuses on the assessment of footage and how this influences police conduct, it also discusses the limitations of these assessments and their potential implications. The second contribution relates, both empirically and theoretically, to the ways in which police officers use and interpret BWV technology in the course of their frontline work. This is covered in Chapter

Six. Empirically, it describes how the personal and operational considerations of the police (as users) influence use – building upon the recent findings of other researchers. The theoretical component of this demonstrates how these specific uses shape the development cycle or trajectory of the technology, given that police (not the public) are direct customers of the technology vendors. A further theoretical contribution is found in the epistemic chapter (Chapter Seven). Given that this dissertation critiques the lack of consideration given to the materiality of technology, it offers to address this gap by proposing a conceptual toolkit for examining police technology adoption which focuses on the technology as a product and outlines points of interest worth examining.

1.1 Research aims

The aim of this research is to identify the impact of technology on policing in England and Wales. BWV technology was selected because it is widely used across policing organisations rather than being confined to a single department, and it has been extensively deployed in the UK. A review of the literature highlighted gaps in understanding both the impacts of BWV technology on policing and the materiality (technical components) of police technologies in general. These considerations can be synthesized into two interrelated objectives: to describe the impacts of BWV technology on policing in England and Wales, particularly regarding police transparency and accountability, and to explore how public police (human interpretation, use, and governance) and body-worn video technology (material design and technical functionality) shape one another, giving sufficient attention to the materiality of the technical system. In short, the research both describes the impacts of BWV technology adoption and explains elements of the mutual shaping process between the technology and the police who select, own, and use it.

1.2 State of the literature and contributions

Much of the sociological and criminological research on police technology adoption and use encountered during this research does not give adequate weight, in practice, to the materiality of the technical systems under study – such as how the technology's design and functionality shapes the police organisation and the users' actions. The most prominent studies on impacts of BWV technology, including a metanalysis (Ariel et al., 2016) and systemic review (Lum et al., 2020), do not refer to the technical details of the systems in use in any meaningful way. Evidently, the materiality of the technical systems is not considered to be a variable in

the explanations they offer. There are notable examples of studies which do examine the materiality of police technology, including BWV technology but this is not representative of the bulk of the literature. Moreover, the majority of BWV technology research relates to BWV devices and behavioural changes (Lum et al., 2019) themselves and secondly, the footage it produces (for example, research by Jones et al., 2018; 2021; Boivin et al., 2017; 2020). There is one substantial research project on the evidence management software platforms (software that stores and manages the footage) (Terpstra et al., 2022), and nothing exclusively related to the peripheral devices such as Bluetooth sensors/tags for vehicle doors and holsters which autoactivate the recording of BWV devices. Some literature (Fan, 2017; Boivin et al., 2022; Malm and White, 2020) does refer to the emergence and potential implications of the sensors, but their impact is theorized, not studied in detail. To capture the idea that body-worn video includes far more than the device and footage, this dissertation uses the term BWV technology and not simply BWV or bodycams.

Concerning police technology research, Dymond (2016) has conducted research on Taser technology use by police in England and Wales. Despite Dymond using sociomaterial research approaches and thus, focuses primarily on the process of the use of Taser, she does examine changes in policing, specifically those in regional policy. It is a positive example of materiality being given equal weight during research in practice and this doctoral research aims to follow suit. Regarding the examination of BWV technology, a significant acknowledgement of the impact of the materiality of technology on policing can be found in Miranda's (2022) article *Body-worn cameras 'on the move'*. A section of the article is devoted to the design implications of the BWV devices used during their field research and centred specifically around the user-friendliness and appropriateness of the design as this impacted the officers' use of the device. It also included a discussion of the usability and interface of the footage management software. The main findings of that study were that a device needs to meet the practical and operational needs of police officers for them to use it effectively – a finding which this research shares, particularly that technology use and development centre around the need for frontline officers to protect themselves (detailed in Chapter Six).

Assaraf et al.'s (2024) article on the physical design of a BWV device (including a yellow sticker notifying the public that the device is audio and video recording) indicates that there is a new interest in the materiality of the device, from quantitative researchers examining police activities. Boivin and colleagues (2017) as well as Jones and colleagues (2018) indicate that there is an interest in the materiality of the device in terms of the footage which

is captured and how this footage is interpreted by humans. Suss et al. (2018) examined the positioning and capture point of BWV devices within the discipline of applied ergonomics, however, this research was a one-time endeavour. Within the discipline of Information Systems, Sesay et al. (2017) conducted excellent sociomaterial research on BWV devices, emphasizing their design and physical characteristics. Guzik et al. (2021) brought this research into the police research domain of criminology, aptly questioning the objectivity of footage and the development of system interoperability. As Flight (2020) notes, *technology matters,* and there is a need to further explore the technical aspects of BWV technology adoption by police and to build upon this growing body of knowledge.

This dissertation concludes with an epistemic chapter proposing that criminological research on police technology adoption could broaden its paradigmatic scope to include insights from the natural and material sciences, which hold extensive knowledge on the design, functionalities, and material affordances (emerging uses) of technology. Such a broadening enables more comprehensive analyses of social arrangements and technical systems and can reveal novel findings that are consistent with criminological concerns, including social, legal, and political implications. To facilitate such an approach, this dissertation introduces a conceptual toolkit that outlines key concepts and points of analytical interest for examining technology as both a product and a process. By considering the design and material properties of technology independently of its use, researchers can systemically identify features, constraints, and affordances that shape potential interactions and organisational practices. This allows for a greater understanding of the technology itself and its likely effects when deployed, complementing studies of impact and use without relying on speculative predictions. Such an approach is particularly important given the rapid pace of technological development and implementation in policing, which often outpaces the capacity of research to evaluate effects after deployment, making pre-emptive understanding of the technology's design and affordances critical.

Empirically, this research contributes to a large body of knowledge in criminology on changes within UK policing. Specifically, it outlines (in Chapter Five) the organisational, regional, and legal changes within policing in England and Wales as they relate to transparency and accountability. These changes include the emergent layers of supervision and scrutiny which are enabled and shaped by the adoption of BWV technology. The chapter also discusses the limitations of these changes, especially in relation to the social arrangements (particularly, governance structures and organisational discretion) in the region which shape the potential impacts of BWV technology. In Chapter Six, this

dissertation theoretically contributes by detailing how the operational considerations of police organisations and personal considerations of their members (as users) shape the way in which technology is selected, used, and develops over time. The chapter thereafter (Chapter Seven) continues to map and examine the technical developments of BWV technology but also contributes theoretically by offering a paradigmatic expansion of criminological research and outlining a conceptual toolkit for examining police technology adoption. The chapter builds upon an empirical product study to identify potential areas of interest for researchers to explore given the significant social (socio-legal) implications which emerge from misalignments in the process of police technology adoption.

1.3 Research questions

Formulating the research aim into a single question, *How do public police and body-worn video shape each other?*, risks oversimplification. As discussed later, criminological research has largely neglected how technology impacts policing. Using this single question as a guide can lead to an unbalanced focus on how humans shape technology, reinforcing the view that technology merely reflects organisational structures. There is also a tendency to concentrate on the shaping process itself (human interpretation and use) rather than the phenomenon under examination i.e. the longitudinal impacts that emerge over time. This dissertation seeks to avoid these pitfalls by re-emphasizing the role of technology in the bi-directional shaping process, while remaining vigilant of the risk of technological determinism, which represents the opposite extreme of privileging social arrangements. To ensure balanced enquiry, the research questions are divided into two interconnected parts:

RQ1: What is the impact of body-worn video technology on public policing in England and Wales?

RQ2: How do body-worn video technology and public policing shape one another?

Although separating impact from process is theoretically rather than practically possible, doing so provides analytical clarity. Understanding impact in the region offers empirical insight into improvements, unintended consequences, and directions for policy and practice. Focusing on the shaping process alone risks revealing more about the research ontology than the phenomenon itself, a dynamic Holz (2021) refers to as 'theoretical centrifugation.' Despite overlap between these dimensions, separately examining impact, technology as a product, and technology as a process remains valuable. Engaging with this challenging

terrain has produced novel findings about the mutual development of policing and BWV technology.

1.4 Research design

As previously discussed, this research adopts a socio-technical analytic approach. The framework has historically been used in Organization Studies to examine the impact of technology on the organisation, taking into consideration the contextual and regional variables in which the organisation operates. In combination with the dual view of technology approach of Orlikowski (1992) and Roberts and Grabowski (1999), this constitutes a methodological approach or research design which aims to examine three interrelated components of the relationship between technology and organisations/humans. Roberts and Grabowski (1999) did not coin a term for this methodology, which could have contributed to it not gaining traction. Building upon their work, this dissertation attempts, firstly, to describe the impact on the organisation implementing the technology (the police organisation as well as policing in the region where possible); secondly, it examines the technology as a product which is designed and constructed by technology vendors (BWV technology); and thirdly, it describes and explains technology as a process which involves the various uses of the technology.

To gather data on these three areas of interest, 'rich' information containing inside perspectives (Bows, 2019) was sought by generating data through interviews with key participants within police, third-sector, vendors, and regulators as well as brief field observation of frontline police officers. Data triangulation was also a priority and thus, a range of secondary sources were collated and analysed. These sources included organisational and regional policy, procedural documents, news media, vendor documents and advertisements to learn more about the technical systems, the social arrangements, and shifting narratives on BWV technology adoption and use.

1.4.1 Choice of police technology

The UK was the first region to trial body-worn video technology in 2005 as well as the first to develop procedural (PCSD, 2007) and technical (CAST, 2014) guidance documents. It is a technology which has been broadly adopted, with all organisations in England and Wales having adopted the technology to varying degrees. It is also a technology that is fast evolving in terms of both material design (physical and digital properties such as camera lens,

recording quality, and physical shape) and technical functionalities (capabilities such as livestreaming, algorithmic integration, and interoperability). Accordingly, it is a technology that is thriving within public policing.

As BWV footage increasingly entered the public sphere, the technology was leveraged to address racial (Black and Minority Ethnic) disparities in policing (for example, through the NPCC/CoP's *Police Race Action Plan*). Given that the rising costs of these systems and their expanding functionalities, BWV technology is of growing public interest. Moreover, the research was initially designed to focus on a policing organisation that was trialling the technology in a specialised capacity, making it a suitable case through which to explore the impacts of BWV technology adoption. Like Gaub et al. (2016), the research therefore would have focused on the implementation stage of the technology adoption. However, certain uses and impacts of new technologies adoption can unfold over longer periods of time (Brynjolfsson and Hitt, 2003; Lee and Kim, 2006; Koper et al., 2014).

Instead, the primary police organisation being examined (Peelford Constabulary; a pseudonym) had been using BWV technology for several years and, as a large organisation, had made significant contributions to use and strategic documents in the region. They made use of Reveal's systems and devices, and the service contract was scheduled for renewal. This need for an 'asset refresh', replacement with newer devices, or a change in vendor, meant the BWV device being used by their officers were mostly the older D-series (D3 and D5). The implications of this technical system and its design and functionality are discussed in the respective findings chapters. Their Digital Evidence Management System for footage management was DEMS360. The organisation was not using peripheral devices such as Bluetooth sensors which trigger automatic activation of officer's BWV devices. Livestreaming via mobile connectivity (4G/LTE) was in operation and trials were being conducted for further expansion of this functionality.

1.4.2 Choice of regional context, participant organisations, and pseudonyms

To effectively examine change in policing over time resulting from technology adoption, it was necessary to gather insider information from participants with in-depth expertise on the topic. Key personnel were therefore sought from policing organisations across England and Wales, representing different levels and departments, as well as from regulators. Given that the public impact of technology is central to the analysis, participants from third-sector

organisations working on technology adoption issues were also approached. Additionally, vendors who design and construct BWV technology were included to account for the materiality of the technology as a product. Field observations were conducted to examine how the technology was used in practice and to identify its potential influence on police-public interactions.

This research encountered significant access challenges, particularly with police organisations, vendors, and third sector participants. These difficulties shaped participant selection and are further detailed in the research design and methods chapter (Section 3.2. Participant selection and access). The decision to focus on BWV technology remained, but the research canvassed multiple policing organisations across England and Wales, which includes more than 40 territorial and special forces, to allow for a socio-technical analysis of organisational change.

Peelford Constabulary was an important police organisation to examine given that they had contributed towards BWV procedural guidance documents, components of the Police Race Action Plan, and the Community Scrutiny Panel draft guidance. Attempts were made to include multiple police organisations to compare organisational arrangements, policies, cultures, practices, and approaches relating to BWV technology. One additional specialised police organisation initially agreed to participate due to an imminent transition to a new BWV system, but access was ultimately delayed and subsequently withdrawn for unofficial reasons.

Pseudonyms were assigned to protect the identity of participating organisations. Historical county names in England provided a range of suffixes for police organisations, including -shire, -ham, -bury, and -ford, combined with the name of Sir Robert (Bobby) Peel, widely associated with the 'policing by consent' model. The main participating organisation is referred to as Peelford Constabulary. Another organisation that declined participation but provided informal support and later, an interview with their BWV technology programme lead, is named Bobbyham Constabulary. Pseudonyms were also applied to the third sector organisation (Surveillance Check), former regulator (WeRegulate), and BWV technology vendor (Future Tech Inc.), each of which participated in interviews.

1.5 Structure of the dissertation

1.5.1 Criminological gaze, interdisciplinary knowledge

Criminology has historically embraced interdisciplinarity by absorbing key concepts and ideas from other disciplines from social and political sciences who share paradigmatic frameworks. Criminology as a field which emerged as a subdiscipline from a congregation of faculties, has enjoyed the privilege and room to borrow ideas from different disciplines without attracting too much attention or being able to reject the critique of losing its identity. However, there has been less of an exchange of ideas with fields that have different paradigms such as human factors (applied ergonomics and design engineering for example) and cognitivism (applied cognitive science for example). There has been an uncomfortable relationship with the natural sciences in general given the difference in paradigmatic viewpoints related to determinism and volunteerism, idealism and materialism. Briefly, social sciences tend to ascribe to the belief that the world is socially interpreted (at weakest, determined at the strongest) and shaped through human agency while natural sciences tend to believe that there is a material world external to humans which exerts a force on us. Historically, criminology has shifted away from anything resembling the biological determinism of old due to the inhumane conclusions which were offered when this intersected with the proponents' supremacist ideologies. Accordingly, these historical and paradigmatic elements have ensured that there has been far less engagement with the bodies of knowledge from natural and material sciences (Wright and Boisvert, 2009).

It is possible, and valuable, to embrace other paradigms and even soft determinism, when appropriate, without repeating the mistakes of others by maintaining a critical (criminological) lens and acknowledging that 'scientific' knowledge is not value neutral. As such, this research incorporates literature and findings from disciplines such as applied ergonomics, design engineering, and applied cognitive science to augment its own findings and to emphasize the significance of potential implications of technology adoption or the process by which the police and BWV technology shape one another. It also draws from Human-Computer Interaction (HCI) when proposing a conceptual toolkit for examining police technology adoption, developing the relevance of material design and technical functionality. This endeavour to incorporate a variety of knowledges allows for the materiality of the technical system to be given equal consideration, addressing gaps in criminological research on the topic.

1.5.2 Chapter overview

This introductory chapter serves as a signpost for the reader of this dissertation and the conclusion (Chapter Eight) aims to weave together the various threads of the dissertation. The previous research and theoretical engagement (Chapter Two) and research design and methods (Chapter Three) chapters serve to provide the overall context which informed why and how the research was conducted in the manner it was. The case and background (Chapter Four) details those components of the social arrangements (police and policing in England and Wales) and the technical systems (the technology and the vendor landscape in the region) which are described, examined, and explored during the findings chapters. Without these details, there is much context that would be missing from the discussions.

The dissertation then presents the findings chapters on the themes of transparency and accountability (Chapter Five) and physical protection (Chapter Six) as well as the epistemic chapter on technology as a product (Chapter Seven). Chapter Five deals with the impact of BWV technology on policing in England and Wales, using the theme of police transparency and accountability. It specifically discusses the oversight mechanisms which were enabled by the technology and how certain elements of the social arrangements in the region limit their effectiveness. Chapter Six examines the ways in which the selection, use, and development of BWV technology is influenced by the operational and personal considerations of the police organisations and officers (as users) respectively. Chapter Seven serves as a quasi- findings *and* discussion chapter, building a conceptual toolkit from the empirical insights of this research in addition to findings in psychology, criminology, and natural and material sciences.

1.6 Findings

The research areas of interest and the subsequent findings relate to the impact of technological adoption, the technology as a product, and the technology as a process. Each of these areas aims to contribute empirically and theoretically to the criminological body of knowledge as well as outlining future sites of research and research toolkits.

As previously discussed during the aims of the dissertation, and emerging from gaps in criminological research, this research aims to describe the impact of BWV technology adoption on policing in England and Wales. To this extent, it examines the organisational changes (over time) within Peelford Constabulary and examined regional guidance

documents, respective laws governing BWV technology use, and various policies to describe change in policing more broadly in the region. It achieves this by concentrating on the interrelated topics of transparency and accountability. Specifically, it finds that BWV technology enabled certain mechanisms for police oversight and labelled these as increased supervision and scrutiny. It examines these changes, provides the limitations of this endeavour from a technical standpoint, and offers potential implications. Consequently, it achieves the aim of examining the impact of the technology on a policing organisation and policing in the region, more generally, when possible. In so doing, it adds to an empirical body of knowledge and addresses gaps in knowledge by incorporating the variables related to the technical systems and including interdisciplinary research findings from the applied and natural sciences such as applied ergonomics, cognitive science, and sensory ecology.

The second focus of the examination is technology as a process. This relates to the interaction between the Police Constabularies (organisations) which adopt them, the members (users) of the organisation in various capacities (detection, evidence-gathering, assessing footage, maintenance, and monitoring compliance) and the various components (devices, footage, and digital evidence management systems) of the technical system. Accordingly, this research examines the various interpretations and uses of BWV technology and shows how the operational and personal considerations of police shape how BWV technology is selected, used, and subsequently developed by the technology vendors. Specifically, it focuses on how BWV technology is used in various ways to protect police officers given the dangerous nature of policing and how these uses have resulted in the material design taking certain shapes and the technical functionalities being expanded in such a way as to increase the protection of officers.

The third aim of the research is to examine BWV technology as a product which is designed, constructed, and marketed by humans, particularly vendors. This examination is conducted to address gaps in criminological research which do not give equal consideration, in practice, to technical systems. Specifically, the aim is to identify if, how, and why materiality of BWV technology is salient to policing in England and Wales. This is addressed in the epistemic chapter (Chapter Seven) which provides an empirical basis for the argument and then offers a conceptual toolkit based on the principles and lessons learnt in Human Computer Interactionism (HCI). It theoretically offers that material design and technical functionality are relevant and then provides examples from this research and the academic research of others, to show how these are relevant to police implementation and use. Most importantly, it links the materiality of technology to the social arrangements by identifying the importance

of (mis)alignments between the technology as a product designed and marketed for specific purposes and the way it is interpreted and used. This does, however, highlight the importance of the role of vendors and their relationship with police as their customers given their role in designing, constructing, and marketing the technology and places it firmly as a prospective site for future examination by researchers. Consequently, it offers much as a starting point to address the gaps in criminological research on the materiality of technology as it intersects with public policing.

Conclusion

This chapter has briefly introduced and, where relevant, summarised the various components and chapters of this dissertation. The next chapter examines the existing criminological research related to police technology adoption and highlights various gaps in this body of knowledge, which were introduced here.

Chapter Two: Previous Research and Theoretical Engagement

Introduction

The following review of the relevant literature involves a series of interrelated bodies of knowledge concerning organisations and technology. It begins in the broadest sense by examining the historical development of examining organisations' adoption of technologies, including police organisations, within the field of Organization Studies. It then narrows down to research examining police adoption of body-worn video (BWV) technology, revealing the influence of Organizational Studies on criminology, and highlighting key findings and emergent gaps in the research. It then concludes by connecting these threads, outlining how the research aims of this research address gaps and build upon findings, both empirically and theoretically.

2.1 Research on organisational adoption of technology

Concerning research on organisations' adoption of technologies, there are two significant decisions which researchers must consider, namely the theoretical approach (framework) and the methodological approach. These two elements influence data gathering and analysis and resultantly, the nature of the findings produced. The theoretical framework concerns the relationship between social arrangements (for example, the organisational structure, their members who use the technology, policy, and their respective governance framework) and technical systems (for example, the design and functionality of technology). This section provides an overview of key theoretical frameworks related to organisational adoption of technology and details the theoretical framework adopted in this research. The second decision, which derives from the first, relates to the focus of the research examination to understand something about the social arrangements and the technical system. This is dealt with in the subsequent chapter under 'research design'.

Organization Studies has been examining organisations' implementation of various technologies for almost a century. Crucial to these studies are two considerations, namely the social arrangements and the technical system.

2.1.1 Theoretical framework

As is sign-posted by the title of this dissertation, this research engages in a socio-technical analysis of change. The approach or theoretical framework used in the research is socio-technical in nature and this derives from socio-technical systems theory. Pasmore et al. (1982) traced the development of socio-technical systems research and theory over a thirty-year period and reviewed 134 experiments to distil the concepts and gaps in socio-technical research of the time. They attributed the term 'socio-technical system' to Trist and Bamforth (1951) and described it as a method for analysing organisations "which emphasizes the *interrelatedness* of the functioning of the *social and technological* subsystems of the organization and the relation of the organisation as a whole to *the environment in which it operates*" (Pasmore et al., 1982: 1182; emphasis added). Accordingly, the socio-technical approach considers the environment in which the organisation operates to be relevant to an examination of organisational change. This is particularly useful for examining the impact of BWV technology adoption on policing in England and Wales.

The terms social (socio) and technical delineate the two core elements of the research agenda when investigating organisational adoption of technology, namely the social arrangements and the technical system. Materiality refers to the properties of a technical system (Leonardi, 2012), in this research it relates to the various components of BWV technology used by police in the region. These components are enumerated in Chapter Four and the concept of materiality is further developed as part of a toolkit offered in Chapter Seven.

When analysing organisational implementation of technology, two interrelated positions are taken by researchers according to the relationship between the social arrangements and the technical systems and how they shape one another. As subsequently shown below, these positions have significant implications for research.

Views on the relationship between social arrangements and the technical system

According to the socio-technical approach, social arrangements and the technical system are empirically distinct, yet interrelated entities (Pasmore et al., 1982). This is in accordance with critical realism, which is a view that this doctoral research adopts. Where an analysis is made, it could be described as making a Cartesian cut – a metaphorical term used to distinguish between mind and matter (Atmanspacher, 1997) – studying the two as separate entities.

Critical realism, as developed by Bhaskar (1975: 102-108; 2008: xv), is premised on a stratified ontology that distinguishes the 'real' (underlying causal structures and mechanisms), the 'actual' (events generated by those mechanisms), and the 'empirical' (our perceptions of those events). Critical realism takes a realist ontology (structures exist independently of perception) but is critical of empirical realism (positivism, empiricism) which assumes that what humans observe is reality. According to realism, structures (both social and material) exist independently of human perception, but they shape outcomes only when certain conditions bring out their effects. Bhaskar's (1975: 103) example illustrates this: in a scientific experiment, humans create the conditions that allow causal mechanisms to produce observable events, but they do not create the mechanisms themselves. Accordingly, humans influence outcomes without determining the causal structures, which exist independently of them. Later applications of critical realism, such as Archer's (1995; 2010) morphogenetic approach, demonstrate how it can be used to examine social phenomena without collapsing into reductionism or determinism, emphasising the interaction between material structures and human agency.

Conversely, a sociomaterial approach (introduced in greater detail in a later section) sees the social and technical as co-constitutive. This is based on Barad's (2007) agential realism, where matter (materiality) and meaning are understood as inseparably entangled - contrary to critical realism. According to this view, entities do not pre-exist their relations but are instead produced through intra-actions, meaning that material and discursive practices are co-constitutive. Accordingly, agential realism shifts the analytical gaze away from structures with enduring causal powers towards emergent, situated entanglements. As such, the technical system is not seen as having inherent or independent agency - underlying causal powers, to use critical realist vernacular. Instead, it is only once it interacts with humans through interpretation or action, that it is considered to have agency. Where an examination takes place, this is described as an Agential cut, as opposed to a Cartesian cut in critical realism. Accordingly, the hyphen has come to signify the core distinction between these two approaches (socio-technical and sociomaterial) which adopt either critical realism (a realist ontology), with a hyphen, or agential realism (a relational ontology), without one.

Importantly, Leonardi (2013) argues that sociomateriality can adopt a critical realist approach, but their reasoning is not convincing, with their own colleague (Mutch, 2013), in the same edited collection of chapters, arguing against this possibility. This has paradigmatic implications for the inclusion of bodies of knowledge such as human factors (for example, applied ergonomics) and cognitivism (for example, applied psychology) which are premised

on critical realism (the notion that there is a material reality external from the human mind). Specifically, this could lead to fundamental dissonance between bodies of knowledge which inform, design, and construct police technologies and those bodies of knowledge which study, using a sociomaterial approach, the impact and use of said technologies. This would be an undesirable situation, and the findings chapters aim to demonstrate the benefits of borrowing knowledge from disciplines in the material and natural sciences.

Critical realism and the analysis of design and functionality in isolation

A core advantage of critical realism is that it allows analysis of a technology's properties and functionalities in isolation from its immediate use, while avoiding technological determinism. Using a critical realist approach, Fleetwood (2005: 204) argues that technologies have real causal powers, irrespective of whether they are activated in practice. Mutch (2010: 513-516), drawing on Archer's (1995) aforementioned morphogenic approach, demonstrates how technological design can be examined as materially real, with implications that *condition*, but do not *determine* subsequent use. Elder-Vass (2012: 10-12) reinforces this point by showing that while meanings are socially constructed, they are nonetheless constrained by the causal properties of technical artefacts (designed and constructed objects), and he extends this to social structures. Consequently, critical realism gives the socio-technical approach used in this research the ability to analyse design in a way that acknowledges potentialities and risks *without* lapsing into technological determinism.

The nuclear bomb is a clear, albeit extreme, example: its causal properties are dangerous whether or not it is detonated, and these properties exist independently of human perception. While it is human action which ultimately realises these potentialities, the causal properties endure regardless. Moreover, scientists can approximate its destructive power without triggering an explosion, by examining design features such as physical structure, detonation mechanisms, and fuel composition (Sublette, 2019). This capacity to assess design in isolation from immediate use allows society to anticipate implications and make important socio-legal decisions, such as banning the proliferation of nuclear weapons.

The same logic applies to police technologies such as BWV technology. Accordingly, Chapter Five examines how the design and functionality of BWV devices, footage, and the digital evidence management system have impacted, and might continue to impact, police transparency and accountability. Chapter Six explores material and technical features related

to officer protection. These analyses use a conceptual toolkit that is theoretically developed in Chapter Seven, with its central elements outlined in Section 2.1.5 of this chapter.

Views on how social arrangements and technical systems shape each other

As discussed above, the first position which researchers adopt concerns the separateness (or not) of the social and technical. Discussing the second position, which concerns how they shape one another, requires a return to the literature from the field of Organization Studies in the 1990s when theory was highly being contested, methodologies were becoming solidified, and there was much promise for the study of organisational change. Barley's (1998) article entitled *'What can we learn from the history of technology'* is a poignant title since two and half decades later, it seems as if similar issues and contestations continue to arise. Barley was attempting to make sense of a range of theories arising from Organization Studies during the 1980s and '90s into organisational adoption of, mostly, information technologies. One of the most important aspects which Barley (1998) discusses is the distinction between determinism vs. volunteerism and materialism vs. idealism. It is worth including Barley's (1998: 24) assertion in full given that it fully captures and cuts to the core of the state of research on organisational technology adoption:

> "Because those of us who study technology labor at the boundary between physical and social phenomena, sooner or later we must take a stand, if only implicitly, on two dilemmas that have plagued Western philosophy since the Ancient Greeks. The first is the problem of determinism vs. voluntarism, popularly known as the problem of 'free will'. Determinists hold that human behavior is caused by forces and conditions that exist independently of and typically prior to the behavior of interest. More often than not, these forces are external to the actors themselves. From the determinist's perspective, humans are pawns of a system, be it technological or cultural. Voluntarists, by contrast, hold that human behavior is predicated on the choices that actors make. Under the doctrine of voluntarism, we are authors of our existence. The second dilemma, materialism vs. idealism, concerns types of causes rather than the nature of causality itself. Materialists hold that human action stems from physical contexts and causes such as geography, biology, climate, and technology. Conversely, idealists argue that ideas, norms, values, ideologies and beliefs are what drive human action." (Barley, 1998: 249)

According to the assertion, the *a priori* viewpoint of the researchers is a relevant factor in shaping both what is studied and how it is studied. Researchers can take the position that technology is deterministically shaped by the social arrangements or vice versa. For example, researchers who hold that social arrangements, especially human interpretation determines technical systems are predisposed to follow sources of information which

provide context on organisational variables such as culture (structuration) and examine the ways in which technology is used (practice). Their findings are likely to reveal that these variables are core to technology adoption. See for example, Willis' (2022) article on BWV technology entitled *'Culture eats strategy for breakfast'* which examines the implementation and policy-making process, supervision, and training. This research does reveal the power of organisational culture in determining the 'success' of technological implementation, but it provides no account for the impact of the design and functionality of the BWV device (Axon 2) and other material components of the broader technical system under examination - as if it were a passive and neutral object in the process of change.

Regarding those who hold that technology shapes humans, they are predisposed to examine the design and functionality of the technology and how these shapes use and the organisation. Their findings are likely to confirm this view, showing how certain designs and functionality lead to more optimal use of the technology. See for example, Liberman-Pincu and Bitan's (2021) study which develops a user-centred product design methodology in the field of applied ergonomics/sciences. While the study does outline a potentially useful framework for a material assessment of the technical system and it does interview users to receive feedback on the product they trial (as part of the evaluation component of their model), it does not outline the social arrangements (such as culture, unforeseen uses, and attitudes toward autonomous technologies) within the organisation which might significantly impact how the technical system is implemented, used, and whether it is accepted.

Neither of the above approaches are incorrect per se. If either of the researchers took a soft position (as opposed to radical) in their viewpoint stating that the constituent social arrangements or technical systems are important in shaping (enabling and influencing) the other, then they would be correct. If they claimed, based on their findings, that theirs was the most important variable in their area of research, they might also be correct given that the degree to which they shape one another is an empirical question. This is the grey area in the relationship between the social and the technical. However, if they took a radical position (as opposed to soft) by stating *a priori* that either the social arrangement or the technical system deterministically shapes the other, they would, arguably, be mistaken. While such radical positions, made *in theory*, are few and far between (some examples provided in Section 2.2.4 'On the neglect of materiality'), the neglect of either the social or technical appears to occur more recently *in practice*. This is explained in the section below.

Equal consideration of social arrangements and technical systems

Researchers might not be aware that they are overly fixating on either the social or the technical and are, accordingly glossing over potentially significant variables, presenting an incomplete picture, and/or not addressing important potential implications. Jackson et al. (2002) contend that the theoretical understanding and theory in practice are distinct, and that one can privilege the social or the technical in practice despite the theoretical framework employed in the research. They refer to this as the 'tendency to tilt', using Argyris and Schön's (1978) concept of 'tilting'.

Bearing this tendency in mind, this doctoral research, using a socio-technical approach, assumes that the degree to which social arrangements and the technical system shape one another is an empirical question, one which it aims to answer through equal consideration. The issue regarding the ability of technology to shape arises at the point of agency. While an object, produced by nature, may have not intentional agency independent of human action, this issue is resolved (and further developed in Chapter Seven) in this research by deriving intentional agency from the humans (vendors) who design and construct BWV technology. Thus, it becomes crucial to examine the materiality of BWV technology and how this shapes police organisations.

This section has spoken quite theoretically about this issue thus far. Below is a more concrete example of the gaps within criminological research, followed by a discussion of the more recent shift of research ontology in criminology.

2.1.2 History of social determinism: Neglecting technical systems in theory

To trace and make sense of how criminological research on police technology adoption has arrived at this point, it is necessary to travel back in time to the 70s and 80s when social scientists were developing approaches and social theories for examining how humans and organisations interact with technology. In 1976, Giddens was calling for new social theories to depart from certain tendencies of the 19th century industrial revolution to directly counteract what he labelled 'the theory of industrial society'. According to him, society had too heavily embraced notions of positivism and objective realms of social reality. Writing prior to the birth and explosion of the internet, Giddens (1976) made certain claims, which proved to be incorrect, which dismissed those emerging predictions about the expansion and

dominance of industrial (technological) innovation. Regarding the construction of social theories, Giddens wrote that:

> "The need for substantial rethinking is, I think, evident in the rash of speculative ideas suggesting that we are in the throes of a major process of social transformation in the industrialized world: theories of 'post-industrial', 'post-modern', 'technotronic' society, and so forth, abound. By and large, however, such theories continue the assumptions of previous times, holding, for instance, that 'industrial society' is in the process of being superseded by 'post-industrial society'." (Giddens 1976: 721)

Giddens (1984) expanded upon his call for a new wave of social theory by presenting the 'theory of structuration model' which entails that institutions are social systems structured by the activities and interactions of those possessing agency and power i.e. humans. Thus, approaches which employ structurational theory focuses solely on those social processes (the social arrangements), since Giddens asserted that only humans possess agency. In the 1990s, aided by organisational adoption of IT technologies, theories related to social arrangements and technical systems were being redeveloped, with Latour (1990: 111) expressing that:

> "the main difficulty of integrating technology into social theory is the lack of narrative resource. We know how to describe human relations, we know how to describe mechanisms, we often try to alternate between context and content to talk about the influence of technology on society or vice-versa, but we are not yet expert at weaving together the two resources into an integrated whole."

Subsequently, a computer scientist, by the name of Wanda Orlikowski, had noticed that research findings on technology and organisational change indicated that technology was not producing the expected deterministic effects on social processes. Based on those emergent research findings and the work of those who she described as sociologists of technology and information technology researchers, Orlikowski developed a social constructionist theory entitled the 'structurational model of technology' (Orlikowski, 1992). Orlikowski premised her novel approach on Gidden's (1984) previously mentioned theory of structuration, which constitutes a radical social constructionist theory.

Orlikowski (1992) presented a foundational model designed to give due consideration to both social arrangements within organisations and the technical system they implement (balanced duality). Her critique targeted the prevailing hard and soft deterministic tendencies of socio-technical theory at the time. Although her early structuration-based perspective is balanced in theory, she focuses on how people interpret and enact technologies. In practice, the social is the primary structuring force in her analysis and leans toward social

constructionism. Later, she cautions against neglecting the technical dimension, calling on researchers to engage directly with the technologies under study (Orlikowski and Iacono, 2001). In her view, technical systems are analytically significant, yet only insofar as they are shaped by human agency, which she positions as the primary structuring force. While Orlikowski's (1992) 'duality of technology' model, which differentiates between technology as a constructed product (technology as artifact[1]) *and* a process (technology-in-practice), forms part of this dissertation's methodology, her subsequent work increasingly departs from this foundational contribution. As such, her later works are not incorporated into the methodology - this is further detailed in Section 3.1 of the ensuing chapter.

Leonardi (2013: 64) emphasises the significance of moving towards a 'practice lens' in Orlikowski's (2000) article. This technology-in-practice model laid the foundation for researchers to focus their examinations on the use and interpretation of technology with the organisation, since it was the organisational structure and practice which shaped the technical system, minimizing its import. According to their developing theory, technical systems are considered important but not equally important, given that they are interpreted. In effect, technology becomes an emergent property of social practice. This is arguably due to the strong routes in Giddens structuration theory which diminishes the agency of technology to shape. This change towards the practice model/lens laid the foundation for the theory to collapse into social determinism.

Nowhere is this journey of theoretical privileging more apparent in criminological research than in the shifts in the writing of the prolific expert on police research, Peter Manning. In his early publication, Manning (1992: 351) attributed a balanced weight to the technical systems in affecting change, stating that "technology is an apparatus, or the means by which work is accomplished, and it may be material, logical, or social in its manifestations. Technology is embedded in social organization and has social meanings attributed to it; it changes organizations and occupations and is shaped by them." In his seminal book on police technology, Manning (2008) had shifted to patently attribute more weight to the social element, stating that "the idea of technology is more important than the materiality of technology because it is ideas that drive its installation, social shape, aesthetics, and uses" (Manning 2008: 63). After a lengthy discussion on technology in relation to Orlikowski's

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[1] Orlikowski uses the American English spelling of the word. This dissertation uses the British English spelling - artefact.

1992 work, he further states that "to put this in positivistic terms, we might say that technology in every case is the dependent variable, not the independent variable" (2008: 68).

This has not been isolated to police technology, more generally, but has also influenced a doctoral study on the effects of BWV technology. Koen's (2016) doctoral research, conducted in the US, was geographically limited to a small police department. Koen investigated the structures and practices of the police organisation which might be affected by BWV technology. Moreover, 'organisational domains' were also examined. These domains are the organizational elements, including social processes and activities, which were theorised by Orlikowski and Gash (1994) in their technological frames of reference (TFOR/TFR) approach. Koen's use of the TFR framework for measuring organisational change meant that the examination privileged the social arrangements. This is revealed by one of the key set of questions in their survey which focuses on police officer interpretations and perceptions, with perceptions of the technology (not the technology) affecting behaviours:

> "What are the interpretations of the Nature of BWCs of individuals belonging to different groups within the organization? How do certain individuals belonging to different organizational groups perceive the functionality and complexity of BWCs and how have these perceptions affect their behavior[sic]? How have perceptions and behavior change since implementation, if at all?" (Koen 2016: 33).

This is not a pedantic observation and critique as conflating technology's impact with how it is socially constructed (interpreted/perceived) results in only perceptions being investigated. Consequently, there is no need to examine the technical system itself since its materiality is not significant, only how that materiality is interpreted. This theoretical viewpoint creates conditions for researchers to ignore the materiality of technical systems and to privilege social arrangements *in practice*. Crucially, the author states that there is a 'nature' of BWCs, alluding to some sort of functionality and design, but does not detail or explore what it is or what the term means.

Information Systems (IS), as an academic discipline (Davis, 2006), adopted actor-network theory (ANT), a sociomaterial approach, early in the new millennium and reflects the same journey, described by Milovanovic (2022), which criminology would take at a later stage. Hanseth et al. (2004) note that IS scholarship has embraced the ANT approach, positioning IS as a socio-technical discipline. The authors' then critique both organizational

institutionalism[1] and Orlikowski's (1992; 2000) 'structuration theory'. Specifically, they find that Orlikowski overly focuses on uses of technology (technology-in-practice) and does not meaningfully examine the technological artefact and how it shapes technology-in-practice (Hanseth et al., 2004: 118). In the critique, the authors assert that "the studies of IS based on these theories do not address the role of technology in a proper way. This fact is largely a consequence of the fact that *both these theories totally ignore technology*" (Hanseth et al. 2004: 117; emphasis added).

Early formulations of ANT were compatible with socio-technical thinking, which explains Hanseth et al.'s (2004) characterisation of ANT as socio-technical. However, following Latour's *Reassembling the Social* (2005) and Law's *Actor Network Theory and Material Semiotics* (2009), ANT itself underwent a sociomaterial turn in which the duality of the social and material was eroded, like Orlikowski's later shift influenced by Barad (2007). Similarly, criminology has experienced this sociomaterial turn, as discussed in the next section.

2.1.3 Ontological turn in criminology

The previous section discusses how social deterministic approaches privilege social arrangements of organisations in theory and provided instances within police research. This section addresses the more recent trend in criminology of adopting sociomaterial research approaches. This is important given that, as shown in the next section, sociomaterial research averts the theoretical tendency to privilege, but neglects the longer-term impacts of police technology adoption in the process.

Like Information Systems in the early 2000s, criminology has largely shifted away from social determinism (or radical social constructionism) toward sociomateriality. As noted earlier, Orlikoswki's structurational model (Orlikowski and Scott, 2008) took a sociomaterial turn through Barad's (2007) agential realism. Similarly, many criminological studies draw on Latour's (2005) and Law's (2009) sociomaterial interpretations of ANT and increasingly adopt new materialist approaches. Milovanovic (2022) has referred to this as the 'ontological shift in classical criminology.'

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[1] Organizational institutionalism or 'new' institutionalism, a rebrand of neo-institutional theory, is not relevant to the discussion as it has not influenced relevant literature to the same degree as structuration theory.

Sociomaterial approaches consider the technical systems and social arrangements in a network or assemblage (depending on the vernacular) to be co-constitutive and build upon relational (process-based, emergent) ontologies (de Moura and Bispo, 2020)[1]. Despite attempts by some scholars (Mutch, 2013; Tunçalp, 2016) to retreat from agential realism, which underpins relational ontology, leading figures (Leonardi, 2013; Scott and Orlikowski, 2013) continue to advance it strongly. This sociomaterial turn, like social determinism before it, originated in Organization Studies, was taken up in Information Studies, and has since permeated criminology.

As aforementioned, there has been a series of criminological research studies employing ANT. A book of these studies was compiled and edited by Robert and Dufresne (2016) and included technologies such as Taser and CCTV. Goldsmith et al. (2022) use a sociomaterial perspective to emphasise the importance and role of guns in the commission of crimes. Berry (2021) used ANT to make sense of users' experiences of electronic monitoring and Casey (2021) conducted a technosocial ethnography, drawing mostly from ANT, as part of their doctoral research on penal electronic monitoring in Scotland.

Dymond (2014) has called for an incorporation of social theories of technology from science and technology studies (STS) into criminology, specifically the application of a socio-technical approach. Dymond's work primarily focuses on the use of Taser technology but specifically states that a move towards a socio-technical approach can be applied to other policing technologies (Dymond, 2020). It should be noted that it is a misnomer, given that the research, although theoretically eclectic, is technically sociomaterialist in nature (a discussion which is covered in the next chapter). Her work used ANT and the social construction of technology (SCOT) – to a much lesser degree - to highlight seeing Taser as an *actant* (the preferred vernacular of ANT theorists as actor is conflated with human agency), Taser as *network*, and Taser as part of a broader *network* and *programme of action* (Dymond, 2016).

Taser as an actant holds that the material characteristics and design play an important role in an actor-network such as the physical shape (shaped like a firearm and placed in a holster), the electrical output signature (duration, burst and automatic cut off), and a sound signal after the device has been discharged for 3 seconds. Taser as network refers to the specific grouping of role-players who were responsible for its final design. Broader network and

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[1] This article is a valuable resource for comprehending both the range and application of sociomaterial approaches.

programme of action discusses the wider social and cultural contexts which shaped the decision to delegate the responsibility (delegation of violence) to incapacitate a suspect from police officers (through physical restraint) to technology and what this means for use of force.

This creative application of ANT parallels the methodology of this research, which gives due consideration to materiality. Dymond's research similarly examines the technology as a designed and constructed product (Chapter Seven), the social arrangements shaping it (Chapter Six), and its impact on policing in the region (Chapter Five). Dymond's (2016) data analysis demonstrates that affording sufficient focus and consideration to materiality of technology can provide novel findings and uncover significant implications. The way in which Taser devices were designed had important considerations for the harm inflicted on members of the public and certain historical design choices arguably led to unnecessary and preventable deaths – designs which have since shifted significantly to mitigate the risk of harm. The focus of Dymond's work and the consideration of materiality are something which this research intended to apply to the field of BWV technology, and it serves as an example of sociomaterialist (despite Dymond labelling it is socio-technical) research giving equal consideration to the materiality of technology in practice.

The *De Gruyter Handbook of Digital Criminology* (Mareile and Heidi Mork, 2025) further reflects the ontological shift. Chapters on agency, digital interviews of objects, and affordances demonstrate the increasing centrality of relational ontologies in criminological research. Although contributions like Krasmann's (2025) acknowledge technology as an actor and grant it a form of agency, this agency still stems from human practices. The focus remains on how technology is used rather than on how it is designed and constructed.

While social determinism in theory is less present in criminology given its ontological turn towards sociomaterial research, there is still the issue of materiality of technical systems being neglected or the social arrangements privileged in practice. This is highlighted in Section 2.2 which focuses on previous research on the police adoption of BWV technology.

2.1.4 Positioning the theoretical contribution

This socio-technical research overlaps with sociomateriality in emphasising the importance of materiality in shaping social arrangements. It affirms that material properties exist independently of human activity and perception and that the degree to which they shape one

another is an empirical question, thereby avoiding radical constructionism or interpretivism. At the same time, it recognises that the social and the technical are interrelated: social arrangements give shape to how technologies are used and condition their impacts. Material properties thus represent potential events realised under social conditions, which avoids both technological determinism and positivism. Social arrangements, then, are worth examining because they shape how material causes and properties play out. Chapter Five covers many of these social arrangements in relation to BWV technology, particularly the governance framework consisting of rules and oversight mechanisms.

In disciplinary terms, this research distances itself from the ontological turn in classical criminology towards sociomateriality stemming from Organization Studies (e.g., Scott, Orlikowski) and Science and Technology Studies (e.g., Barad). Although criminology has rarely adopted critical realism explicitly, there are several dispersed streams of work that lean on realist assumptions without naming them as such. One strand comes through realist evaluation (Pawson and Tilley, 1997), which emphasises causal mechanisms and context–mechanism–outcome (CMO) configurations. They argue that "casual outcomes follow from mechanisms acting in contexts", formulated as Context + Mechanism = Outcome (Pawson and Tilley, 1997: 58). Here, the context is the set of conditions that trigger mechanisms into producing outcomes. This is loosely comparable to social arrangements shaping how technical systems operate and the impacts they generate. Pawson and Tilley's (1997) evaluations draw on criminological and applied social policy settings, including crime prevention programs, probation, and CCTV systems. The realist evaluation of CCTV was subsequently assessed by Gill and Turbin (1999), who, after conducting their own empirical research, concluded that the methodology had promise.

Another strand appears in evaluations of police technology, which to varying degrees explicitly recognise the shaping role of material design and technical functionality and implicitly draw upon critical realism. Flight (2019b), for example, examines the visibility of the BWV device and how this might shape interactions (whether the deterrent effect is triggered). More importantly, his evaluation (Flight, 2019a: 28)[1] of Amsterdam police's BWV pilot directly draws from Tilley's (1993) realistic evaluation, which itself is premised on critical realism. Kersting and colleagues (Kersting et al., 2019)[2] explicitly examine the 'wirkmechanismen' (mechanism of action) as part of their research questions, discussing whether BWV devices influence self-awareness and rational choice. Their group discussions

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[1] A report published in Dutch. Google Translate was used to translate relevant sections.
[2] A report published in German. Google Translate was used to translate relevant sections.

found that participants did not believe that the front-facing screen (monitor) had much impact, largely due to its small size; in some cases, people even moved closer to inspect it, undermining officer safety (Kersting et al., 2019: 122-123). Miranda's (2022) analysis of the mobility of BWV device similarly shows how design features condition certain outcomes, even if she does not frame this in explicitly realist terms.

These contributions are fragmented, but together they signal a latent realist undercurrent in criminology. This dissertation builds on that undercurrent by making its realist commitments explicit, particularly in relation to material design and technical functionality and their capacity to shape policing. The realist undercurrent in criminology seems to be driven less by abstract theorising and more by applied research contexts. The aforementioned scholars are embedded in evaluation studies, policy work, and practice-oriented projects, where it arguably becomes difficult to sustain a purely constructivist position. Even Dymond's (2016) doctoral research (though theoretically eclectic) was driven by the need to make sense of Taser, a specific policing technology, with real-world design and functionality.

In such applied spaces, realism often creeps in tacitly: the demands of the research push scholars to acknowledge that technology has real, material effects, even if their toolkit does not cite Bhaskar, Archer, or Pawson and Tiller. By contrast, more abstract sociological and criminological theory has more room (and appetite) to lean heavily into constructivist or relational ontologies. Accordingly, the theoretical contribution of this dissertation lies between the radical constructivism of sociology and the determinism of applied sciences. It is closest to STS and sociomaterial criminology, but it builds on a narrower realist stream (Archer, Elder-Vass, Fleetwood, Mutch) and an even smaller set of applied criminological studies (Pawson and Tilley, Flight, Miranda, Dymond), whether or not they explicitly identify as realist.

Whereas sociomateriality rejects the idea of analysing design in isolation, this research does so deliberately, to enable speculative thinking about potential implications. A small but growing field is beginning to examine the design and functionality of police technologies. This dissertation explicitly lays the theoretical foundation for such applied studies, analysing design and functionality in isolation and in relation to use. Chapter Six, for example, provides a technical analysis of BWV design features that reflect a concern with protecting officers from violence.

The shift toward recognising the agency of the material is a positive development for criminology, but it is crucial to have a variety of approaches on offer. This contribution offers one such alternative: a social-technical approach grounded in critical realism. It identifies emergent gaps in the literature such as the privileging of social arrangements over technical design, the lag between research and implementation, and the lack of engagement with natural and material sciences and seeks to address them. It does this by focusing on impact, engaging with highly technical analysis of design through the lenses of human factors and cognitivism, and proposing socio-legal implications through speculative analysis.

This contribution thus aligns with, and adds to, a growing field of applied research on police technology. Critical realism provides the conceptual tools for integrating insights from cognitivism, human factors, and natural science into criminological analysis. As the next chapter shows, this allows a shift in emphasis: from use and process alone to design, impact, and use together.

2.1.5 Conceptual toolkit for analysing police technology adoption

Building on the critical realist and socio-technical foundations detailed above, this research proposes a conceptual toolkit to guide the empirical analysis of technology as a product. The purpose of the toolkit is to provide conceptual distinctions which allow for a more structured examination of how police technologies shape and are shaped by policing contexts. While these elements overlap in practice, separating them conceptually enables a clearer analysis of the technical and social mechanisms underpinning technology adoption.

The toolkit makes use of Gibson's (2015; first published in 1979) affordance theory, which is increasingly being used in digital criminology (Wood and Arpke-Wales, 2025). Affordances refer to the action *possibilities* that a material or technological artefact offers to a user relative to their abilities, context, and intentions. Actions which are not possible or are limited by an artefact are referred to as constraints. As is indicated below, technical functionality describes the actual designed capabilities of a system i.e. what a technology can do in a technical sense and these causal powers exist independently of human perception. Affordances stem from functionalities – an affordance only exists when a user perceives and acts upon it – while a functionality exists whether or not anyone uses it. Accordingly, functionalities can be used to analyse design in isolation of immediate use, while affordances

is useful for analysing the relationship between users and artefacts (what it enables and constrains).

Crucially, Wood and Arpke-Wales (2025) find that affordance theory is useful for understanding the relationship between technology and human actions, but that affordance theory is limited in explaining how affordances came to be. They can describe the outcomes of design, but not the process or structures which that created them. Accordingly, the limitation is that a focus on the process does not reveal the larger story. This is precisely the gap which this research fills, by exploring how design decisions, vendor rationales, and police organisational priorities interact to produce particular outcomes and functions while constraining others.

The toolkit identifies four interrelated components, namely agency, materiality, situatedness, and control. Materiality is further subdivided into material design and technical functionality. Together, these components provide a vocabulary for analysing how technologies exert influence and how their affordances (action possibilities) and constraints (limitations) emerge through use. This conceptualisation also enables the analysis of potentialities (what a technology could do) as well as actualities (what it does in practice). The table outlines each component and provides an example from the findings chapters. These tabulated concepts are elaborated in detail in Chapter Seven, where they applied to the BWV technology and its various components.

Beyond the mutual shaping of social and technical arrangements, this research employs the notion of (mis)alignment to capture the tension between human and material agency. Misalignments occur when user actions diverge from design intentions, but also when beliefs about what the technology does conflict with its actual effects. For instance, while vendors and organisational narratives often describe BWV footage as objective and independent, in practice footage amplifies cognitive biases, shaping perception and assessment in subconscious ways (detailed in Chapter Seven).

TABLE 1 SUMMARY OF CONCEPTUAL TOOLKIT WITH EXAMPLES FROM FINDINGS

Component	Conceptual meaning	Illustrative example (from findings)
Agency	The capacity of technology and its components to shape outcomes independent of human intention.	The deterrent effect of the BWV device; front-facing screen potentially shaping behaviour (Section 6.2).
Materiality	The composition and design of technology, encompassing physical and digital properties.	See *material design* and *technical functionality*.
Material design	The physical or digital construction of a technology's components; their form, arrangement, and visual, auditory or tactile properties.	The HD lens and low-light sensors of devices, altering visual perception and evidential interpretation of footage. (Section 7.2)
Technical functionality	The intended capabilities or capacities embedded by designers that define what the technology can do, irrespective of activation or use.	Livestreaming or facial-recognition readiness designed into BWV systems even when not enabled by the police. (Section 6.3)
Situatedness	The environment and context in which a technology is deployed, including the physical and organisational arrangements surrounding its use.	1. How the BWV device is worn; device placement on the officer's chest producing first-person perspective bias. (Section 7.2) 2. Development of algorithmic integration with cloud-based evidence management systems occurring outside of public purview. (Section 7.3.3)
Control	Who operates, governs, and accesses the technology and its outputs.	Police maintaining control over footage disclosure and system access, limiting external oversight. (Section 5.3)

Adams and Thompson's (2025) chapter on 'interviews with digital objects' also acts as a conceptual toolkit, offering several 'heuristics' but differs by being grounded in a relational ontology. Using ANT, they outline focal points for analysis and identify relevant data sources, including news media. As their methodology is grounded in agential realism, their focus is on technology use and their notion of material agency stems from human action. Interestingly, the authors offer a heuristic which analyses moments when artefacts 'break down'. This is like misalignments, which is premised on the notion of 'malfunction' – that

technology can stop fulfilling its intended purpose. However, function is an inherent causal property (critical realism) and thus, is distinct from relational ontologies which focus on affordances (uses of technology). 'Breakdowns' is therefore more limited in scope as it doesn't speak to function independent of use – something which this research specifically analysis in Chapter Six.

2.2 Research on police adoption of BWV technology

The previous section discusses research on organisational adoption of technology more broadly to introduce the fundamentals of the theoretical framework in use and to provide a historical overview of research between humans/organisations and technology. This section narrows down by examining the previous research on police adoption of BWV technology.

Depending on the nature of the theoretical framework and how it is deployed, researchers might not provide equal consideration to the technology (technical system), privileging rather the social arrangements within the organisation, or vice-versa. This has, arguably, occurred historically in quantitative criminological police research examining the impact of BWV technology adoption on police activity, but has also appeared, to a lesser extent, in qualitative research on BWV technology adoption.

Since its first trial in the UK in 2005 (NBC News, 2007), BWV technology has attracted significant research attention. A relatively extensive body of international literature now exists on police adoption of BWV technology, with most studies conducted in the United States (Lum et al., 2019). However, research output has not kept pace with the rapid global expansion of BWV technology use. As discussed below, existing studies have largely relied on quantitative approaches, particularly in examining police activities. Although this research does not employ quantitative data, it is necessary to outline the current state of BWV technology scholarship and the key gaps that remain.

2.2.1 Quantitative research

The 'Rialto study' conducted by Ariel et al. (2015) is hailed as the first randomised control trial (RCT) examining the effects of BWV technology on policing, which found a decrease in use of force incidents, citizen complaints, and ultimately concluded that BWVs are worth the investment. This study seemingly set the tone for which effects should be measured in future research and has been cited by police organisations looking to evidence their

procurement, implementation, and continued use of the technology. Nonetheless, the authors do concede that their conclusions are limited and may not represent all law enforcement, specifically stating that random sampling with more participants might yield different results. They proceeded to suggest further research given the limitations of their research design and context. Sutherland et al. (2017) followed up at the Rialto site three years later and found that the impacts of the BWV technology adoption had persisted.

Adams and Mastracci (2019) identify five response variables which are of interest to previous BWV technology studies. These include use of force, external (citizen) complaint, assaults on officers, arrest activity, and judicial outcomes. The two researchers examined officer burnout and changes in the officers' (respondents) perception of organisational support which was available to them. As identified by Lum et al. (2015), there have been an abundance of empirical studies conducted on BWV devices, particularly their effectiveness, effect on police use of force, community engagement, and citizen complaints. Recent research features many of the same behavioural measurements. For example, Groff et al. (2020) measured the effects of BWV technology on officer behaviour, including stops, arrests, use of force, and citizen complaints. While not an RCT, the researchers were purposive in their sampling method by deciding to compare officers from one department, who were making use of BWV technology, with those of three other departments (those sharing core similarities) who were not.

There was a concern that BWV technology, as a means of improving transparency and accountability in policing might have deleterious effects on police behaviour. Wallace et al. (2018) investigated this notion of a "depolicing" effect (decreases in policing activities and proactiveness) brought about by the presence of BWV devices. The hypothesis is that the surveillance potential from the public (external) and their department (internal) cause police officers to limit their interactions with the public for fear of repercussions. Wallace et al.'s (2018) RCT which was conducted at one of the same sites in Gaub et al. (2016) (both part of a larger Spokane Police Department study) did not find statistically significant camera-induced passivity. The four measurements included officer-initiated calls, arrests, response time, and time at the scene.

While Wallace et al.'s (2018) article did provide an important discussion on visual surveillance technologies and attempted to define why BWV devices are effective in their ability to deter bad behaviour, it fell short by not considering the materiality of the technical system which might have impacted the findings in the various studies which they analysed.

Specifically, there was no mention of which devices were used and how their idiosyncratic functionality and/or design could have played a role in the deterrent effect. This is problematic when the discussion of effectiveness of surveillance technologies includes the topic of observability and presence of the technology itself, yet there is no discussion about how certain BWV devices are more visible (through lights, sounds, and potentially a front-facing screen) than others.

Research by Groff et al. (2020) found contradicting results from Wallace and colleagues in the form of reductions in proactive policing. However, their research design was different. Although they had used a multi-site sample (3 sites not using BWV technology; 1 site using it), their project was not an RCT, but rather approximated randomization. In the absence of randomization, the researchers purposively assigned BWVs to a single police district based on its high number of calls for service and crime. After conceding this limitation, the authors revealed that, crucially, they were unable to measure the compliance rate with the policies which stated that officers must record each engagement. Considering validity concerns, the authors attempted to increase the internal validity of the findings by making use of propensity score matching between officers with and without BWVs, which approximates randomization and thus, minimizes selection bias.

Limitations of randomised control trials

While some researchers (Ariel, 2018; White and Malm, 2020) have stated that RCTs are the 'gold standard' for measuring change resulting from BWV technology adoption, there are several limitations inherent to RCTs and other limitations which have developed given the widespread diffusion of BWV technology across policing organisations in England and Wales. Drover and Ariel (2015), for example, highlight certain challenges facing those researching organisational change in the police. Specifically, they conclude that the practice of assigning intervention and non-intervention to the public when forming control and treatment groups is ethically questionable. Further inherent limitations include the issue of attrition as a relatively high number of officers need to stay in the trial as well as needing to mitigate the risk of potential contamination. Contamination involves the risk whereby officers with BWV devices (treatment group) affect those officers without devices (control group) if the two sets of officers interact with each other while devices are present. The assumption is that the control group would subsequently change their behaviour once they become aware of devices being present during the interaction(s). Researchers offset this risk by monitoring and accounting for any contamination.

However, contamination is incredibly difficult to control given the diffusion of BWV technology in the UK. Over numerous publications, Ariel and colleagues (Ariel et al., 2017a; 2019; Ariel, 2018) have extensively attempted to explain and address certain contradictory findings and challenges conducting RCTs at police organisations. As aforementioned, RCTs involve two groups of officers, the control (those without a device) and the experimental group (those with a device). One such speculation by Ariel et al. (2017a) was the existence of 'contagious accountability', whereby the initial stages of equipping some officers wearing devices led to a professionalisation across the organisation. This meant that it would technically taint the control group. A second obstacle to randomised control trials which they proffered (Ariel et al., 2019) is that once officers have adapted their behaviours to wearing devices, they cannot go back to behaviours which are independent of them wearing a device. Thus, officers might behave the same irrespective of whether they were wearing a BWV device. Nonetheless, given that police organisations in England and Wales work together operationally and there is an exchange of personnel across organisations means that there might no longer be an ideal environment in the real-world where an organisation is completely immune from the effects of BWV adoption or ideal way to correct for these factors.

The degree to which BWVs have already been implemented almost precludes researchers from being able to capture implementation changes since the impact has been so extensive. In England and Wales, even if a police constabulary had not yet adopted BWV technology across their organisation and did not wish to do so, they would be forced by law to provide devices to their armed forces and those assigned a Taser. This has become more pronounced given that all instances of 'stop and search' and 'use of force' need to be recorded with a BWC device. Further, there is much transfer of police personnel between organisations, especially in the UK, meaning that even if an organisation has not yet embedded BWV technology across its core departments, it is likely that transferees would have used the technology at their former organisation. This was observed at Peelford Constabulary (the participating organisation) where several staff were from other UK organisations and had used different BWV technology systems. With all these limitations in combination with the current diffusion of BWV technology, replicating these large-scale RCTs might no longer be practicable in the UK.

Neglecting the materiality of BWV technology

Although it served as the quantitative benchmark for BWV technology impact research, the BWV devices trialled in the Rialto Experiment (Ariel et al., 2015) vary considerably from modern devices, bringing into question the validity of any comparative analysis with recent or future studies. For instance, earlier models of BWV device have much wider lens angles (fisheye lenses) which would cause distortion of the footage. Newer models from Motorola, Reveal, and Axon have decreased the lens angle to 120 degrees horizontal. However, the latest BWV device from Axon, the Axon Body 4, has been designed with 160-degree field of view capture functionality and uses an algorithm which automatically corrects for the (fisheye) lens distortion. The same issue exists with the quality of the produced footage, with early models recording in 480p and the higher-end new models can both record at 1080p and livestream at 720p.

The Edmonton Police Service's (EPS) final report (2015) of their BWV pilot project provides further evidence of technological variance affecting policing activities. Conducted between 2011 and 2014, EPS identified 16 types of BWV devices from 12 different companies. Interestingly, after having undergone initial laboratory and training testing the Taser Axon Flex's system was found to be unsuitable for field testing. Instead, EPS decided to field test the Reveal Media RS3 SX camera. However, it was further concluded that it too did not fully meet EPS' operational needs, highlighting the state of early BWV models and systems. Essentially, by 2011 there were already at least 16 types of BWV device, none of which met EPS' full operational needs. Further research conducted by The Johns Hopkins University of Applied Physics Laboratory (Hung et al., 2016) conducted an evaluation of BWV devices on behalf of the US Department of Justice and it was revealed that by 2016 there were already over 60 types that were commercially available BWVs to criminal justice departments.

Evidently, even the earlier iterations of BWV devices varied to an incredible degree across vendors and current technological offerings indicate the extensive development which has occurred over the past decade. Certain models (i-Pro BWC4000) have a 12-hour battery life, now lasting an entire shift, featuring swappable battery packs. This is compared to the EPS (2015) project where the BWV used had an internal battery and could record for 90 minutes. Multi-docking functionality, whereby multiple BWV devices can be connected to a single docking station, means fewer docking stations are now required per police station, reducing

cost. See Sousa et al. (2016: 369) for a discussion on how docking unit limitations negatively affected their research methods.

This oversight concerning the materiality of BVW technology becomes patent when examining research carried out by Gaub et al. (2016) as an example. Close attention was paid to increase the validity of the RCT results and the study involved multiple experienced researchers adding credibility. The researchers measured officer perceptions of BWVs over time (before and after deployment) across three departments and it is evident that the authors went to great lengths to understand the differences in perceptions between the three departments, offering four key explanations. Nonetheless, there was no mention of how the different models of BWV device (and their systems) across the departments might play a role in officer perception. This is particularly problematic since it can be argued that 14 of the 33 survey questions used in the study are affected by the specifications of the different cameras and their systems.

Young and Ready (2016) describe the features of the popular Axon Flex and Vievu and the Evidence.com system in a footnote. However, they do not indicate how that information is pertinent to their research findings. Drover and Ariel (2015: 85) went much further, and it should have acted as precedent, by providing the features of the BWVs used in their study - under the heading of "Apparatus". Although they do not mention which model of Edesix (subsequently acquired by Motorola Solutions) BWV device is used, they do describe the size of the camera, the positioning of the camera, the minimum audio and video capture functionalities, and the fact that it charges and syncs via a docking system at the police station. They even include a photograph of the BWV, giving the reader a sense of how it might operate/be perceived in the field. Once again however, the "Apparatus" section does not mention how these features might have influenced the research findings. Similarly, Ariel et al. (2015) detail the specifications and features of the BWV and system but do not mention which model of Taser (rebranded as Axon) was used nor how these technical/material details might have affected their results. Given the credibility of the authors and that these were some of the first studies on BWV technology, including the technical details in the article (at a minimum) ought to have set a precedent for future articles. However, this did not carry over to later studies. This is surprising given the precedents that were set by Ariel et al.'s (2015) Rialto study, such as the importance of a RCT. If it had set a precedent for an "Apparatus" section, this might have created the conditions for researchers to realise that technical details are be relevant to their findings.

Despite Ariel and colleagues' earlier consideration of technical details, Ariel et al. (2016) arguably constitutes the most blatant example of ignoring the materiality (design and functionality) of BWV devices (and their systems) in their meta-analysis of use of force and assaults on officers. The authors did not account for technological differences when comparing the relevant RCTs. It could further be argued that the studies included in the meta-analysis might not have disclosed the technical details of the respective BWVs. Even if true, it does not justify a complete lack of discussion in their article about how material variance might play a role in the mixed results across research sites. While the authors went to great effort to constrain extraneous and incomparable variables, they did not account for technological variations.

In contrast, Assaraf et al.'s (2024) article constitutes a significant finding which could nudge future quantitative researchers to include the materiality of BWV technology in their examinations and explanations. The authors found that officers wearing devices which had a yellow notification sticker on the device experienced more violence from the public than those officers without the notification sticker. Apart from this lone exception, quantitative studies examining police adoption of BWV technology have ignored material components of BWV technology. However, as Assaraf was a doctoral student of Ariel (and a co-author of the article), it is possible that quantitative research might begin to acknowledge the importance of materiality as a variable and test for it in the future.

2.2.2 Qualitative studies

It is understandable that the body of research on effectiveness, and officer behaviour more generally, has been prolific given the immense cost of BWV devices and their systems as well as the growing number of high-profile cases of police abuses, especially police killings recorded by the public. The public has been eager to learn whether BWV devices are the solution they were promised to be, while police need to determine if BWVs are a sufficient return on investment. Lum et al. (2019) conducted a review of the evidence base concerning police adoption of BWV technology and found 32 studies measuring officer behaviours, 32 studies measuring officer attitudes, 16 measuring citizen behaviours, 16 measuring citizen attitudes, 5 measuring investigations, and only 8 measuring organizational impacts. Accordingly, there is a major gap in the literature in qualitatively examining the changes within police organisations beyond measuring police officer activities and attitudes. As O'Neill et al. (2024: 2) state, "most of the research to date is based on experimental methods (introducing cameras in one area but not in another and then comparing what happens) or

uses surveys of the public or the police to gather their views. There is very little research to date on BWV which employs a qualitative, observational methodology to witness police and public encounters where a camera is present to record how the devices are used and effect they have."

This doctoral research set out to deal with the gaps created by quantitative studies and the privileging of social arrangements. Since this research commenced, other research has also addressed these gaps. For instance, a recent acknowledgement of the impact of the technical components of technology on policing stemmed from the work of Miranda (2022), which drew from interview data with British police officers. A section of Miranda's article is devoted to the design implications of the BWV devices used during her field research and centred specifically around the user-friendliness and appropriateness of the design as this impacted the police officers' use of the device. It also included a discussion of the usability and interface of the footage management software, with their core findings being that a device needs to meet the practical and operational needs of police officers for them to use it effectively. This is reinforced by similar findings in Chapter Six, which reveal how personal and operational needs shape the development of BWV technological.

Further relevant qualitative research includes Murria's (2023) examination of police 'stop and search' in the era of BWV technology in England and Wales. While her research limited itself to police 'stop and search', it does work with a large set of interviews with police of various levels of seniority and includes coded assessment of BWV footage of 'stop and search' interactions, acting as a quasi/digital field observation. As a result of this qualitative research into police use of BWV technology, there are many overlaps in the findings with this research, which reinforce both sets of findings. Their research benefits from limiting its scope to 'stop and search' use by being far more in-depth with the issues of citizen encounters and transparency and accountability. Moreover, there is more engagement on the respective legal framework given that the research is within the field of law.

In terms of materiality, Murria (2023) does mention that Axon (they assessed footage via the Evidence.com digital evidence management system) devices and systems were used by their participating police organisation. They provide a brief overview of how the device functions and how it is activated (Murria, 2023: 325-326). They do not mention how the design and functionality might impact 'stop and search' interactions. Nonetheless, they crucially discuss the limitations of the device's audio and visual capture point (point of view) which produces the resultant footage which is assessed. Further, they cover the issue of

'camera view bias' (Murria, 2023: 328) whereby assessors defer to the authority of officers who capture the footage when there is a conflict which the footage cannot resolve – an issue which is discussed in granular detail in Chapter Seven (Section 7.2.1. 'Arbitrator of Truth'). Finally, they introduce the issue of retention period of the footage (the length of time before it is automatically deleted if not marked as 'evidential') which is a material design choice of the technical system which police organisations control and can adjust. This research distinguishes itself from Murria's by giving far greater attention to the materiality of BWV technology, further demonstrating how the design and functionality of the technical system impacts the theme of police transparency and accountability.

The INTERACT project, comprised of four UK universities, examined the impact of new and emerging technologies on policing. One such arm of the research involved extensive field observation of police (two sites in England and two in Scotland) interactions with the public, with the briefing paper (O'Neill et al., 2024: 3) stating that their researchers "spent approximately 500 hours in total across the four sites observing police activity with the public and noted what transpired when a camera or other mobile technology was employed where BWV technology was involved." This sub-study is unique in that it unapologetically focuses solely on the use of BWV technology to ascertain its impact on police-citizen interactions and is, methodologically speaking, fertile ground for relational (process-based) ontology such as ANT, examining the ways in which humans and technology interact.

Unsurprisingly, this study involving UK police being conducted at a similar stage as this doctoral research, much like Murria's (2023), presents several overlapping findings with this research. Especially, concerning the theme of police protection, whereby the researchers found that police officers regarded their assigned BWV device as a tool to protect themselves. Concerning the researchers' consideration of technical systems, the authors of the briefing paper recommend that "officers should be made aware that policing technologies are not neutral tools; *their presence* and how officers use them can have an impact on the people they encounter" (O'Neill, 2024: 5; emphasis added). That the authors articulated the importance of, and thereby disentangling, the presence (technology as a product) *and* the use (technology as a process) of the device might allude to further findings being published on the research in the future which capture how the materiality of the BWV technology has direct implications on policing, specifically public-citizen interactions. It is hoped that subsequent literature emerging from this research links the materiality of BWV to police protection and in so doing, compliments the findings found in Chapter Six of this dissertation.

Sesay et al. (2017) is another positive example of BWV technology being studied using a sociomaterial approach. However, theirs is specifically from an Information Systems perspective and is not from the field of criminology. The authors speak of both digital and physical materiality (design) of the technical system. Interestingly, the authors separate change from impact. Stating that changes occurred resulting from BWV implementation and then describes the impacts of these. For example, a change was wearing BWV devices as part of standard equipment and the impact was discomfort from hot battery pack and weight of equipment (Sesay et al., 2017: 4272). While the authors have evidently produced novel and pertinent findings, their conceptual toolkit illustrates the issue of vocabulary employed by sociomaterialists which is, arguably, a hindrance to itself as an approach.

Table 3. Sociomaterial Instances of Police Work with BWC		
Concept	Sociomateriality Definition	Sociomaterial Instance of Police Work
Materiality	A process of materialization of phenomena enfolding in material-discursive practices of IS development, implementation and use	Technological artefacts at the scene of the interaction: Lethal and non-lethal weapons (guns and Tasers), BWC, Smart Phone (iPhone), broomstick, Wireless signal, etc.
Relationality	Form, attributes, and capabilities of entities emerge only through inter-penetration	Through human agency, officer unclips BWC from uniform, hoists it on a broomstick, and mounts through an aperture in the attic where suspect was hiding. Through material agency, BWC uses high definition, low light capability to record in the attic affording officer the ability to search for suspect in remote location
Inseparability	Inextricable entanglement of the social and the material	Though unclipped and mounted in a remote location in the attic, officer remains inseparably entangled with BWC through Bluetooth connectivity with handheld iPhone
Performativity	The idea that certain utterances have the capacity to achieve social outcomes	Affordances of BWC, permit officer to see suspect, read his posture and body language, as if they are face-to-face. With that, appropriate commands and responses are issued to negotiate suspect's surrender
Practice	Embodied, materially mediated arrays of human activity	BWC-mediated practice of policing

FIGURE 1 TABULATED FINDINGS FROM SESAY ET AL. (2017: 4273).

It is important to note that this doctoral research does not vilify sociomateriality given that at its core, sociomateriality does not necessarily privilege social arrangements. However, this research does take issue with the gaps produced by its relational ontology (specifically the agential realism underpinning it) and the nature of the jargon which it has developed. Specifically, it's history of fixating on theory-building, inherent focus on immediate and emergent use over longitudinal change and speculative use, and the opaqueness of its vernacular. This is covered in far greater detail in the next chapter. At this stage it is sufficient to note that in theory it does not neglect technical systems, in fact many who have identified the neglect of technology have successfully adopted sociomaterial approaches to address the issue. Guzik et al. (2021: 103) (from the same study as Sesay et al., 2017) state that "sociomateriality holds the potential to contribute to criminological and policing research by

reorienting our understanding of the relationship of technology to work settings. Criminological research has traditionally, like the social sciences more broadly, not considered the material specificity of technological artifacts."

Other qualitative and sociomaterial researchers, however, have neglected the materiality of the technical system in practice. For instance, Campeau and Keesman's (2023) article describes the importance of examining the materiality of technology without providing a single example of material components of BWV technology which are relevant to shaping the police. This is a substantial oversight since auto-activation peripherals (discussed in Chapter Four, Section 4.1.4) and remote activation functionality (discussed in Chapter Six, Section 6.3.1) are material components which could be used to further evidence their assertion that frontline police officers are becoming 'robocops' as these auto-activation peripherals arguably erode officer discretion.

As a further example, Sandhu and Simmons' (2022) article equates police officers to filmmakers in their use of BWV technology. While they mentioned the material design and technical functionalities of the Axon BWV device being used by participants in their research, they do not discuss how these components impact the capturing, editing, and presenting of footage which they describe as the 'filmmaking process'. Accordingly, this is not out of ignorance but rather a 'tilting' in practice. This tilting glosses over technical variables relevant to their argument such as the variability of the BWV device lenses, the existence of 'point-of-view' headset peripherals, and certain models having an articulated lens/head which allows officers to manually adjust the capture point of the device akin to a director in the filmmaking process. Despite this oversight, their critical engagement is useful for a subsequent discussion on the perceived independence of BWV footage (see Chapter Seven, Section 7.2.1).

2.2.3 BWV footage

While much of the research discussed thus far focuses on the impact of the presence of the BWV device itself, there is significant sideways growth of BWV technology research which focuses on the impact of the BWV *footage* produced by BWV devices. Researchers have examined the assessment of footage, the potential impact of watching footage on writing police reports, the quality of the footage in terms of subject visibility, and the conduct of those officers and citizens captured in the footage. This body of literature, often requiring an interdisciplinary focus and calling on disciplines such as cognitive science and ergonomics

pays far more attention to the impact of the materiality of the technology than studies examining the impact of the device itself.

Boivin and colleagues have conducted much quantitative research on the assessment of footage, specifically simulated interactions between police and members of the public. The authors (Boivin et al., 2017) sought to test whether the 'camera perspective bias', which was first identified by Lassiter and Irvine (1986), was present in BWV footage. Their findings confirmed the existence of the bias, and they extended the term to acknowledge the existence of a 'body camera perspective bias', noting that the first-person perspective of the camera unjustifiably discriminates against the subject (member of the public) in the footage since it creates a sense of self-imagery. They later hypothesized (Boivin et al., 2020) that those who are more able to imagine themselves in the position of the recording officer are more affected by the bias. This research is useful in showing how the materiality of the BWV footage (what is and isn't captured by the recording) has an impact on the assessor. For example, Boivin et al. (2017) discuss the importance of the lens angle in affecting the assessment since the wide-angled lens creates a distortion in the distance perception of the assessor when the distance between an officer and the subject (member of the public) is a key factor when determining whether officer intervention (use of force) was reasonable or not. This body of literature highlights the importance of examining the role of footage, and not simply the device itself, when analysing the research data.

Vredeveldt et al. (2021) examined the impact of police officers watching their footage on the quality of their report writing. This article is valuable both in terms of its contribution to understanding the impacts of technology on policing, but also in terms of including a discussion of the device used in the research as well as the potential material impacts specific to the device. The authors disclose that the police organisation which they researched were using GoPro BWV devices and noted that the recorded audio quality was poor. This in fact lead to the occurrence where a small proportion of officers incorrectly edited, in and out, details of their initial report based on the audio after watching the footage. While the authors were careful to describe the limitations of their study and to suggest that further research be conducted to replicate the findings (assigning a set/fixed duration of time for the interaction and increasing the amount of time between the interaction and the report writing), they were able to provide significant results using quantitative data analysis to recommend that offices write an initial report based on their memory of the event, then watch their footage and be allowed to make amendments. Initial results found that this would improve the accuracy of the report writing and a deeper analysis found that this would be especially beneficial to

more experienced officers (time within the organisation). The proviso and recommendation being that officers must note where amendments were made after the footage was viewed, as what was initially recalled and what was later remembered with the aid of the footage would likely become relevant during trial.

Crucial research which speaks to the quality of evidence produced from chest-mounted cameras was conducted by Uchida et al. (2022). Researchers gathered118 BWV critical incidents recordings (police shootings and use of force) released by American police forces and further subdivided these into 400 segments. Using the technique of Video Data Analysis, their research assessed the quality of the segments, coded and analysed the behaviour of police 'use of force' and citizen resistance. The purpose was to identify whether behavioural changes resulted from being recorded by the BWV device. Using manual coding, they found that 62% of segments had no or almost no obstruction, but that 15% of the segments had 50% or greater obstruction of the camera. A core finding was that for evidentiary purposes, the current placement (chest-mounted) of BWV devices might not be as suitable as commonly assumed.

Uchida et al. (2022) also contained a discussion considering whether releasing footage to the public via platforms, such as YouTube, is beneficial or detrimental for policing and the public. The authors did not settle this question but rather raised concerns about the way in which footage is edited and released, stating that it can unjustifiably bias the assessment of the incident. When discussing the footage which they assessed, they (Uchida et al., 2022: 12) found that it "can suffer from a limited view of BWC, audio problems, and blocked or inadequate view shed as these, in the curated CI [critical incident] videos, appear to be common situations that may lead to difficulties in assembling a coherent account. Furthermore, the issues of who, what, how, and some assessment of the situational contours (mental health call, involvement of alcohol, domestic conflict, crime in progress, etc.) and the ultimate outcome (arrest, injury, fatality) are not typically or easily distillable from BWC in the CI video." This was further reinforced by Murria's (2023) findings regarding 'stop and search' interactions captured by BWV devices. Uchida et al.'s (2022) Video Data Analysis and the findings are significant in tempering the belief that BWV footage can provide an unbiased and comprehensive account of an incident and calls for a more transparent process of editing and releasing footage by police organisations. This is useful to the current research in that it highlights the need to examine the nature and quality of BWV footage when analysing the research data.

2.2.4 On the neglect of materiality

It was previously argued that a social determinist analytical framework might cause researchers to overlook, in theory, the importance materiality of police technology and how 'tilting' in both quantitative RCT research and qualitative sociomaterialist research might, in practice, lead to privileging social arrangements. However, it is possible that there are other factors for neglecting to consider the materiality of police technologies. An article in the field of applied ergonomics might provide clues to a potential explanation. Suss et al. (2018) first discussed their preliminary findings from their assessment of video footage from BWVs mounted in different positions. They later expanded on their research in an article (Suss and Petushek, 2021) published in a French-language journal. They placed BWV devices on both sides of a hat, glasses, shoulders, chest, and on the firearms of officers and had them perform a shooting drill at a stationary target using a handgun, patrol rifle, and shotgun. Each frame of footage produced from each camera was coded to detect the visibility of the target during the drill. What is most salient about the article is that the researchers stated which devices they used and included a limitations section where they discussed the implications of using a relatively older BWV device (Axon Flex I) which had a horizontal lens angle of 75 degrees horizontal. The industry standard had shifted, newer models included a wider lens (120-130 degrees horizontal), and the technology had addressed issues of missing visual information that the researchers were examining. At the time then, the findings were less relevant.

While the researchers were judicious in stating these technical limitations of their findings, it highlights why current and future researchers might be hesitant to follow suit. Specifically, their findings would be tied to the technical/material components of the technology being investigated and this would constitute a potential variable in their findings. Should the technology develop drastically and become antiquated, so too could the research results. Hypothetically, citing an article from 2015-2016 as evidence of one's position or argument might no longer be feasible if it is evident from an 'Apparatus' section of the article that the technology in one's study is different in significant ways. While this is not a defence or justification of neglecting the variable of materiality, it does provide a potential explanation for those researching technology to not want to list the devices being used by their participants. A further explanation is that revealing the device might inadvertently de-anonymise participating organisations. However, given that the vendor landscape has become monopolised, most police organisations procure from a handful of vendors, revealing this information is increasingly unlikely to identify the organisation.

These explanations act in concert with historical developments in police research involving socially deterministic frameworks (for example Manning, 2008) and research in practice (based on the researcher's viewpoint/tendency) tilting towards privileging the social arrangements to undermine material considerations. Except for specific studies or unless some element of the design or functionality is sufficiently significant that researchers cannot ignore it (such as loose cords, poor design leading to accidentally (de)activating devices, livestreaming, and facial recognition technology) there is a critical gap in the research which this research aims to address.

2.3 Capturing delayed impact(s) of BWV technology

Two of the key variations across police technology adoption studies have been the duration of data gathering (mostly a quantitative consideration) and the respective stage of BWV systems implementation at the research site(s). For example, some have selected sites with recent implementation, others sought to examine organisations before, during, and after BWV implementation. Specifically, Koen and Willis (2020) state that their findings would have been more valid had the data been collected before and after the implementation of BWVs. Gaub et al. (2016) had in fact attempted this, conducting officer perception surveys a few weeks before and after the deployment of BWVs. While the pre- and post-implementation design might capture the greatest amount of change, their timeline (of weeks after implementation) is questionable. They have neglected to account for an idiosyncrasy belonging to technological implementation, namely the potential occurrence of a 'time lag' between implementation of a technology and its effect.

While most of the studies on time lag focus on productivity of information technology and computerization, their findings indicate that improvements and structural changes of organisations and economies occur over longer periods of time (Brynjolfsson and Hitt, 2003). In their study of information technology adoption in health care systems, Devaraj and Kohli (2000) propose several longitudinal variables – spanning months up to four years – to measure the potential lag effects. This time lag could arise due to new systems offsetting early predicted gains by causing initial learning and troubleshooting issues, with processes becoming more streamlined over time and users taking time to become familiar and proficient with the technology. Initially named the 'productivity paradox of information technology' (Brynjolfsson, 1993), it raises the potential for new technology to produce no, or even negative, yields when measuring its effectiveness shortly after implementation. Koper et al. (2014: 215) reflect on this by claiming that police have difficulty during the

early stages of technology, noting that "further, desired effects from technology (like improving clearance rates and reducing crime) may take considerable time to materialize, if they do at all, as agencies adapt to new technologies and refine their uses over time." Consequently, the research conducted by Gaub et al. (2016) might have benefited from a follow up survey a year after implementation. Such a follow-up could have identified if negative perceptions were a reflex reaction to implementation issues. Thus, perceptions might have levelled out over time as issues which trigger frustration and other negative emotions become resolved.

Koen (2016) had taken the lag effect into consideration in their methodology, expressing that their initial goal for selecting a site would be one which had been using BWVs for more than one year. For Koen, this was preferable to a site that had recently implemented BWVs and might still be experiencing 'teething problems', where the initial implementation challenges had not yet been addressed. The researcher settled on a site which had been using them for three years and they felt that three years was apt since officers would still have remembered what the organisation was like prior to the adoption of BWVs. Sutherland et al. (2017) produced findings which indicate that BWVs have a persistence effect on policing change, as opposed to a fade out effect. This is based on a three-year follow up from their original Rialto Experiment study as described earlier (Ariel et al., 2015). The effects appeared to have lasted 4 years since implementation. What this indicates is that the BWV effects on certain types of police behaviour (use of force and citizen complaints) persist over time. While this does not necessarily translate to effects on police organisations, it might indicate general habituation to BWV technology. Accordingly, there is cursory evidence in support of the belief that post-implementation research would not need to be tested within a matter of weeks for fear of the effects dissipating.

Peelford Constabulary, the main participating police organisation had been using BWV technology for five years and had significantly modified the technology use, policy, and systems configurations over this period. While there may be value in seeing the immediate changes to an organisation and its behaviour during technology adoption, there is value in researching organisations who are 'mature' users in the stages of late development. Such an organisation, if the correct insiders are interviewed, could provide key insight into their early-day challenges, their reasons for changing policy (lessons learnt from mistakes), to understand how and why the technology is expanding, as well as potentially where their thoughts on the trajectory of technological development and what they foresee best practice

in the region to be heading towards. This research attempts to gather and examine this very information and to triangulate it with secondary sources where possible.

2.4 Theoretical engagement with core policing themes

2.4.1 BWV technology and physical protection

As shown in Section 2.2.1, many studies have examined the behavioural impacts of BWV technology on police activities, including police 'use of force' and assaults against officers. One of the underlying hypotheses being tested was whether BWV technology possessed a 'deterrent effect' on the public and the police. The following section reviews the literature concerning the deterrent effect, on members of the public specifically. It forms the basis of the discussions in the second findings chapter (Chapter Six: Physical Protection) regarding police use of BWV technology to protect themselves and how this in-turn shapes the development of BWV technology.

Deterrence theory

While the first RCT, the Rialto Experiment, presented findings which showed a reduction of assaults against officers wearing BWV devices, it should be noted that there is contradictory research on the topic. A review of BWV technology research was conducted by Lum et al. (2019). One of their findings on citizen compliance with police (Lum et al. 2019: 105) found contradictory results, with some studies finding that officers wearing BWV devices were more likely to be assaulted than their counterparts who were not assigned devices to wear. In Lum et al. (2020) the authors specifically examined all RCTs which qualified for analysis (n=30) and noted that 15 of them measured assault against officers or arrest resistance. Two of which were specifically conducted in the UK, ten were anonymous sites, and the rest (bar one from Uruguay) were conducted in the US. From these studies, they found that there was a 15.9% relative increase in assaults or resistance against those police officers wearing BWV devices. It is important to note however, that they conclude that "the finding is not statistically significant, indicating a lack of evidence supporting the beneficial (or detrimental) effects of BWCs on this outcome. The confidence interval is wide, and the distribution is heterogeneous, indicating uncertainty in the effect of BWCs on this outcome" (Lum et al., 2020: 22). From the outset of the systematic review, the authors indicate that BWV devices "do not seem to affect other police and citizen behaviors in a consistent manner" (Lum et al., 2020: 1).

Research conducted in Germany provides insight into the inconsistent results. Kruse et al.'s (2023) results from six German police departments examining officer's perceptions on the aggressiveness and cooperation of subjects being recorded revealed several important findings. The first is that perceived aggressiveness of the subject decreased from the initiation of recording compared to the recording simply being announced. While they found that the presence of the device alone has a small deescalating effect, it was the activation of the recording which had the greatest impact on perceived aggressiveness. An important finding is that those under the influence of alcohol and in acute mental distress were not positively affected by the presence and recording of BWV devices. They were likely to be both more aggressive and less cooperative, and the authors argue this adds evidence to the impact's explanation of self-awareness and rational choice theory.

Examining their findings (Kruse et al, 2023: 5-9) more closely indicates that the initiation of recording increases aggressiveness of those who were not aggressive to begin with and decreases the aggressiveness of those who are aggressive from the commencement of the interaction. Moreover, it also appears that the presence of the device alone may have a minor deescalating effect for citizens with low levels of aggressiveness, but that the activation of recording is necessary for those who are highly aggressive. From their findings, the device appears to have a flattening effect on perceived aggressiveness - on low-level aggression with its presence, and on higher levels of aggression with its activation. The issue they faced however, is quantifying the degree to which the subject was aware of the device, as this is not known.

There are two key pieces of literature on the topic which attempt to disentangle the differing findings of BWV technology's efficacy on this topic. They both introduce the importance of recording policy and activation compliance. Ariel et al. (2017b) attempts to directly make sense of the empirical knowledge at the time, making it clear that the various research does differ in terms of methodology and rigour. They place much emphasis on RCTs and replication studies. Ariel et al.'s (2017b) article reiterates the importance of the deterrence theory as the underlying mechanism for reducing misconduct and criminal behaviour. They proffer that the most salient factor is the likelihood of apprehension, specifically that the recording of the interaction and the detail by which it captures the incident deters misconduct. They assert then that the effectiveness of the deterrent effect, and thus the reason for varied research findings, is reliant on whether the device is recording, and when. According to the authors, the degree to which officers have discretion when and what to

record (a spectrum from weak to strong) impacts the deterrent effect. Specifically, they found that minimal deterrence is inversely related to strong discretion.

Importantly, the authors note that strong discretion can produce counter-effective results whereby officers begin recording once the interaction escalates and this act further inflames the interaction or potentially 'locks' in a reaction (Ariel et al., 2017b: 11). This explanation suggests that maximum deterrence operates when there is weak discretion, whereby officers record all incidents from the start of the interaction and notify the subject. This explanation may account for variations in findings across studies, as the police organisations under examination likely operated under different recording policies: which types of incidents required recording, when officers were expected to activate the recording, whether subjects needed to be notified, and what exceptions were permitted.

Boivin and colleagues (2022) also attempt to provide an explanation for the variance in research results. While Ariel et al.'s (2017b) explanation introduced the importance of discretion/recording policy, Boivin and colleagues have rightly gone further to introduce activation compliance and the environmental and individual factors affecting this compliance. While an organisation's policy might dictate that they record a particular incident, whether (and when) the device is activated, i.e. compliance, remains a further issue. The authors postulate that the difference in activation policy would account for contradictory results, which agrees with Ariel et al.'s (2017b) explanation.

However, the others continue that procedural justice, not simply the deterrence effect, might also explain why BWV technology impacts police-public interactions. The argument is that citizens are more likely to cooperate and comply as they have expectations that they will be treated more fairly. The authors continue, noting issues with this explanation. Importantly, Kruse et al.'s (2023) findings indicated that the presence and recording of BWV devices decreased the perceived cooperation of citizens by police officers. This further muddies the water of these explanations as the researchers of the German police organisations indicated that the officers have strong discretion (i.e. they had wide discretion to choose what and when to record). Nonetheless, the conclusion of both articles is that activation of the device i.e. whether a recording is made and when is likely the factor behind these differing results of reducing violence against police. Finally, Boivin et al. (2022) identified personal factors such as more experienced and female officers are less likely to activate their devices for the same incident. This seemingly complicates research findings since the composition of

personnel might also be an important variable in the effectiveness of devices in protecting police officers.

There are some conflicts in Kruse et al.'s (2023) findings and the explanation offered by Ariel et al. (2017b). Their findings, based on German police officers with strong discretion, indicated that perceived aggressiveness did decrease despite Ariel et al.'s assertion that strong discretion is inversely related to strong deterrence and accordingly, less effective in dissuading misconduct and illegal activity. Secondly, Ariel and colleagues warned that activation once the interaction had started escalated could provoke or 'lock' in a heated response, yet their findings indicated that activation at stages where aggressiveness was seen to be heightened had the highest impact of decreasing aggressiveness.

These conflicts indicate that there are unknown variables at work - potentially cultural differences between members of public in the US and Germany which affect public-police interactions. Kruse et al. (2023: 11) note this succinctly, by stating that:

> "while it seems clear that a multitude of individual, situational, and societal factors can influence any de-escalating effects of BWCs, it is equally clear that combinatorial effects of such factors are unlikely to be fully understood within the context of research that is restricted to an area with specific constraints. Accordingly, future progress may ultimately depend on coordinated multi-site national or even international studies. The perspective is that these can provide far bigger datasets under more variable context conditions, thus permitting more precise modelling of the determinants of BWC effects."

Nonetheless, the underlying agreement between these articles is that the pacification/de-escalation/civilizing effect of the camera is most effective when activated; that the awareness of the activation is needed; but that this is a challenge to measure. There is evidently a belief that the device offers protection, but when and how is currently not best understood.

Finally, Assaraf et al.'s (2024) article adds further complexity to explanations concerning the deterrent effect of BWV devices. They found that officers wearing devices which had a yellow sticker on the device (indicating that it captures audio and visual information) experienced more public assault than those officers who wore a BWV device without the yellow sticker. While Flight's (2019b) paper first theorised that the visibility of the BWV device would impact the deterrent effect, Assaraf and colleagues' study is the first to examine the effect of specific physical design components on the deterrent effect. Based on a review of the literature, there are many variables impacting the deterrent effect and the materiality of BWV technology is one which has only recently begun to be explored in the

literature. Chapter Six attempts to address the aforementioned gaps by bringing the variables of technological materiality to the fore.

2.4.2 BWV technology and police transparency and accountability

One way of examining and describing organisational change resulting from BWV technology adoption is to identify changes to the internal arrangements within the organisational such as control mechanisms, policy, and diffusion of technology across departments. In Chapter Five, this research explores these very changes centring around the themes of transparency and accountability. The discussion below outlines the various discussions, concepts, and research related to police technology adoption and the themes of transparency and accountability.

Clarifying terms

Transparency and accountability are interdependent concepts; for either to be effective or meaningful in practice, both must be present. Speaking of them within the context of a democratic system, almost implied that they are both present but for the sake of practical analysis they must be examined individually. One can imagine a hypothetical scenario where citizens within a non-democratic country might become aware of state actions and decision-making, which run counter to public interest, but are excluded from any mechanisms which might hold the state accountable and bring their actions and decisions into alignment with public interest. Walsh and Conway (2011) note that there has been rapid reform in the realm of transparency and police governance (a term for broader accountability mechanisms) over the past fifty years, but that this has also been accompanied by rapid growth in policing powers and technology which although meant to protect individuals, can result in the opposite. Whether the police powers and technology protect, or abuse individuals is, according to Walsh and Conway (2011, 63), determined by "the strength and deployment of governance and accountability mechanisms."

The overlap of transparency and accountability is illustrated by definitions which have been offered in the literature as well as in practice. For instance, Argyrous (2012: 459) states that "a transparent process is one that is open to scrutiny." Ericson (1995: 137) captures this when introducing 'account ability' which they describe as "the capacity to provide a record of activities that explains them in a credible manner." This becomes evident in UK policing where, under the 'Transparent' section of their Stop and Search Authorise Professional

Practice (APP), the College of Police (CoP, 2016) state that "transparency requires data to be of sufficient quality to permit analysis of trends or patterns. Individual encounters must be documented in sufficient detail so that they can be reviewed to assess whether or not the [stop and search] powers are being used in the right circumstances and for the right reasons."

While it is a broad definition which covers a range of articles within a journal's special issue entitled 'The dynamics and police governance and accountability', Walsh and Conway (2011: 62) define police accountability as "encompass[ing] all procedures and methods which can be deployed to render an individual officer, and the police authority as [a] whole, answerable to another person or body whether that person or body is located inside or outside the police force in question." Although this offers a practical definition for understanding accountability, further literature helps clarify important distinctions. Bovens et al. (2014) is helpful in this regard, given that they create a distinction between the more normative concept of accountability as a virtue and the more descriptive concept of accountability as a mechanism. This conceptual distinction helps us move away from an aspirational discussion embodied by Peel's principle of 'policing by consent' to a more pragmatic analysis of police accountability in England and Wales.

Guzik (2020) brings together useful analytic tools for examining police accountability. Specifically, they introduce three components of accountability which are pivotal to democratic government. Borrowed from the works of Bovens et al. (2014: 9), these include 'relational', "linking to those who owe an account or explanation (agents or actors) and those who are owed that account (principals or forums). Second, it is interrogative, providing the 'the possibility for the forum to interrogate the actor and to question the adequacy of the explanation or the legitimacy of the conduct.' Third, it is 'consequential', in that 'the forum may pass judgment on the conduct of the actor'" (Guzik, 2020: 67). Guzik (2020) includes further concepts which are used in Chapter Five and include the distinction between internal accountability and external accountability (based on Stenning, 1995); individual accountability and corporate (organisational) accountability and whether accountability is voluntary or mandatory (based on Bovens et al., 2014); and the concepts of 'answerability' and 'responsiveness' (based on Uhr, 2001).

As for transparency, Argyrous (2012: 459) references the Productivity Commission (2010: 17.16) who find that "transparency is especially important where governments face sectoral pressures and other potential conflicts of interest that could lead to policies and regulations that are not always in the broader public interest." Further, they state that "transparency

deters governments from being 'sloppy' about implementing best practice regulatory processes" (Argyrous, 2012: 459). This further implies that accountability can function at the level of individual actions (which might not be in line with policy or regulation i.e. non-compliance) as well as instances where policy is not in line with public interest. Both become important in Chapter Five (Section 5.3.2). The definitions and conceptual distinctions covered above allow for analytic and linguistic specificity during the discussion of Chapter Five and the findings presented, without which the discussion could not move beyond broad-stroke statements or findings about whether BWV technology improves transparency and accountability of policing.

Conclusion

As most studies of relevance focused on *police activities* and the *effectiveness of BWV devices*, much room remains for research on the topic of organisational change from a socio-technical perspective. The various gaps in the criminological literature point towards gaps in identifying organisational and regional change, such as structure and policy, that can be ascertained through interviews with experienced officers and decision-makers. Given that most BWV technology studies were conducted in the US, where policing is historically and practically quite different from the UK, illustrates the need for research on change within the region. This has been addressed more recently, with much of the qualitative research engaged with being conducted in the UK. In many ways, this research builds upon and reinforces the findings of those studies.

The greatest gaps, however, include an under analysis of materiality in practice and using methodologies which can incorporate multidisciplinary insight, capture use and change over time, as well as engage in speculative thinking of potential implications. Given that the research objectives aim to identify impact from BWV technology, examine the technology itself (product) and its use (process), the themes of transparency and accountability (public considerations/benefits) and protection (operational considerations/benefits) were selected from the interview data and their theoretical and conceptual foundations have been covered in this chapter. It is imperative, therefore, to ensure that discussions concerning these deeply criminological themes give sufficient consideration, in practice, to the materiality of BWV technology as a technical system. Accordingly, the variables relating to materiality (design and functionality) are addressed wherever relevant in the discussions which follow in their respective chapters.

Chapter Three: Research Design and Methods

Introduction

This chapter covers the various research design elements employed. It describes the data collection and analysis processes, engages with supporting literature, and outlines the overarching methodology and principal elements which informed the decision-making. While it details the methodological and analytic frameworks influencing the loci and foci of the research, it also provides granular detail on the steps taken and decisions made which shaped the research. This chapter describes the selection of participants and the access issues which fundamentally shaped what data was sourced and how it was collected. These sections are candid about setbacks encountered and the limitations of the research. The chapter concludes by presenting the impact of the researcher, outlining their positionality.

3.1 Research design

The aim of this research is to describe the impacts of body-worn video (BWV) technology on policing in England and Wales as well as to explore and explain the ways in which police and BWV technology shape one another through use, giving equal consideration to the materiality of the technology. Accordingly, the research was designed to meet these aims. This section provides an overview of the methodology, which determined what and how data was collected and then how it was analysed and presented.

The previous chapter illustrated how social arrangements and technical systems shape one another, revealing that theoretical frameworks can privilege one over the other and thereby produce certain insights while obscuring others. The iterative nature of academic research can reinforce these trajectories as scholars build upon earlier studies and inherited approaches within their disciplines. Just as theoretical frameworks can produce conceptual gaps, research designs can yield methodological ones. For example, while sociomaterial research seeks to redress the theoretical privileging of the social, its emphasis on the process of technology use introduces a methodological gap. This section explains how the current research adopts a specific approach to address this gap.

3.1.1 The dual view of technology

This research adopts the dual view of technology methodological approach which was initially introduced by Orlikowski (1992) as a theoretical viewpoint for understanding technical systems within organisations as both a *product* (technology as artefact) and a *process* (technology-in-practice). According to Orlikowski (1992: 11), "the duality of technology identifies prior views of technology--as either objective force or as socially constructed product--as a false dichotomy. Technology is the product of human action, while it also assumes structural properties. That is, technology is physically constructed by actors working in a given social context, and technology is socially constructed by actors through the different meanings they attach to it and the various features they emphasize and use."

Roberts and Grabowski (1999: 159) expand upon this dual view of technology, adapting it into a methodological approach by outlining two distinctive foci when examining technology within an organisation, namely the organisational impact and the use of the technology, stating that:

> "Exploration of technology characteristics and challenges develops descriptive pictures of what technology is, how it grew, and its role in organizations. In contrast, relational approaches focus on relationships between technology and organizations, and incorporate problems of assessment because it is difficult to assess fluid concepts and relationships.
>
> This chapter adopts the dual challenge of providing a descriptive view of technology and organizations followed by a relational examination of technology and organization structure.
>
> The descriptive picture is an important first step that sets the context for the rest of the chapter. The relational view develops for us the continuous, changing, and interactive nature of technology and organizations, a perspective both related to and distinct from the impacts technology has on organizations."

The research approach outlined by Roberts and Grabowski (1999) suggests that researchers examine both the impact (the phenomenon) and the relationship between the organisation and the technology. This recommendation arose in response to research increasingly using relational approaches (the agential realism underpinning sociomateriality meets this criteria) which were tending to focus on the process of technology use at the expense of the impact of technology. As Orlikowski and Scott (2008: 451) summarised "writing almost 10 years later, Roberts and Grabowski [1999] suggest that the organization literature offers two distinct perspectives on technology: (i) *a descriptive view* (which focuses on types and roles of technology within organizations), and (ii) *a relational view* (which focuses on the

relations between technology and structure). They argue that these two views, on their own, are incomplete, and thus need to be integrated so as to account for the nature and development of technology, and for its relations with organizations, *particularly as these evolve over time* with the changes brought on by the post-industrial age." (emphasis added)

There is an allure to sociomaterial research given its ability to describe complex, fluid, and emergent interactions (Fox and Alldred, 2014) between users and technology, and can be used to address a historical neglect of the materiality of technology (Sesay et al., 2017). Further, theorists claim that it can bypass dualisms and epistemological issues surrounding researcher positionality (Fox and Alldred, 2016). However, the conceptual language used is increasingly opaque to anyone other than sociomaterial scholars and some studies have overly fixated on the ontology (theory-building) instead of the phenomenon under study, in what Holz (2021: 257) labels 'theoretical centrifugation'. These issues are wittingly jested at by Kautz and Jensen (2013). In all seriousness, while the approach thrives at capturing emergent and fluid interactions (immediate and micro interactions), it is far less suitable at analysing and describing broad changes over time i.e. police organisations and policing within a region, more generally (longitudinal and macro interactions). Thus, despite its capacity to grant equal consideration to materiality in theory and practice, it is not in alignment with the research aims detailed in Chapter One.

Instead, this research adopts Roberts and Grabowski's (1999) foci of impact and the use of the technology, while also retaining Orlikowski's (1992) focus on the technology as a product (design and construction) – and extending it to include how the product is marketed by vendors. Accordingly, there are three key foci that emerge as relevant to the research - as enumerated and described in further detail below.

3.1.2 Applying the methodological approach

Given the criticism of technology use in Organization Studies involving a relational (process-based) ontology as pre-disposed to focusing on process (technology use) and ignoring the impact (a temporal approach), part of the design of the research is the aim to examine the impact on police organisations over time. Therefore, the methodology of this research focuses on three key aspects, firstly, the impact of BWV technology; secondly, BWV technology as a product; and thirdly, police use of BWV technology.

1) The impact

There are several components which needed to be examined to capture the impact of the body-worn video technology on policing in England and Wales. These included examining the regional and historical context in which police organisations are operating and how these might have changed over time since BWV technology was first trialled in 2005. Accordingly, a context and background chapter has been provided. A further way to identify changes resulting from BWV technology adoption is to examine policy changes over time, relating to the police organisations themselves and the region more broadly given that police organisations in the region, despite having regional laws and guidance, enjoy operational discretion.

To examine and make sense of the change within the organisation and policing in the region, it was essential to identify insiders who were able to describe changes within the organisation. Of more import, was varied levels within the organisation, from users of the technology to those who shape internal policy and potentially shape region guidance documents. It was also important to include the perspective of regulators working on police technologies. Given that the impact was not solely on the organisation and policing, but also the public who are impacted, it was important to include insiders who worked in the civil society (third sector/non-government sector) who represent, and work towards, the interests of the public. Given that the impact on policing and society can be reflected within narratives, examining impact includes examining mainstream media and how those narratives of policing technology adoption have potentially shifted over time.

As highlighted by Roberts and Grabowski (1999), this is largely a descriptive exercise of capturing change over time within the organisation but expanded, where possible, to capture shifts in policing within the region of England and Wales, more broadly. This examination is predominantly contained in Chapter Five.

2) The technical artefact

To examine BWV technology as a designed and constructed product, there are several sources of potential information which might provide insight into what the technology can achieve, how it functions as part of a police system, how the technology has been designed and constructed, how this has changed over time, and why these changes might have occurred.

The first is finding insiders within the police organisation who are responsible for running and maintaining the technical system and who acquire and service the devices. Another is to approach the vendors who design and construct the technology and ask someone who is familiar with the design processes how they perceive the technology, its role and need within policing, the design considerations, and potentially how they see technology impacting or addressing police needs over time. Information can also be sought from technical documents (such as brochures and user manuals) and vendor websites detailing the technical systems under examination, potentially revealing how the technology has developed over time. Vendor channels on YouTube are also useful in providing technical details of the product and can even demonstrate its functionality. All of this allows for an examination of the technology as a product (material design and technical functionality), how it has changed and is changing over time, as well as its *intended* role or purpose within policing.

Literature on the product such as that from design engineering and applied ergonomics are also useful in examining the issues related to the technology as a product given that these disciplines are responsible for examining the 'human fit' element i.e. whether the design and functionality of the technology meets the needs or wants of the intended user(s).

While elements of technology as a product are alluded to throughout the findings, the bulk of this discussion is contained within the epistemic chapter (Chapter Seven) which proffers a conceptual toolkit for analysing police technology adoption.

3) The relationship between the organisation and the technology

Examining police uses of BWV technology requires that one acquire and analyse data sourced from those who use different components of the technical system (detailed in the next chapter). For example, detectives who use BWV footage for information gathering and evidence, professional development who assess the conduct of the officer recording the interaction, those who have experience establishing and facilitating scrutiny panels (assessment of footage by those outside of the police organisation), and frontline officers who use the technology as part of their daily operations. It is also crucial to get data from those who create policy dictating how the technology must be used within these various units of the police organisation. Examining the interaction process provides information, from the data gathered, about use cases and their potential implications. Examining the various ways in which police use and interact with BWV technology also allows for a discussion on the ways in which the police and the technology shape one another. This third focus of the

research (technology as a process) is predominantly explored in Chapter Six, which examines the ways in which the operational considerations and personal needs of police officers (as users) tends to shape the way BWV technology is selected and used (by police organisations and their members) and developed and advertised (by vendors).

Given the objectives of the research to examine the impact of technology adoption, the technology itself, and the process by which it is used, the subsequent section explains who was included in the data gathering and analysis phases to ensure that sufficient information was available to meet the research aims.

3.2. Participant selection and access

This section details the participant selection process as well as the access negotiation process, with their key challenges and outcomes. What emerges is a series of historic and structural variables, specific to policing in the region intersecting with the positionality of the researcher. All names of organisations, provided for ease of reference, are fictious.

3.2.1 Initial plan

The research objective has been to examine the impact of police technology adoption and how police and technology shape each other. This meant that the research primarily involve gathering data from a police organisation in the region, examining the changes within the organisations and looking at how the technology is used by their members, and potentially how the members were reacting to the impact of the technology. Accordingly, it was imperative to secure access to a police organisation to gather insider information on their technology implementation.

As was stated in the introduction chapter (Section 1.4.1), the specific technology selected for examination to identify potential impacts was BWV technology given that the UK was the first region to trial the technology in 2005 and it had since been broadly adopted across all organisations in England and Wales. Its use has diffused within and across organisations. It is also a technology that is fast evolving in terms of both material design (physical and digital properties such as camera lens, recording quality, and physical shape) and technical functionalities (capabilities such as livestreaming, algorithmic integration, and interoperability). Accordingly, it is a technology that is thriving within public policing and serves as a suitable technology to achieve the research aims.

A police organisation was identified and selected for convenience (conducting field work) and strategic purposes. Strategically, there were informal, interpersonal connections between one of the research supervisors and the organisation, which could be used to facilitate access negotiations, as opposed to approaching an organisation 'cold'. Extensive access negotiations were had, and access was subsequently granted. However, shortly before the final commencement meeting to discuss the logistics and final arrangements, the police organisation stated that they were no longer able to participate. No formal reason was provided. Alternative technologies were proposed by the research team to the police organisation, but none were accepted. Accordingly, participation had to be reconsidered, and new participants sought. Although unexpected, access issues of this nature with public police organisations are well-known and documented in criminological research (Fox and Lundman, 1974; Lundman and Fox, 1978; Holdaway, 1980; Demarée et al., 2013; Rojek et al., 2014; and Mac Giollabhuí et al, 2016).

3.2.2 Participating organisations

As the researcher had already completed extensive reading on BWV technology and pertinent literature as well as the popularity of the technology amongst UK police, the technology was retained. However, the decision was made to consider and canvas the broader regional and 'policing' (exploring plurality) landscape for other organisations, including private security/sector and emergency services, to replace the original organisation as research participants. The net was cast wide with several Constabularies in England being contacted directly.

Most police organisations in England did not reply to invitations to participate, while others declined. The vital breakthrough was when one organisation (Bobbyham Constabulary – a pseudonym) offered to have an informal meeting to discuss their use of BWV technology. The meeting took place online and the contact offered to introduce the researcher to a senior member within a different policing organisation (Peelford Constabulary – a pseudonym), who they thought would likely be interested in participating. This proved to be a key connection as the referral was head of the BWV program at Peelford and they were interested in the research project.

While this was an important police organisation to be researching given their extensive use of BWV technology and their role within the wider regional policing context, efforts continued to secure access with other organisations knowing that it would be too much to

request a single organisation to participate in both qualitative and quantitative data generation (which was the initial plan). Moreover, it was considered important to attempt to secure several backup participating organisations should access erode again. While an interview was conducted with an officer from Bobbyham Constabulary, it is important to note that these are glimpses of an organisation, and the participant agreed to be interviewed with the proviso that it did not represent their organisation actively participating.

As aforementioned, given that impact was being examined and that the current use of BWV technology is primarily public-facing, it was relevant to include third-sector organisations as they could provide insight into the impact on the public and their interests. Many third-sector organisations (TSOs) were contacted about participating in the research, mostly through their enquiries email addresses or website portals. Numerous emails were aimed at the executive level of the TSOs if their emails could be found online. One head of an organisation (Surveillance Check – a pseudonym) replied, stating that they would arrange for someone within their organisation to participate and included the email addresses of other executives at other TSOs, which they recommended be included in the research. Unfortunately, none of the other heads of their organisations agreed to participate. Based on their study of human trafficking, Segrave and Milivojevic (2019) describe the challenge of gaining access to TSOs given their resource limitations. As they include in their book chapter, it is as relevant to indicate who did not participate as it is who did, to indicate to readers that limitations due to the scope of the actual research was not solely due to research design, but rather partly due to engagement being refused (Segrave and Milivojevic, 2019: 353). However, a senior member of Surveillance Check participated in an interview. While the organisation did not focus on BWV technology specifically, the mandate of the organisation involved state institutions' use of surveillance technologies and thus, they were able to speak to the impacts and challenges which these technologies present to the public interest.

Given that technology as a product is being examined, it was necessary to include BWV technology vendors who would be able to provide insight into the issues related to the product itself as well as its technical role within policing. BWV technology vendors were approached through enquiry emails, targeted emails if addresses could be found online, as well as LinkedIn Mail, specifically towards their senior members. One of the major BWV vendors in the UK did agree to participate and they assigned one of their more technical staff members, who had a background in policing. This was fortuitous as they were able to provide insight into overlapping issues concerning design and functionality (technical)

considerations and the role of BWV technology within policing (operational). At the start of the online interview, the participant made clear that, for legal reasons, their responses do not represent those of their organisation. This did not weaken the data generated as it provided insight into core, insider considerations even if they assert that it legally does not represent the brand's corporate position. In addition, the participant made clear that there was concern within the team of the organisation that my introductory email and participation request might have been a spear-phishing[1] attempt to gain access to their network, as part of corporate espionage. This might explain the lack of responses from other vendors to the researcher's introductory email.

3.2.3 'Second gate' access: Field work and securing interviews with police officers

Fox and Lundman (1974) describe two gates when navigating access with police organisations. The first gate are those senior authorities of the organisation, granting access to it. The second are those intended subjects, and securing actual participation with individuals. Given the access issues, Peelford Constabulary became the primary organisation for primary data generation. While other policing organisations claimed that vetting was required and implied that this was an externally mandated requirement, Peelford had not insisted on vetting.

While the initial plan was to conduct interviews in person, an ethics amendment was submitted once further access issues began to emerge and the decision was made to reduce the number of barriers to interviewing participants. During field work at Peelford Constabulary, field observation had been planned as well as a general call for interviews at the organisation. However, when the researcher arrived in England for a week of observations and interviews, they were informed that there was an emergency event which the organisation needed to divert resources to and that they would only be allowed to be at the organisation for two days. Much of that time was spent in-person meeting various people and introducing the research to them, requesting online interviews with them. Despite the setback, this was largely successful as the researcher was introduced to investigators, professional development, ICT, and frontline officers. Accordingly, online interviews were

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[1] Kaspersky's website defines spear-phishing as 'highly personalized cyberattacks that target specific individuals or companies.' KASPERSKY. no date. *What is spear phishing?* [Online]. Available: https://www.kaspersky.co.uk/resource-center/definitions/spear-phishing [Accessed 20 June 2024].

secured with a range of officers from various departments working with BWV technology. The remainder of the time at the organisation was spent on two shifts with frontline response officers.

3.2.4 Non-participating organisations

Segrave and Milivojevic (2019) emphasised the importance of discussing the participation which was refused during the research process. As aforementioned, after having received cancellation from the initial police organisation, the net was cast wide to find as many willing participating organisations as possible. One of the researcher's supervisors had a connection with a member of a specialised policing organisation who was interested in participating as they were preparing to transition to a new BWV technology vendor and system. This was set to generate data regarding policing organisations as they transition their systems and to be able to provide insight into officer's perceptions of working with different technical systems. There were significant delays to clear the vetting process, but access was officially approved. The ethics application process was completed with this organisation in mind. However, when they were contacted to discuss the logistics of conducting the research, they did not reply. Several emails were sent to various members of the organisation, none of which garnered a reply. It was almost two years after access was originally granted that a new liaison replied to a follow-up email and met with the researcher online to explain why (unofficially) field research was not supported even after official access had been granted. This aligns with Fox and Lundman's (1974) article which argues that there are two gates that a researcher needs to clear namely, that of the senior officials/decision-makers and physical access to participants. Accordingly, one can gain permission to access an organisation, but without logistical support and buy-in from participants in the field, there is no real access into the organisation.

An additional Police Constabulary in England was approached to participate in the research. The head of their BWV platform and the head of their ICT were interested in the project. However, the researcher needed to be vetted according to their existing security policy, which included a requirement that researchers must have lived in the United Kingdom for a total of three years - which had not been met at the time. While attempts were made to bypass this by creating a Memorandum of Understanding or have one of the researcher's supervisors be regarded as the Primary Investigator and complete the vetting process instead, these alternatives were not accepted. The issue was escalated within the organisation and after almost a year of contestation, the organisation responded that an attempt to negotiate access

through an agreement should be made, but the relationship had deteriorated during the appeal process and none of the liaisons replied to subsequent emails requesting to negotiate alternative agreements.

3.3 Methods

This section covers the two primary sources by which data was generated as well as the secondary sources collected for data gathering.

3.3.1 Participant observation

Participant observation[1] involved the study of police officers in their natural environment to learn about them and their everyday work (Bows, 2019) as well as their use of the technology. It allowed the researcher to make sense of how the participants make sense of the experiences in their everyday life (Ley, 1992), in this case the ways in which they use BWV technology, make sense of it, and potentially how it impacts their interactions with the public. More importantly however, participant observation in combination with interviews allowed the researcher to identify what police do as well as what they say they do. As Demarée et al. (2013: 106) phrase it, "participant observation is considered a valuable way of doing social research because it allows examining both what people say and what they do; a presumed causal relation heavily debated in the police research field." Field observation of operator's use of the BWV would also gather information about the variables involved in deciding when to turn on the cameras and potentially identify consequences of certain uses.

The field observation was conducted in England at Peelford Constabulary for a week of field work. The first day of fieldwork involved meeting the research liaison and discussing the logistics. The researcher was also given a tour of the police organisation, including the different departments and the 'back-of-house' room containing the BWV devices, docking stations, and the computers connecting them to the cloud-based servers. The researcher was then introduced to the team of frontline officers and was assigned to a 'double-crewed' unit (two police officers).

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[1] The field observation proforma used is attached as Appendix F.

The researcher attended two shifts; one a day shift and the other was a night shift on what is a 'student party night' in the area. Despite it being a student night, these shifts occurred during the (work) week. The end of the night shift involved the officers returning to the station after they had attended to all their planned/assigned in-field assignments to complete their administrative tasks ('paperwork'). Accordingly, the researcher left at approximately 3am instead of at 5am (when the shift was set to end).

Environments housing and hosting police technology

During the planning stage of this research, the researcher had not foreseen the possibility that they would be shown the backroom for the BWV devices and docking stations and further, that what they saw in the room would be worth discussing in the findings. Some things were observed which would have been valuable for the research, but this did not emerge in the interview or field observation data. Most of the photos of docking stations provided online indicated that they were in the main areas and as such, the researcher had not realised that they were housed in a secure room with their own technical issues. Moreover, the researcher was given a tour of the ICT where faulty devices are sent for dispatch to the vendor and the 'pool' (excess devices to replace faulty ones) managed. Much information was shared about the technical details of the devices during this session. To capture some of this lost information, an interview was conducted with the head of the ICT department to discuss these issues.

Accordingly, a valuable lesson is to the traditional scope of field observation to include the physical and digital environment hosting, managing, fixing, and assigning the technology as well as potentially arranging for a 'digital tour' of the system itself as part of data collection. It emerged much later in the research process, that BWV as a technology extends beyond the device itself, including the data management system, footage, and peripherals. Accordingly, the lesson learnt was not to assume anything about the layout and environment of the technical system nor to limit the participant observation to only 'in the field' incidents but also to potentially discuss access to the environmental space in which the technology is housed. This relates to the work of Mardones-Bravo (2022) regarding online research in qualitative criminology. As researchers are adapting to technological development, so too is it essential to reconsider the 'environment' of technical systems as both inhabiting their own online and physical spaces for research ethics application purposes.

3.3.2 Interviews

As a qualitative research method, interviewing can be used to acquire in-depth, 'rich' data on the research topic (Bows, 2019; Polit and Beck, 2010). Semi-structured interviews were used since they can provide information about participant's experiences and the meanings embedded within (Bows, 2019). They are also useful for allowing the researcher to probe through follow-up questions (Noaks and Wincup, 2004). A document containing themes to be covered during the interviews was created and cleared during the ethics application process.[1]

Conducting the interviews

The initial ethics application requested authorisation to conduct in-person interviews with participants. However, after the main access issues emerged, an amendment was submitted which requested for authorisation to be extended to online interviews, which were conducted via Zoom. Online interviews are one of the online methods in qualitative criminology covered by Mardones-Bravo (2022: 85), who states that these have "developed in the evolving advancement of technology and adaption to global events [COVID-19]." One benefit of online interviews flagged by Mardones-Bravo (2022) is that they are valuable when dealing with participants with busy schedules. This arose during this research involving a frontline police officer, who had not responded to an interview request for weeks, who suddenly emailed that they could participate in the interview that same day – this was possible despite the short notice but would not have been possible if it were required to be in-person as the researcher was in a different country.

Concerning the online interviews, the recording of the interview was saved unto the cloud storage. Unlike MS Teams, Zoom allows for the splitting of the video and audio into separate files. The video file was deleted (reducing the potential for participants to be identified if there was a data breach) and the audio was used for the purposes of transcription. Once the transcription was processed (anonymised) and the research completed, the audio file was also deleted. Only the anonymized transcription was retained.

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[1] Interview themes are attached as Appendix E.

Selection of participants

As aforementioned, it was imperative to secure participation from a range of organisations involved in police technology adoption. This is necessary to be able to piece together the puzzle of police technology adoption given that it involves private companies designing and constructing the technology, the police who adopt and use the technology and are thus, impacted by it, and the public who are also impacted by it. The aim of qualitative research is to gain the perspectives of those being studied (Bryman, 1998). Accordingly, police organisations were approached, third sector organisations were approached to gather data on the public impacts and interests, and vendors were approached to gather data on the design considerations and relationship with the police in shaping the technology to their needs, since they are the customers. As Bryman (1984: 78) posited, interviewing, as a method, allows researchers to gain an 'inside view'.

As technology use varies across police departments, each with their own respective needs and functions, and that senior members shape internal policy and use, it was necessary to interview members from these different departments and members at different levels of hierarchy within organisation, including a senior member of the police organisation. This is consistent with Bryman (1988: 61) who cites Woods' (1979) research, which paid attention to the phenomenon of a diversity of perspectives amongst groupings, particularly that the participants had differing ways of making sense of the institution and their role inside of it. Westmarland (2008) speaks to a diversity of 'cultures' between ranks and departments within a police organisation. Given the range of participants interviewed in this research, it is understandable why the interview data was able to reveal much about the various aspects of BWV technology adoption and its impacts. It is the nature (quality) of the participants as opposed to the quantity which provided a rich source of insider information about BWV technology and its impact in the organisation and the region, more generally.

The table below represents those who participated in the research and their general position or nature of work. All names of organisations are fictious. Research 'participant' was selected as the term given that they participated in the knowledge production of this research.

TABLE 2 INTERVIEW PARTICIPANTS

Participant	Position and nature of role	Organisation
1	Senior police officer – head of BWV platform	Peelford Constabulary
2	Senior police officer – head of BWV platform	Bobbyham Constabulary
3	Senior police officer – former head of BWV platform	Peelford
4	Member in a leadership position	Peelford
5	Police officer - user of BWV technology for detective purposes	Peelford
6	Police officer - user of BWV technology for detective purposes	Peelford
7	Police officer – user of BWV technology for professional standards	Peelford
8	Support staff - internal management of BWV technology systems	Peelford
9	Customer manager for BWV technology vendor	FutureTechInc
10	Police officer - frontline user of BWV technology	Peelford
11	Senior legal advisor for international NGO/third-sector organisation	SurveillanceCheck
12	Former member of leadership of UK regulatory organisation	WeRegulate

Nature of interview questions

Given that the research aims to analyse the impact (change over time) and the process (use of the BWV technology) while addressing the gap in literature by giving sufficient credence to the technical components of the technology, a broad set of questions were used. While the questions were focused on impact, the technology, and the process by which it is used, the questions were tailored for groups/clusters of participants given that there were a wide range of participants from different sectors, organisations, and roles within their organisation. For example, senior members of police do not use BWV devices in their roles, but they do shape the policy of how they are used by officers in the organisation. Accordingly, it was appropriate to ask broader questions about what shapes use and policy (i.e. their decision-making) and not asking them about the specifics of how they personally might use them in the field. The same applies for a member from a vendor who could be asked about design and cost considerations (technical) versus a member from a third sector organisation would know more about the impact on, and the interests of, the public (socio-legal).

Interview questions were constructed to treat participants as insider sources of information and to avoid privileging the human perception of change (a 'more-than-human' sentiment) (Fox and Alldred, 2023). Accordingly, the questions were balanced to not only ask participants how they felt about change, but to describe the changes, the technology, and the process by which it is used. Participants were still asked about the perceived role and assumptions of BWV technology, which is a vital component of the socio-technical approach. However, participants' perceptions were not the sole focus of the data generation.

As is standard with semi-structured interviews, the interview themes document constituted guidance. It was important to adapt to the interview as it progressed and tailor questions to previous responses and the flow of the interview (Noaks and Wincup, 2004). Accordingly, it was important to follow up on certain responses or to explore themes which the participant introduced which might have been unknown to the researcher and worth exploring or to ask a rephrased question if the initial question was misunderstood or potentially avoided. Moreover, it was important to let the participants follow their own flow of articulating how they make sense of their experience with BWV technology and policing as even something such as rambling is valuable as it reveals information about the participant's concerns (Bryman, 1998). Nonetheless, it was important to remain alert enough to follow-up on significant themes that emerged (Noaks and Wincup, 2004).

General themes of interview questions

Given the research aim to provide equal consideration to the social and technical components in the shaping process between police and BWV technology, the questions tended to focus on the role of BWV technology, the features and design, how it is used, issues which arise in the field, and potential environmental factors.

The general first question of the interview across participants was: What is the role of BWV technology in policing? This is a useful probing and introductory question as it generally revealed their organisational relation to the technology and their assumptions on what the technology is capable of. The neutral nature of the question also aids with effectively building rapport, which is fundamental to qualitative interviewing (Noaks and Wincup, 2004). It neither suggests that technology is good or bad; that policing is good or bad; or that police technology has good or bad impacts - only that technology has a role in policing. It provides the participant with the ability to pursue a line of reasoning or discussion that they find significant to discuss and can reveal to the interviewer potential areas to probe (Bows,

2019). Accordingly, it does not give any significant underlying assumptions to the participant but can reveal quite a lot to the researcher and allows the participant to shape or lay the ground for the rest of the discussion.

Analysis of interviews

Initial coding was conducted in NVivo but given the heterogeneity of the participants and their sector-specific vocabularies, it was not useful. Specifically, participants were from diverse sectors (vendors, police, and civil society) and questions were tailored to their gain information on their roles and insight. Even participants from the same police organisation varied according to department (professional development, frontline, detective services, management, and leadership).

While software-assisted coding was trialled, it did not provide additional insights given the diversity of participants and language used across the various sectors. Manual thematic analysis was therefore adopted, which is more aligned with critiques (St. Pierre, 2011) that stress the value of interpretation and meaning-making beyond mere sorting and counting of data. Transcripts were read and accompanied by memo writing (Lempert, 2007) to identify sub-themes for later development and sorting. This flexibility allowed themes to be developed inductively while remaining grounded in the data. Despite the lack of overlap between participants responses, many interrelated sub-themes emerged: the various proposed reasons for and benefits of BWV technology implementation and use; the different rationales and interests it serves, as well as both concerns and optimism towards the impact of the technology on policing, and to a lesser extent, the public more broadly. It was clear that a larger, overarching narrative was missing to connect these interrelated sub-themes from the interview data in addition to the information in secondary data sources and relevant BWV technology literature.

Accordingly, it was necessary to read the transcripts several times in addition to policy, document, and news media analysis to identify the throughline of the data. The outcome of which was that the responses could be weaved together to describe a story of organisational and policing change with dialectical themes. As Pollock and Bono (2013: 629) conclude, "we have two jobs as scholars: Answering interesting questions and telling the story." This dissertation is unified by a larger story or throughline which connects the various foci explored. One strand of this story involves BWV technology adoption and use which benefits the public along the theme of transparency and accountability and how this has

impacted police in the region. The other strand is BWV technology use which benefits police as the primary users, following along the theme of officer protection. While the theme of protection initially included protection from public complaints and physical protection, this was further narrowed down to focus solely on physical protection due to wordcount limitations. Once these dialectical themes were identified, the transcripts were re-read and any responses related to these topics were identified and marked to classify and categorize the data (Roulston, 2014).

As aforementioned, these themes also coincided with the research aims of identifying the impact of the technology and the process of technology use. The rationale or use case covered in technology as a product (Chapter Seven) was of interest as it related to the way in which interview participants described and made sense of BWV footage i.e. whether it captured the truth of the incident or the user's perspective. These competing narratives were analysed and critiqued using various literature from both the natural and social sciences.

3.3.3 Secondary sources for data triangulation

Secondary sources were collated using a purposive and comprehensive search strategy aimed at identifying all relevant documents concerning BWV technology and policing in England and Wales. As Bryman (1988: 47) found, "one reason for the employment of a variety of techniques is that it allows inferences or 'leads' drawn from one data source to be corroborated or followed up by another." This is the approach of this qualitative research, which used the interviews as a means of deriving information about the ways in which BWV technology has impacted police organisations and the ways in which it is used by police officers, using this as the backbone of the research and then engaging with documentary analysis of secondary sources to corroborate and build upon the interview data. Roulston (2014: 299) reinforces this by stating that "researchers generate interview data that align with their research purposes" and suggests sourcing multiple data points to corroborate interview data for those who "aim to generate factual information concerning a research topic."

As Segrave and Milivojevic (2019) provide, there is a distinction between content analysis and discourse analysis. The policy, technical manuals, and guidance documents served as vital sources of content to analyse for changes to law, technological development, and best practice concerning BWV technology and policing in the England and Wales. The guidance documents were also a valuable source of discourse analysis to identify the meaning and

value being communicated directly and indirectly in the text (Burton and Carlen, 2013). Much like Davies' (2019) description of their approach to qualitative data analysis on the topic of Child Sexual Abuse, this research was largely unrestricted and organic in its accumulation of documents relevant to police use of BWV technology, and there too was constant engagement between the information found in the literature, documents, and interview data.

All documents were collated in a digital repository and grouped by type (policy, organisational, vendor, media, FOI, and technical). Analysis was conducted in two modes. Firstly, content analysis was used to derive factual information (for example, procurement choices, technical specifications, and policy guidelines). Secondly, discourse analysis was applied to identify how BWV technology was framed, narrated, and justified (Burton and Carlen, 2013). This dual approach is in alignment with the social-technical framework as technical manuals and design documents provided insight into the material functionalities of BWV technology (see Chapter Six: Section 6.3), while organisational policies and media discourse revealed the social arrangements conditioning their use (see Chapter Five: Section 5.3).

Collection and analysis of secondary sources

Secondary sources were collated using a purposive and comprehensive search strategy aimed at identifying all relevant documents concerning BWV technology and policing in England and Wales. Instead of adopting a systematic review approach, the strategy followed an iterative process consistent with qualitative research Davies (2019), whereby materials were collected, examined, and re-sought as themes and gaps emerged.

The analytic strategy was informed by the socio-technical approach. Specifically, that social arrangements and technical systems mutually shape one another. Themes first emerged inductively from interviews, where participant highlighted BWV technology as balancing two purposes: serving the public by enabling transparency and accountability mechanisms and serving the police through officer protection. These themes were then triangulated with documentary sources, including policy and guidance documents, technical manuals, news media, and FOI disclosures. Documents were analysed both for their content (for example, technical design, system functionalities, formal rules) and discourse (narratives of transparency, accountability, and protection), providing evidence of the conditions, beliefs, and expectations that the technology operates within. By reading documents and interviews

together, the research was able to examine how material properties and social arrangements interact, shaping the adoption and implications of BWV technology. While not framed in terms of formal context-mechanism-outcome configurations (as other critical realists have), this approach remains consistent with critical realist orientation in that it treats both social and technical components as real, causally significant (able to shape), and worthy of analysis in isolation.

ORGANISATIONAL POLICIES

Each territorial website police website in England and Wales was examined, with keyword searches for "body-worn video" and "BWV" to identify policy statements, public guidance, or hosted FOI responses. These documents can be used for content analysis to identify how police organisations govern their use of BWV technology. Given that the aim of the research is to identify change in policing in England and Wales, it follows that various policy documents of policing organisations in the region were gathered and their content analysed. The policy documents mostly related to either the use of BWV devices and their systems or the internal and external assessment mechanisms of BWV footage.

POLICY AND STRATEGIC DOCUMENTS

All reports from the Home Office, National Police Chiefs' Council (NPCC), His Majesty's Inspectorate of Constabulary and Fire & Rescue Services (HMICFRS) PEEL assessments, and other relevant government bodies were examined. Relevant documents were located by keyword search for "body-worn video" and "BWV" within these published policing strategy reports. While reports released by HMICFRS and IOPC reveal practices and shortcomings of police practice, the strategic documents outline government's framing and justification of BWV technology use. Accordingly, these documents present a mixture of content and discourse analysis. Some of these documents allowed for the tracing of practice such as the shifting mentality towards public release of police BWV footage, which played out in news media and official documentation (see 'Limitations on transparency' in Section 5.3.1).

TECHNICAL AND PROCEDURAL GUIDANCE

All regional BWV procedural and technical guidance (2007-2014), relevant College of Policing documentation, and broader digital evidence management guidelines, such as processing and retention, were examined, with keyword searches for "body-worn video" and "BWV" to identify relevant sections. In terms of content analysis, these guidance documents

were a source of information about the systems, types of uses, and proposed best conduct. Much like O'Brien and Wilson's (2014) qualitative study mapping shifting policy and rhetoric as evidenced in the United States Trafficking in Persons Report, these guidance reports could also be analysed through discourse analysis to identify shifting principles and rhetoric about police use of BWV technology in England and Wales. Given that these documents were written many years apart and have seemingly become annualised over the past three years, they served as a useful tool for discerning shifts regarding the technology and the use thereof (content analysis) as well as the principles and justifications underlying their use (discourse analysis) over time.

Noaks and Wincup (2004) highlight that it is common for qualitative researchers to attempt to identify shifts in policy and that government documents can be valuable in providing information for this endeavour. They cite the work of Jones and Newburn (2002) when emphasizing the importance of using government documents to identify influences of criminal justice policy. Nonetheless, it is important to note that no text is neutral (Davies, 2019) and that a critical lens was used during analysis to identify not only what was there, but what wasn't included in the text. Criticality was particularly crucial for the guidance documents as they reflect 'best practice' in theory, but police organisations in the region largely enjoy operational discretion (as is introduced in Section 4.2 The context: Policing in England and Wales and analysed in Chapter Five: Transparency and Accountability).

NEWS MEDIA

National and regional news reports relating to police use and adoption of BWV technology over the period 2007-2014 a ten-year period. Google and DuckDuckGo search engines were used to identify relevant reports using keyword searches for "BWV", "body-worn video", "police", with the location set to United Kingdom. These articles were also gathered and used in this research for both content and discourse analysis. In terms of content, they could identify the existence of a 'newsworthy' event and provide missing information on what technologies police are implementing and what vendors are developing. Moreover, public statements are made by senior role-players, and this can be triangulated with other sources to map larger changes in police use of BWV technology in the region. For instance, the changing sentiment regarding the public disclosure of BWV footage played out in the media (Section 5.3.1). In terms of discourse, they can identify rhetorical shifts on public and media perceptions of police technology use and highlight the critiques and shortfalls of such uses. The articles were also a source of information regarding the details of which vendors police

organisations had selected and the number of BWV devices procured, especially when this information was not available on the police organisation's website.

VENDOR MATERIALS

Using content analysis, technical information about material design and technical functionality of BWV technology was drawn from several vendor sources, including their technical documents, operational manuals, website FAQs, news releases, advertisements (from their own website and via third-party or email) and official YouTube channels. These sources provided a wealth of information concerning product functionalities and design, and news about their acquisitions and technical developments. In terms of discourse analysis, vendor brochures and advertising were also useful in terms of triangulating data with themes of transparency, accountability, and protection. Specifically, data was taken from these sources to evidence that vendors are employing popular narratives around these topics to advertising their products.

FREEDOM OF INFORMATION REQUESTS (FOIS)

Some police organisations host FOIs which they have responded to. Online FOI repositories and all territorial police websites were keyword searched and all available responses were collated, gearless of outcome (granted, refused, partial disclosure). FOIs are a rich source of content for providing details about police BWV technology policy, the technical specifications of their system, and the use cases (policing purpose). These FOIs are also valuable in indicating the types of information which police organisations did not want to share and the means which they use to justify not providing the requested information. Most of these FOIs requested information about the technology vendor which was selected, the initial spend and running costs of the technical system, and how the organisation is using the technology (e.g. recording or livestreaming), while others requested access to their respective use policies. The high number of FOI requests is understandable given that few police organisations in England and Wales freely share or host this information on their websites.

3.3.4 Ethics

Ethical approval to conduct this research was granted by the University of Glasgow's School of Social and Political Science.[1] Given the nature of the access issues which arose during the research, amendments to the original ethics application were later applied for and approved. These amendments requested permission to conduct online interviews (in addition to the original in-person interviews requested) and to include additional police organisations in the research.

It is also worth noting that a safety clause was included in the application that the researcher would take all possible precautions during field observation, and should unforeseen dangers arise, this would be reported to the ethics committee and measures would be adopted to mitigate these previously unforeseen risks. Peelford Constabulary specifically stated that the 'observer' had to follow the instructions of the assigned officers during observation and not to involve themselves with the police-public interactions.

3.3.5 Limitations

There is a broader politics of evidence (Denzin, 2009; Parkhurst, 2016) which has permeated research on BWV technology adoption (Henne et al., 2022), with the largest contributor towards BWV technology research entitling one of their articles *'Not all evidence is created equal'* (Ariel, 2018). Qualitative research has come under much criticism and there have been a range of attempts to conceptualise generalisability of qualitative data (Rapley, 2014). Generalisation is the ability to draw broader inferences from specific observations (Polit and Beck, 2010). Speaking on the topic of qualitative research, Guba (1981: 81) states that "the concept analogous to generalizability (or external validity) is transferability, which is itself dependent upon the degree of similarity (fittingness) between two contexts. The naturalist does not attempt to form generalizations that will hold in all times and in all places, but to form working hypotheses that may be transferred from one context to another depending upon the degree of "fit" between the contexts." This is a useful mechanism for readers to identify whether the findings are representative of the region more broadly. Conversely, the "researcher's job is to provide detailed descriptions that allow readers to make inferences about extrapolating the findings to other settings" (Polit and Beck, 2010: 1453).

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[1] The letter of ethical approval and relevant consent forms are attached as appendices.

When discussing policing in the region of England and Wales, the issue of transferability becomes highly salient. Other organisations might be having issues with their implementation or might not have a positive attitude towards the technology. All of this decreases the fit of the findings and this is further exacerbated by the limited number of interviews. While the interviews were with key members related to police adoption and use of BWV technology in the region they are not likely to represent the entire spectrum of use, impacts, and sentiment towards BWV technology as it relates to transparency and accountability and physical protection of police officers.

Peelford was an example of a large, seemingly progressive[1], organisation which had been using BWV technology for several years and were reportedly having 'success' with their system. Moreover, they had been part of the collaboration work which had gone towards producing regional use guidance and draft guidance on community scrutiny panels. While they were the correct organisation to contact to understand the progressive uses and 'positive' developments of BWV technology within their organisation, they are unlikely to represent all 43 territorial police organisations in the region. In fact, organisations who have had difficult implementation processes and who might not be progressive or are facing internal crises are more likely to refuse participation. This is a salient point and is discussed in detail in the conclusion chapter (Section 8.2.3).

For this reason, additional sources of information (such as guidance documents, relevant laws, policy documents, and reports from the regional ombudsman) were included to verify what was reported in the interviews. This mostly provided insight into organisational changes resulting from BWV technology adoption within certain police Constabularies relating to transparency and accountability in the region (Chapter Five) in addition to police uses of BWV technology within those organisations to increase their physical protection (Chapter Six). However, whenever possible, this was extended to the region more broadly. This dissertation is careful to articulate when findings are more broadly applicable or when they are less likely to 'fit' other territorial police organisations. This variance between police organisations in the region is itself problematized in Chapter Five (Section 5.3).

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[1] Concerning their policies, transparency and accountability mechanisms, uses, and sentiment towards BWV technology.

3.4 Positionality

This section discusses the potential ways in which the researcher's positionality has shaped the research process and subsequent findings.

3.4.1 Data access

Brown (1996) offers a typology of police researchers based on their institutional positioning and affiliation with the police. As a researcher affiliated only with an academic institution and having no formal connection to the police organisations examined, I occupied what Brown (1996) terms an 'outsider-outsider' position. As Davies (2016) notes, this can present methodological challenges, such as gaining access to the organisation. Access proved to be a significant barrier to conducting the research. That the researcher was a foreign national further compounded Brown's (1996) outsider status. Certain police organisations followed strict vetting procedures which precluded the researcher from gaining access given that they had not been living in the UK for a total of three years. This further reduced access to participant organisations and their staff. Westmarland (2015: 166) also speaks to this exacerbated outsider status, describing herself as a woman, non-police, and non-American (examining US police). However, unlike the researcher, in her case she concludes that this did not hinder the data she was able to gather during her research.

From the outset, the research aimed to give equal weight to the social and technical components of police adoption of BWV technology. The chief contact (acting as gatekeeper to Peelford Constabulary and its staff) stated that it was the research's emphasis on technology that motivated them to participate. The senior officer described themselves as passionate about technological innovation and noted that having a researcher who shared this enthusiasm was a key reason for facilitating access. As the principal gatekeeper, this individual was instrumental in facilitating entry and ultimately ensuring that the research could generate new data at all.

3.4.2 Data collection

To further complicate Brown's (1996) typology of police researchers, although the researcher was an outsider in terms of being unaffiliated with the police (and a foreign national), they have partial insider status based on their previous work experience. As Davies (2016) indicates, there are benefits to this blurring of insider/outsider divide. Upon arriving

at Peelford Constabulary, the researcher was introduced to the response team supervisor by the liaison. During this first introduction, the supervisor mentioned that they had had a case of a credit card reader being stolen from a fast-food franchise. During this discussion, the researcher stated that they had dealt with a similar case back in South Africa while the researcher was working in the private security industry. The researcher mentioned certain details including that the device is encrypted, and the data can be wiped remotely, but that the reason offenders might steal one device is for an insider (at the franchise, for example) to replace the stolen device with one which 'clones' cards. As such, the criminal element/risk is not related to the stolen device but rather the vulnerability created when making space for a compromised device.

There was a noticeable shift in the mood (between the shift leader, the liaison, and the researcher) when the researcher explained their background as a practitioner in the private security industry, as well as their involvement as an undercover investigator in wildlife crime. This is because, to build upon Brown's (1996) typology, the position of the researcher shifted from complete outsider-outsider (academic researcher with no police affiliation) to semi-outsider-outsider (academic with an applied background in security). This information would no doubt have been disseminated in some form to the staff within the organisation either through the shift leader or the liaison. Accordingly, staff would have been more willing to share information with someone who has field experience dealing with criminality and less likely to see them as a threat.

Conclusion

This chapter has provided the methodology which, using a socio-technical analytic framework, examines the impact of technology implementation (organisational, regional policing, and societal) as well as BWV technology as both a product (a designed and constructed artefact) and a process of interaction (use) between police as users and the various components of the technical system. It has detailed the methods used to generate and collect data as the process by which the data was analysed. It has been candid about the limitations resulting from access issues and provided key insight which the research gained as a result. The subsequent chapter provides key contextual information regarding the case and background of BWV technology adoption by police in England and Wales.

Chapter Four: Case and Background

Introduction

This chapter introduces and details three core areas of the research namely, the technology being examined, the policing context, and the technology vendors (as designers, constructors, and marketers). The details provided act as a foundation for the subsequent findings chapters by introducing relevant background information. These findings chapters discuss the myriad of ways in which body-worn video (BWV) technology impacts policing in England and Wales and how operational considerations and police activities shape the selection and development of BWV technology in turn. To understand the ways in which police shape a particular technology, it is first necessary to examine the recent history of policing, with its governance framework, in the region. This chapter sets out to achieve this task by examining the respective laws, best practice, and governance mechanisms concerning police use of BWV technology. Additionally, given that the materiality of BWV technology is emphasised in this research, all proprietary features applicable to the findings are discussed in this chapter. Whenever appropriate, the in-depth discussions contained in the findings are signposted with the associated contextual information provided in this chapter.

4.1 The technology: Four major components of BWV technology

As was noted in the previous chapter, most research on BWV has related mostly to the effect of the BWV device on police. Other research has examined issues related to the BWV footage, with only one study exclusively exploring the digital evidence management system, and a handful of articles having mentioned the inclusion of peripheral devices which trigger auto-activation of the device. Accordingly, when BWV is mentioned, there is a general tendency or association that the focus is on the device itself.[1] Consequently, this dissertation speaks of BWV *technology*, not simply BWV. One of the findings to emerge from the research data is that BWV has four distinct components, each with their own material implications and impacts on policing. For example, Chapter Five (Section 5.2.1) discusses

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[1] This also emerged during interviews, where it became necessary to explain to participants that the research interest also covers BWV footage and systems, not simply the devices.

how the design and functionality of the digital evidence management system allows for increased supervision of officer use of the BWV device. Thus, for the sake of accurate analysis and communication, it is important that this dissertation is specific and intentional with the language it uses to discuss the respective components of the technical system.

Boivin and colleagues (2023) initially brought the material distinctions of BWV technology to the fore in their article exploring perspective bias in BWV footage assessment. The authors (Boivin et al. 2023: 413) distinguish between research on the 'container' (the BWV device) and the 'content' (the footage that is produced). They found that much of the research focused on the container and the impacts the presence of the BWV device alone had, regardless of whether it was recording. For example, much research has explored the impact of the presence of the device on the number of public complaints or instances of 'use-of-force'. The authors wanted to bring more attention to the impacts and issues surrounding the footage itself. Thus, the first two components of BWV technology are the device itself and the digital files which are produced i.e. the audiovisual footage.

Beginning with this chapter, this dissertation proposes to extend that categorization with two additional components. Namely, the digital evidence management system which manages the digital files and the auxiliary devices and systems. Given that this dissertation aims to provide sufficient consideration to the materiality of BWV technology, it is important to distinguish the various components of the technology which constitutes an interconnected technical system consisting of both hardware (devices) and software (online, cloud-based eco-systems with user interfaces). This allows for specificity when examining the ways in which the materiality of each component can impact the police and shape their use of the technology. The following categorization of the BWV technical system offers an in-depth introduction to the often-overlooked components on which the remainder of the dissertation builds. Each category is detailed below.

4.1.1 The body-worn device

As aforementioned, much of the literature on BWV has tended to focus on the effects of the device. Many studies have examined the impact on 'use-of-force' and public complaints (see Ariel et al., 2015; Sutherland et al., 2017) as well as public interactions more broadly (see Groff et al., 2020; Taylor and Lee, 2019). Exceptions have examined the mobility of the device (see Miranda, 2022), the weight and heat of the device (see Sesay et al., 2017; and Guzik et al., 2021), while others have examined what effects if, and when, officers decide to

record (see Lawrence et al., 2019; Boivin et al., 2022). There have been relatively few studies that have compared the functionality and design of various devices and their suitability for police operations, and these were conducted when BWV technology was relatively novel to policing and thus, not much was known about the suitability of their functionality and design. This includes a study by Edmonton Police Service (EPS, 2015) which concluded that 16 types of BWV device did not meet their *full* operational needs. Studies on human factors/fit (operational and ergonomic considerations) that do exist, have been conducted by various scientists on behalf of government organisations (see for example, Espenant et al., 2015 on behalf of the Department of National Defence of Canada; and U.S. Department of Homeland Security, 2015) or in the field of applied ergonomics (such as the placement of the BWV device by Suss et al., 2018). This human factors/fit paradigm is discussed further in Chapter Seven (Section 7.1). This demonstrates a tendency for technical and operational considerations to be compartmentalised to more 'scientific' fields of enquiry.

4.1.2 The digital files (footage)

Literature surrounding footage mostly derives from the field of psychology (applied cognition) and includes issues surrounding its assessment, specifically that it has questionable objectivity with key legal considerations (for example, Boivin et al., 2017; Granot et al., 2018; and Jones et al., 2018). This is the realm of the cognitivism paradigm, as is discussed in Chapter Seven. Other literature examines the potential, limitations, and implications of assessing police conduct captured in footage, often exploring various forms of video data analytics (for example, Korva et al., 2022; Elkins-Brown et al., 2023; McCluskey and Uchida, 2023; and Murria, 2023). Others have discussed the theoretical impacts, and the different potentialities, of publicly releasing police BWV footage via media platforms such as YouTube and Facebook (Uchida et al., 2024) as well the impact of framing in news media on viewers' perspective of the footage (Poirier et al., 2022). Finally, others have examined the effects of officers replaying their video footage when writing a statement (Vredeveldt et al., 2021) and further issues related to the interplay between memory and footage (Pezdek et al., 2022).

4.1.3 Digital evidence management systems (DEMS)

While the different vendors have different names for these systems (referred to as 'platforms' by police or 'eco-systems' by vendors) such as DEMS360 (Reveal), Evidence.com (Axon) or CommandCentral (Motorola Solutions), this component is the database and management system of the footage captured from the devices. Management systems are required to

process and manage the vast amounts of BWV footage. Police organisations in England and Wales moved from localized storage (HDD and CD-ROM), since their first trial (PCSD, 2007) in the UK in 2005, to remote cloud-based server storage (PDS, 2020). As is detailed further in the subsequent findings chapters, this component of BWV technology ought to be considered a distinct category as it provides its own policy considerations and policing impacts, such as whether footage is 'dip-sampled'[1] for scrutiny panels or whether user analytics (how officers have used BWV devices and how they have saved and accessed footage) are reviewed.

The only study on the topic of digital evidence management (DEM) centred around organisations' strategies and was produced for the U.S. Department of Justice (Terpstra et al., 2022). Nonetheless, it should be noted that authors of the report are senior academic researchers of BWV technology including White, Gaub, and Uchida. The UK would arguably benefit from a similar survey of the variance of DEMS use, strategies, and systems functionalities across the 43 constabularies. Given that Terpstra et al.'s (2022) research emerged from a 10 million US Dollar grant (Bureau of Justice Assistance, 2019), it is understandable that an extensive regional research project on BWV management platforms is unlikely to be replicated.

In addition to the cost, this gap in the research might be due to police researchers not having sufficient access to these systems or being unfamiliar with them. For example, Murria (2023: 180-181) notes the limitations associated with accessing relevant footage for their analysis, including having to work on a police-issued laptop which belonged to, and was controlled by, the senior officer responsible for supervising them during the coding process. This is potentially problematic given the significant development in this area of BWV technology, both in terms of new functionalities as well as research funding[2], and that the developments are taking place in existing police systems and thus, outside of the public purview.

More specifically, the public are not seeing any significant physical changes (visibility) to the devices, yet the surveillant functionality of the overall technical system is rapidly developing in terms of analytic capability (independent of humans) and thus deriving more (new) data from the same stimuli, such as the physical environment (vehicles, number plates,

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[1] Randomly selected from BWV footage which has been categorised and tagged according to the nature of the police interactions, such as 'use of force' or 'stop and search'.

[2] See for example, ROCHESTER INSTITUTE OF TECHNOLOGY. 2023. *RIT scientists developing machine-learning techniques to analyze body-worn camera footage* [Online]. Available: https://www.rit.edu/news/rit-scientists-developing-machine-learning-techniques-analyze-body-worn-camera-footage [Accessed 5 April 2024].

clothing, and objects) and human behaviour. For example, the systems are capable of facial (e.g. Reveal's Face Search[1]), real-time object recognition (e.g. Motorola Solutions' Avigilon[2]), and external conduct analysis programs (e.g. Truleo[3] and TrustStat[4]), commercially launched in 2023, advertise the ability for their proprietary algorithms to identify and categorise instances of problematic behaviour. This component of BWV technology is significant in that it is no longer merely a storage space for footage but rather, the cloud-based storage (provided by vendors) has allowed for a variety of algorithms to be integrated.

The integration forms part of what Linder (2019: 77) refers to as 'the surveillant assemblage-as-a-service' and is enabled by the emergence of cloud-based 'platform policing'. These algorithmic functionalities which are being incorporated into BWV technical systems are not without concern, and platforms which seamlessly allow for all footage to be analysed by these algorithms deserve individualised attention as a component of BWV technology. The developing functionalities of the platforms is discussed further in the research findings chapters (addressed directly in Chapter Seven, Section 7.3.2), but a few examples include algorithmic assessment of BWV footage offered by TrustStat (Police1, 2024a) and Motorola Solutions' Avigilon machine-learning video analytics suite (Motorola Solutions, no date-e).

A further development worth noting is that the online, cloud-based systems no longer have a distinction between servers/platforms for storage and livestreaming. Instead, there has been a merger of storage, livestreaming, and analytic functionality into singular sites which vendors call 'eco-systems'. For example, Axon describe their ecosystem offering as a 'connected network of hardware, software and sensor solutions' (Axon, no date-c). Accordingly, there is no system migration required if police organisations wish to adopt further technological functionality (function creep), thus removing a significant technical hurdle.

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[1] REVEAL. 2021a. *AI* [Online]. Available:
https://web.archive.org/web/20240806232648/https://www.revealmedia.co.uk/ai [Accessed 5 April 2024].
[2] MOTOROLA SOLUTIONS. no date-d. *Video analytics* [Online]. Available:
https://www.motorolasolutions.com/en_us/solutions/ai-video-analytics.html [Accessed 5 April 2024].
[3] TRULEO. 2025. *AI analyst for command* [Online]. Available: https://truleo.co/for-command [Accessed 19 October 2025].
[4] POLIS SOLUTIONS. 2024. *TrustStat* [Online]. Available: https://www.polis-solutions.ai/services/truststat [Accessed 17 February 2025].

4.1.4 Auxiliary devices and systems

This component, as a category, is intentionally broad to capture a range of peripheral devices, such as holster and door triggers (for example, Axon Signal[1]) as well as connectable headpiece lenses (e.g., Axon Flex POV[2]), which are being developed to aid police with their use of BWV devices as well as to capture both the 'secondary' (according to regional guidance documents) and 'covert' (explained in further detail below) uses of BWV technology such as livestream feed integration (e.g., Motorola Solutions' CommandCentral Aware[3] and Reveal's livestreaming[4] and live facial recognition[5]) for scenarios such as tactical operations and event management (via command centres). The integration of footage from BWV devices was foreseen (see for example, Surveillance Camera Commissioner's 2014 presentation) and theorised (Jones, 2020) prior to the technological capability being developed and deployed. A recent example of meta-research has raised serious concern over the integration of additional functionality (Webster et al., 2022), yet integrated functionality has at the time of writing still not received practical research interest.

These uses may not be covert in the sense that the device is not hidden (it remains visible), but they are potentially covert in two senses. Specifically, all indicators that a device is *active* can be hidden/made invisible (e.g. Axon's Stealth Mode[6] and MS' Covert Mode[7]) and secondly, that the public may be aware that a device is *recording*, but not that it is *streaming* or conducting *analytic processes*. The core distinction between recording and livestreaming lies in the functionality of stream integration into systems with algorithmic capabilities. Thus, they exist in a quasi-grey area where the BWV device is overt, but the full range of its functionality is covert. Concerning the degree of invasiveness, it is one process for the public to be recorded by a device, it is, arguably, quite another having algorithms analyse members

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[1] AXON. 2024c. *Axon Signal* [Online]. Available: https://www.axon.com/products/axon-signal [Accessed 31 July 2024].
[2] AXON. 2023b. *Flex POV module* [Online]. Available: https://a.storyblok.com/f/133181/x/9b02860e6c/flex-pov-product-card.PDF [Accessed 17 February 2025].
[3] MOTOROLA SOLUTIONS. 2023b. *Livestream body-worn video* [Online]. Available: https://www.motorolasolutions.com/content/dam/msi/docs/products/body-worn-cameras/aware_for_streaming_v700_datasheet.pdf [Accessed 5 April 2024]..
[4] REVEAL. no date-c. *D5 Body camera live streaming* [Online]. Available: https://www.revealmedia.co.uk/d5-body-camera-live-streaming [Accessed 5 April 2024].
[5] REVEAL. no date-i. *Live facial recognition trial launched with GO! Southampton* [Online]. Available: https://www.revealmedia.com/aus/articles/facial-recognition-body-camera-trial-southampton [Accessed 17 February 2025].
[6] AXON. 2023e. *Turning on or off camera lights, sounds, and vibrations (Stealth Mode)* [Online]. Available: https://my.axon.com/s/article/Turning-On-or-Off-Camera-Lights--Sounds--and-Vibrations-Stealth-Mode?language=en_US [Accessed 31 July 2024].
[7] MOTOROLA SOLUTIONS. 2021b. *V300 body-worn camera user guide* [Online]. Available: https://usermanual.wiki/m/2305b5d5e0e70aeac11c0f24956d0c05689ea11ae21fbfad724ddca89d5c7f21_optim.pdf [Accessed 23 October 2025].

of the public in real-time. Especially, when there is potentially significant *misalignment* between public expectations of what a device is capable of and what it is doing in practice (discussed in Webster et al., 2022). Accordingly, the argument is made in Chapter Seven (Section 7.4) that BWV devices have become far more than a recording device and that this raises serious concerns.

The argument that the public could reasonably suspect that fixed surveillance (CCTV systems) is capable of real-time analytics is not a suitable defence of this function creep of BWV technology. Indeed, the Information Commissioner's Office (2023) has stated that "BWV has the ability to capture footage and audio in close proximity to individuals, and can also be used to record in new or novel ways. This type of surveillance therefore has the potential to be more intrusive than conventional CCTV systems." Despite the potential implications and technological and policing developments indicating that this is a growing area of use, this category of BWV technology is the least researched at the time of writing. Arguably, a lack of interest in the materiality of BWV technology has been a factor in these significant technological developments escaping academic critique, which this research seeks to address. Recent research already mentioned (on mobility, notification stickers, and the like) might indicate that there is indeed a shift approaching which will examine the expansion of these designs and functionalities. It is also foreseeable that in the future, this forth category of BWV technology will have to be further subdivided as the variety of auxiliary technologies expand and the more systems are used, developed, and become more specialised, resulting in idiosyncratic and potentially contradictory impacts and implications worth examining.

Now that the components of BWV technology as a technical system have been introduced in granular detail, it is necessary to introduce the relevant components of policing in England and Wales.

4.2 The context: Policing in England and Wales

The United Kingdom has separate legislatures and executives for Scotland, Wales, and Northern Ireland (Ministry of Housing, Communities and Local Government et al., 2013a). Policing powers have devolved for Scotland and Northern Ireland, while they have been reserved for Wales (Ministry of Housing, Communities and Local Government et al., 2013b). Policing in the UK is thus separated into three distinct regions with four national special forces operating across them such as the British Transport Police (Winchester,

2020a). Scotland and Northern Ireland each have their own policing laws, model, and jurisdictions and both have established a centralised, national police organisation (Jones et al., 2023). While Scotland gained devolved policing powers in 1998 through the Scotland Act 1998, it was only in 2012 that it reformed its policing framework through the Police and Fire Reform (Scotland) Act 2012 (Scott, 2013). This dissertation focuses on policing in England and Wales, which is decentralised in nature. At the time of writing, England and Wales have a combined 43 territorial police forces (39 and 4 respectively) (Winchester, 2020a).

4.2.1. Informing practice: Requirements, guidance, and consideration

To accurately explore and understand the impact of technology adoption and the way in which BWV technology and police shape one another within a given region, one must examine the specific context (and its recent history) and the societal arrangement of the policing function within that region. More specifically, this context and arrangement includes an examination of the role of police, where they derive their power/authority from, what rules and conventions influence their actions, as well as the overarching mechanisms of governing and improving their function. In the case of policing in England and Wales, how BWV technology is selected, implemented (and subsequently managed), and used is influenced by principles for consideration and guidance documents or governed by regulation, court judgments, and codes of practice. This legal and governance framework is discussed below.

a) Principles for consideration

British policing purportedly operates according to the *Peelian principles.* These principles are attributed to Sir Robert Peel in the 19th Century but, according to historian Clive Emsley (2013: 11) "there is no evidence to suggest that they were written in 1829, let alone by Peel, or by either of the first two Commissioners of the Metropolitan Police." Rather, Lentz and Chaires (2007: 70, 73) argue that the police history of 'Peel's principles' and its assumptions have seen critical examination since the late 1970s and state that "the ultimate finding is that Peel's principles, as they are generally presented and understood today, are an invention of twentieth century policing textbooks." The authors further found that most sources derive the principles from the historical writings of Charles Reith (1956), Douglas Browne (1956), or William Melville Lee (1901). Of concern to this section of the argument, is the assertion

that what emerges from the principles is that policing functions 'by consent'. According to the Home Office (2012), this is a philosophy of British policing which asserts that the police do not derive their power from the state, but rather from the consent (approval and co-operation) of the public - as a whole, not individually. As is consistent with Lentz and Chaires (2007) findings, the Home Office attributed their definition of 'policing by consent' to Charles Reith.

These principles are placed under the subsection heading of consideration as they are not codified and therefore are not legally binding upon police organisations in England and Wales. Instead, police organisations derive their powers from the state via common law (judiciary) and legislative regulations (legislature). In practice then, police can act in ways which are counter to public consent suffice they are in accordance with state law. Statements by the Independent Police Commission (IPC) can provide a clue as to why they have not been given legal force, namely that they are too vague. When discussing the, then current, state of '*Peelian Principles*', the IPC Report (2013: 30) concluded that "it can also indicate that these principles are too general, or thin, to enable necessary distinctions to be drawn between different visions of policing that vie for attention within democratic societies. This is the view the Commission takes." Moreover, they further state (IPC 2013: 30) that "the Commission believes that the original Peelian principles are necessary, but not sufficient to articulate a 21st century vision of effective and legitimate policing that can have some purchase on the world we inhabit today, or to set that vision apart from competing alternatives." The Commission proceed to revise and elaborate upon the principles, but they do not offer a mechanism or means for providing the principles any legal force. Instead, they state that the remainder of the report and the reform which manifested from the report is guided by the revised principles. This would highlight how the principles do not dictate police action but could potentially serve as guidance to consider.

Even though the principles lack legal force and have an uncertain origin, there is some significance to them. Lentz and Chaires (2007: 70) who researched the historical development of the principles found "that Peel's principles were invented, however, does not necessarily make them a fiction." Instead, they continue to be rhetorically relevant to the UK. For example, 'policing by consent' is referred to extensively within key policing strategy and assessment documents usually as an underlying 'value' or principle itself or tied to improving public trust and confidence. These include, the National Police Chiefs Council's (NPCC) *Policing Vision 2025*, the College of Policing's (CoP) *Policing in England and Wales: Future Operating Environment 2040*, the House of Lords' Library

Briefing *Policing in the UK: Serious and Organised Crime,* and the HMICFRS' *State of Policing 2022*.

If this aspirational philosophy of policing were the case, the technologies adopted and the way in which they are implemented and used would be based on public consent i.e. in the best interests of the public and must be acceptable to society. However, as has been discussed, if police implement and use technology within the confines of legal provisions, public consent is not required. The documents referred to above frame 'policing by consent' as tied to improving police trust but this appears to be more historical/cultural discourse than a legal governance framework. This is indirectly confirmed by the CoP and NPCC themselves. Early guidance by the CoP (2014a) did not refer to 'policing by consent'. While the forward of the guidance, by the then National Policing Lead for BWV, did open with reference to the *Peelian principles*, there was no link between BWV use and any specific principle. When the NPCC released the updated (NPCC, 2022) BWV guidance document which included all the relevant laws governing the use of BWV technology (within England and Wales), they also did not refer to 'policing by consent' or *Peelian principles.* Instead, the latest regional guidance's provision, under the section entitled 'Objections to recording', states that "in principle, users are not required to obtain the expressed consent of any person being filmed" (NPCC, 2024: 39).

b) Legal requirements

REGULATORY PROVISIONS

Policing activities, especially those involving the use of BWV technology are governed by a range of legal provisions. These include the Policing and Criminal Evidence Act 1984 (PACE), the Data Protection Act 2018 (DPA), the UK General Data Protection Regulation (UK GDPR), as well as the European Convention on Human Rights (ECHR). Despite the United Kingdom exiting the European Union, it remains a part of the Convention. Separating from the Convention requires a notice period in writing. While there are discussions about the UK forming its own Human Rights charter, it is still bound to the ECHR at the time of writing.

The various laws allow police to *overtly* record interactions without requiring public consent. However, the respective legislation places limitations on what police are allowed to do, specifically that their actions when to record and what to record must be lawful,

proportionate, and necessary. This pertains to their actions as well as the data which they are allowed to acquire. It also places on them the obligation to protect information and the identities of vulnerable persons. Accordingly, they may not record under certain conditions (for example, where sexual assault is reported), need to redact the faces of people captured in the video footage, must disclose footage during legal proceedings, and have limitations on how they release footage.

COMMON LAW

Policing in England and Wales is governed by common law principles, with certain court decisions being binding upon equal and lower courts according to the doctrine of precedent. Accordingly, specific judgements involving police actions are binding upon police organisations within the jurisdiction of the respective court. For instance, the BWV guidance documents (NPCC, 2022 and 2023) reference *R (Wood) v Commissioner of Police for the Metropolis* [2009] and *Murray v the UK* [1995] to indicate that given that it can be considered an interference, BWV use must be justifiable, on a case-by-case basis, in both public and private spaces. This is the primary justification police organisations in England and Wales use to derive their powers to record members of the public (NPCC, 2023: Principle 1).

CODES OF PRACTICE

The College of Policing (CoP), formerly the National Police Improvement Agency (NPIA), can grant their guidance documents legal force by releasing them as Authorised Professional Practice (APP). Although it is an independent organisation (a quango), it derives its powers as a statutory body from the Home Office. Two codes of practice which play a significant role in the use of BWV technology is the National Decision Model (NDM) and the Management of Police Information (MOPI) APP. The NDM, which includes a code of ethics relates to decision-making of officers and thus will influence how and when they use the BWV device, while the MOPI APP provides instruction, firm limitations, and strict obligations on how the footage, as digital evidence, is managed.

In their overview of the NDM, the CoP (2013) describes the model as a framework for the decision-making process, specifically one in which 'decisions can be examined and challenged, both at the time and afterwards.' In practice, the NDM grants BWV device users final discretion over what and when to record. Specifically, an officer can decide not to

follow their organisation's policy on the proviso that they are able to 'justify' their decision by writing it down in a notebook. Fenton-O'Creevy et al. (2022) highlight the possibility that this justification mechanism, in conjunction with increased scrutiny, has the potential to turn decision-making into defensive decision-making. The authors also indicate the concern that the rise of the NDM, in addition to evidence-based policing strategies, could "delegitimise the use of experience-based intuition" (Fenten-O'Creevy et al. 2022: 2) and thus, they propose that the NDM provide a supplement which asks officers "how do I feel about this decision, and why?"

The topic of police decision-making, including the subtopic of discretion, is an entire research project on its own, as is evidenced by the doctoral dissertation of Edwards (2012). Fortunately, Edwards study focused on policing in England and Wales and does discuss the NDM (although it was a draft at that stage) and thus, it is possible to include some of their discussion and descriptions in this section. Specifically, Edwards (2012: 76) describes the function of the model being:

> "focused on understanding and using professional judgement as part of the decision-making process. This model has been constructed to provide front line staff with an effective tool in the delivery and rationalisation of all decisions, including those that are fast moving or spontaneous; in effect it is the platform for all police decision-making, albeit that the interpretation of the NDM is down to each individual officer to rationalise and decide on the proportionate and necessary response."

Edwards (2012) raises the distinction of personal and organisational discretion. Applying this to BWV technology, while the NDM would influence individual officers' use of BWV devices, it would also apply to and influence the structure and policies of an organisations' BWV technology platform. While this section has touched on a few potential issues surrounding decision-making, at this stage it is important to introduce and describe the existence of these legally binding codes. A further discussion on their influence on officer discretion is further discussed in Chapter Five.

c) Guidance documents and accompanying codes of practice

In addition to the binding laws and regulations, there are numerous documents which provide guidance to police organisations. Despite not indicating who the guidance is for, given the size and specificity of these guidance documents, they are evidently not aimed towards individual police officers as users of BWV technology. Instead, the guidance provides overarching recommendations at a level more appropriate for senior police officers,

managers, and officials who decide which BWV technology to purchase, how to implement the technology, and determine organisational policy.

Below is an overview of the historical release of key guidance documents along with respective codes of practice. Wherever possible, links to the overview pages of the documents have been provided. Given that this dates back eighteen years, many of the publishing organisations no longer exist and thus, the documents have been archived without landing pages and others retained in third-party archives.

HISTORICAL TIMELINE OF KEY GUIDANCE

Guidance on BWV use was first released as early as 2007 by the Home Office Police and Crime Standards Directorate (PCSD, 2007). In 2007 and on behalf of the Association of Chief Police Officers of England, Wales, and Northern Ireland (ACPO), the NPIA (2007) produced guidance on Police Use of Digital Images (referred to as the digital evidence procedure 2.0). In 2013, the Surveillance Camera Code of Practice (Home Office, 2013) came into force, emerging from the Protection of Freedoms Act 2012, and with it the position of Surveillance Camera Commissioner (now Biometrics and Surveillance Camera Commissioner) was established to increase compliance with the code (Home Office, 2021: 5). Body-worn video technology is included in the purview of surveillance technologies and thus, the code contains binding provisions on its use. 2014 was a crucial year for BWV guidance with the Home Office Centre for Applied Science and Technology (CAST, 2014) releasing technical guidance primarily concerning the material (design and functionality) components that are essential for BWV technology platforms such as video and audio quality and data integrity, while the College of Policing (CoP), formerly the NPIA, released updated guidance (CoP, 2014a) on BWV use as well as an Authorise Professional Practice (APP) relating to the Management of Police Information (MOPI) (CoP, 2014b). The CoP attempted to give the updated BWV use guidance legal force over all police organisations in the region by granting it the status of APP but were unsuccessful.

In 2016, the then Surveillance Camera Commissioner (SCC, 2016) released their draft National Surveillance Camera strategy document which aimed at increasing compliance with the Surveillance Camera Code of Practice. From 2018 onwards there would be a substantial increase in the amount of guidance released. The Home Office released guidance on both safeguarding BWV data (Nortcliffe, 2018a) and technical guidance (Nortcliffe, 2018b), for procurement purposes, for BWV platforms and devices in that same year. In

2020, the National Police Chiefs' Council's (NPCC; formerly the ACPO) released guidance on Digital Imaging and Multimedia Procedure (MacLennan-Brown and Cohen, 2020) and a short guidance document (NPCC, 2020) on considerations for the decision-making process to release BWV footage to the public and included case studies from Avon and Somerset Police Constabulary. In 2021, the Home Office released the amended Surveillance Camera Code of Practice (Home Office, 2021) and the NPCC (2021) released Evidence Retention guidance. The, then recently reformed (Department for Digital, Culture, Media and Sport et al., 2021), Information Commissioner's Office released Video Surveillance guidance (ICO, 2022) in 2022. The NPCC (2022) released updated BWV procedural guidance the same year. An amended version of the procedural guidance was released the following year (NPCC, 2023). This NPCC guidance has become more regular, with the latest guidance being released in 2024 (NPCC, 2024).

Further guidance impacting police relates to the establishment and management of community scrutiny panels (CSPs) which assess police organisation's BWV footage, and this had its roots in improving police interactions with Black people in England and Wales. More specifically, the Commission on Race and Ethnic Disparities (CRED, 2021) released their report which gave rise to a joint venture between the NPCC and the College of Policing (CoP) in the form of the 2022 Police Race Action Plan (PRAP). The Plan contained a workstream with the "proposal to strengthen governance and oversight of the use of police powers through effective supervision and community scrutiny of police data and body-worn video (BWV) footage police interaction with Black people" (NPCC and CoP, 2022: 17). This workstream, and their output, provided the basis for the release of the Home Office's draft national guidance for CSPs, which acknowledges that it has no prescriptive power and instead, *recommends* that police organisations establish CSPs (Home Office, 2023: 7).
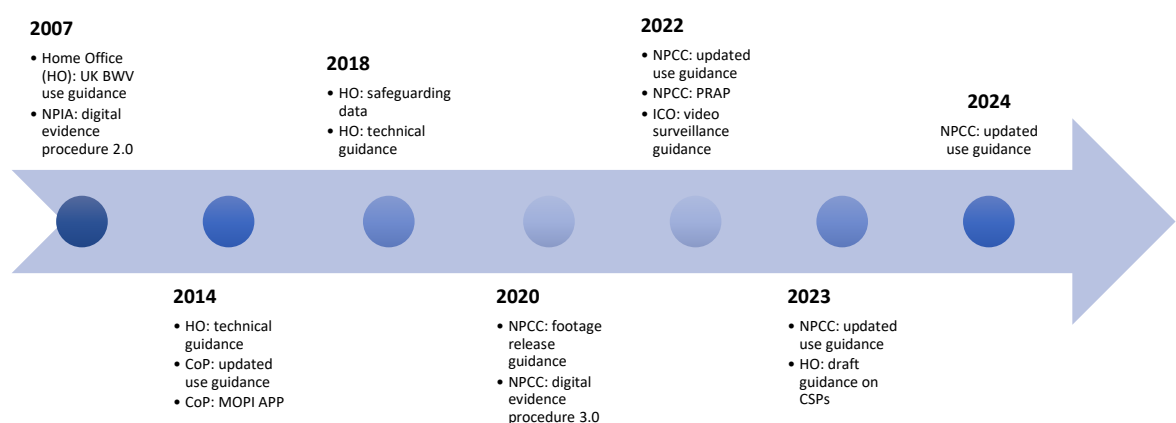

FIGURE 2 RELEASE TIMELINE OF KEY GUIDANCE DOCUMENTS.

CONTENTS OF GUIDANCE DOCUMENTS

Organisational perspectives about BWV technology can shape the ways in which technical systems are implemented and used. The findings chapters contain much discussion about the purported benefits of BWV technology and assumptions about what the technology is capable of. Notably, many of these beliefs and sentiments can be found in the original guidance from 2007 (see foreword, key features, and objectives of PCSD, 2007: 5, 7, 17). Important additions were made to later guidance but the more overarching culture and beliefs of BWV, their use, and their evidentiary value are contained in the first guidance document. While this is notable and it is likely that this early document acted as the founding document for BWV technology, it is not possible to evidence that the beliefs and sentiment stem from this document and attempting to establish this as the origin is outside of the scope of this research. Whether or not this guidance is the origin, it is still worth detailing and exploring the document to understand the potential impact it might have had on the way BWV technology has been implemented and shaped. Aptly, much attention is paid to this first BWV guidance document which was produced for the police in England and Wales.

The first BWV use guidance produced by the Home Office's Police and Crime Standards Directorate (PCSD) was based on pilot BWV technology trials conducted by Devon and Cornwell Constabulary (DCP) in 2005 and 2006. The first trial, named the Head Camera Project (NBC News, 2007), was run by the Plymouth Basic Command Unit (part of DCP), which included officer and community surveys. Select findings from the surveys as well as extensive findings and discussion from the trial are included in the guidance document as appendices (PCSD, 2007). It should be noted that subsequent guidance documents have not followed suit in providing evidence to support their claims about the value of BWV technology. The guidance document included a health and safety risk assessment tool for BWV deployment consideration, as well as technical guidance co-developed with the Home Office Scientific Development Branch. It also included 'Standard Operating Procedures' for organisations looking to introduce the technology. Finally, the document includes the relevant legislation which governed various aspects related to BWV technology such as the Data Protection Act 1998 and the Police and Criminal Evidence Act 1984. It also provides summaries of key areas which govern them as provided by organisations such as the ICO. This practice of detailing the relevant legislation, how it applies, and how officers can practically comply with their provisions is one which continues throughout the subsequent guidance documents. Finally, the guidance provides examples of ways in which officers

might practically use the device including how to navigate recording in private households when one of the parties is objecting to recording.

This first guidance document can be seen as an attempt at laying the legal, technical, and practical frameworks and foundation for introducing BWV footage as key evidence for the police organisation (internal scrutiny and case investigation) and for use in court. In terms of content, it is the most feature complete guidance document and attempts to standardise use across police constabularies in England and Wales as well as promote the potential value of BWV technology, stating that:

> "Through this guidance manual it seeks to standardise practices in the use of the technology, provide guidance on the legal and procedural framework and identify the appropriate technical specifications to make the technology fit for policing purposes in England and Wales" (PCSD, 2007: 6).

This is the earliest guidance that was found; arriving the year before Axon released their first BWV device (Axon Pro); five-years before the first scientific study of BWV technology was conducted by Ariel and colleagues (Ariel et al., 2015) in 2012, and six years before the first publicly available guidance in the United States (see Rankin, 2013; Miller, et al. 2014; IACP, 2014). The guidance was published at a time when BWV technology had not been fully operational in any police organisation in the UK, with the technology that was trialled not resembling modern BWV devices and there was no proprietary digital evidence management system (DEMS), as we would conceive of them today - photographs of initial head-mounted devices are available from news media (PlymouthLive, 2020). The *Objectives* section under *Standard Operating Procedures*, begins with "BWV is an *overt* method by which officers can obtain and secure evidence at the scenes of incidents and crimes. This procedure is intended to enable officers to comply with legislation and guidance to create evidence for use in court proceedings" (PCSD, 2007: 17; emphasis added). The underlying sentiment for this can be found in the opening statement under the *Evidential Statements* section, where it purports that "one of the perceived advantages in using BWV equipment is that the user is able to produce a 'perfect memory' of everything they saw and heard at the incident they have attended. Any video recording of an incident is likely to provide better evidence than an officer's recollection and subsequent note or statement making" (PCSD, 2007: 13). As is discussed in Chapter Seven, this is the direction which the UK criminal justice system has decided to take the development and deployment of BWV technology.

The updated guidance document on BWV use was produced by Hampshire Constabulary (as the BWV 'lead' organisation at the time) on behalf of the College of Policing (CoP, 2014a). It departs significantly from the 2007 guidance in terms of its structure. It is framed around seven key principles and is more intuitively sectioned and simplified into bullet points. The principles include 'the use of BWV, by the police, is lawful (principle 1), 'the normal use of BWV will be overt' (principle 3), and 'the operational use of BWV must be proportionate, legitimate and necessary' (principle 4). Each principle has a section on the laws which inform it, and most principles include case law which demonstrates how the courts have interpreted the relevant legislation, for example the retention period of footage. As a document less than half the size of its predecessor, it has sacrificed the provision of evidence (in the form of findings from their own trial or adoption) and technical recommendations. Instead, technical guidance has been spun off into their own documents.

In terms of content, much of the operational guidance and assertions about BWV from the earlier guidance are echoed. For example, under limitations of use, the 2007 guidance states that "BWV is an overt recording medium and can be used across a wide range of policing operations. In all cases users and supervisors must use their professional judgement with regard to recording." (PCSD, 2007: 23), while the updated guidance states that "BWV is an overt recording medium that can be used across a wide range of policing operations. Its use should always be incident specific and justifiable. Officers should use common sense and sound judgement when making a decision to start recording" (CoP, 2014a: 28). As for assertions, the earlier guidance suggests that "the recordings from BWV units provide a fairly complete record of what the officers saw and heard at incidents" (PCSD, 2007: 6) and the later guidance reasserts that "BWV material provides a reasonably complete record of what its user sees and hears at an incident" (CoP, 2014a: 28). In essence, the 2014 updated guidance provides examples of case law and brings the relevant legislation up to date by including the Surveillance Camera Code of Practice (Home Office, 2013) but echoes guidance and assertions in a reformatted, arguably more accessible, format.

The next updated guidance (third in the series) was produced by the current (at the time of writing) BWV lead, Devon and Cornwall Police, on behalf of the NPCC. Structurally, the guidance confusingly kept the principles backbone but also tries to separate the guidance into additional sections too. As such, the guidance is not intuitive to follow or refer to. The updated format of principles has been kept but several have been merged to reduce them down from seven to five. A key departure worth noting is that in reference to 'when to activate/use the BWV device', the updated guidance states that the user must comply with

'force policy' i.e. the recording policy set by the respective policing organisation. Thus, while the first two guidance documents can, arguably, been viewed as attempts to standardise use across the region, this acknowledges that in practice organisations have tended to create differing recording policies. For example, the guidance no longer recommends the length of time (31 days) that footage is retained for. This differentiated policy and practice within the region is discussed in Chapter Five.

The guidance also considered the establishment of the National decision model which was introduced as an APP by the College of Policing (2013) and gave final discretion to police officers (users) on whether to record an incident. This is further elaborated upon in the next section. All three of these changes are summed up in a single statement in the updated guidance: "BWV is primarily an overt recording medium that can be used across a wide range of policing operations. Its use should always be in line with local and national policy and should unless directed otherwise be incident specific and justifiable by the user" (NPCC, 2022: 31).

The 2023 amended guidance (version 2.0 of the 2022 guidance) is much better structured. While it maintains the five principles, it does not organise the document around them. Instead, sections are more intuitively divided into 'before recording', 'during recording', and 'post recording'. This could be described as a shift from principle to practice. A significant change has also been the inclusion of guidance on covert recording. Previous guidance limited itself to overt use of BWV technology but here it introduced the notion of covert use. Specifically, principle 3 was amended from 'the normal use of BWV will be overt' (CoP, 2014a), echoing the original guidance's 'BWV is an overt method by which officers can obtain and secure evidence at the scenes of incidents and crimes' (PCSD, 2007: 17), to 'the majority of use of BWV will be overt' (NPCC, 2022). It is only in the latest guidance (NPCC, 2024a: 28) where one can find a clarification, albeit as clumsy one, that what is defined as overt "is an overt police officer is one that is readily identifiable as a police officer", and it implies that covert refers to "officers and users in plain clothes, unmarked vehicles and those who are discrete, until such time they exercise a power." Here it refers to the legality of covert operations and the potential use cases of BWV devices in 'stealth mode' (indicator lights and notifications disabled).

The 2023 guidance directly discusses the potential impact of selectively releasing footage to the public, especially public perception of police. It also directly engages with community scrutiny panels (CSPs), while stating that more extensive guidance on the establishment of

CSPs is pending. The major difference in content relates to or symbolise advancements/shifts in BWV technology more generally. These include footage increasingly being released to the public, an increase in covert use practice, mental health concerns, rapid technical development, and (*when read in conjunction with the CPS policy update of 2018*) the CPS deciding to have BWV technology produce best possible evidence.

An earlier draft of this chapter lamented that there remained an absence of guidance for, discussion on, and evidence supporting livestreaming, cross-system integration, and digital video (algorithmic) analytics. Despite certain police organisations using functionalities such as livestreaming and facial recognition extensively, there had not been widespread adoption across organisations in the region and this could explain the lack of guidance on the topic. Nonetheless, the earlier draft chapter stated that the PCSD's (2007) guidance served as a foundation for the introduction of BWV technology to policing in the UK prior to any organisations having a fully operational system. It further argued that subsequent guidance would, arguably, be of great value if it were to follow suit by engaging with these emerging functionalities before organisations develop disparate, and potentially conflicting, policies to provide some semblance of standardization in the service of police use of BWV technology in the region.

Since then, newer guidance has been released, which, under the section 'Emerging Technologies', describes these expanded functionalities of BWV technology. Critically however, this description can best be described as a placeholder note stating that the guidance is aware of these functionalities and outlines proposed operational benefits (explored in Chapter Six) for their use. It falls far short of offering best practice guidance and evidence in support of adopting these expanded functionalities. Instead, these proposed benefits seem to echo much of the vendor advertising jargon captured in the various marketing quotations and images included throughout this dissertation. For example, it states (NPCC, 2024a: 20) that "technological capabilities within the cameras themselves can enhance real-time situational awareness through capabilities such as live- streaming [sic] of footage and built in artificial intelligence (AI) features" which is remarkably similar to sponsored content from an online police publication promoting 'how your body-worn camera system can improve situational awareness and enhance officer safety' (Police1, 2021) and Axon's 'real-time situational awareness and support' (Axon, no date-b). This potentially serves to flag the close mutually-shaping relationship between police organisation's use of BWV technology to increase officer safety and the development trajectory of the technology (as covered in Chapter Six).

d) Practical application for users of BWV technology

It is important to ascertain what the guidance, codes of practice, and legal requirements distil to for the individual user in the field. While the guidance is informative and impacts BWV technology implementation, it has been recommendation only ('best practice') due to gaps in legislation regulating all aspects of BWV technology use. Where regulation stipulating aspects of use exists such as disclosure during legal proceedings, management of data, technical minimum specifications such as encryption, and placing limitations on use, there has been accompanying binding codes of practice. These guidance documents are aimed at informing the way in which organisations implement BWV technology and the policy, structures, training, and supporting infrastructure they adopt. They are clearly not meant for frontline officers specifically, but rather for BWV platform managers and senior officers. Instead, officers are taught the various Authorised Professional Practice (APPs) and similar codes of practice. Users, including officers in the field, and those who deal with footage, such as detectives and professional development, are taught and must abide by their organisation's policies ('force policy').

One development significantly impacts the practical applications for users, especially the notion that police officers must follow organisational policy. The development of the National decision model (NDM) by the College of Policing and releasing it as a code of practice (APP) in 2013 essentially provides a user with final discretion to act in a way which is in line with the model's Code of Ethics and can be justified. For instance, an organisation's policy might state that an officer must record specific incidents such as 'stop-and-search', but the NDM provides the officer with the discretion not to record on the proviso that they note a suitable justification in a logbook. They should be able to justify, and produce a record of, why they did not comply with the organisation's policy and/or code of practice. West Yorkshire Police (no date) specifically include this in their organisational policy under 'Record of non-compliance', stating that:

> "If the individual considers that the use of BWV will significantly affect a police objective, taking into account both this policy and the scenario, they must record in the pocket notebook (PNB) **as soon as it is practically possible** the reason for non-compliance, using the NDM." (their emphasis)

Evidently, while an officer must comply with their organisational policy (in theory), they ultimately (in practice) have discretion when and whether to record based on the NDM which is legally binding in the region. This discretion is not without restraint given that there are

requirements and limitations attached to the NDM. This issue emerges from the interview data and is further explored in Chapter Five (Section 5.4).

4.2.2 Regional implementation, development, and politics: Methods of improvement

There are internal and external mechanisms in which police organisations are governed and improve their standards.

a) External oversight and improvement

Independent bodies provide oversight of all police organisations in England and Wales and these include [His] Majesty's Inspectorate of Constabulary and Fire and Rescue Services (HMICFRS) and the Independent Office for Police Conduct (IOPC) (Winchester, 2020a). The HMICFRS conducts continuous PEEL (police effectiveness, efficiency, and legitimacy) Assessments and the IOPC conducts independent investigations on reported police misconduct (complaints). Policing in England and Wales, since 1964, operates according to a tripartite system between the Home Secretary (representative of the state), Chief Constables (head of territorial police organisations), and the Police and Crime Commissioners (PCC) (House of Commons, 2008). The PCC is a directly elected public servant (Murphy et al., 2017). This system attempts to balance operational independence from shifting politics of the state while maintaining public accountability through both broader state mechanisms and local powers. Historically, police organisations have attempted to isolate themselves and enjoy constabulary operational independence (Gilling, 2014). Ultimately, it is the state which decides whether to reform policing, and a report released by the Independent Police Commission (IPC) made significant changes to policing in England and Wales (IPC, 2013). It resulted in local powers (the PCC) being able to challenge constabularies (Loveday, 2018) and signified what some in police feared was a politization of policing (Sampson, 2012). The IPC report suggested 'simplification' of the oversight mechanisms which resulted in several organisations being merged, shuffled, or closed.

Additional changes to the governance framework of policing in England and Wales have made it challenging to conduct research as it has impacted many of the role players who have written about BWV use. For example, the National Police Improvement Agency became the College of Policing, the Association of Chief Police Officers become the NPCC,

the Information Commissioner's Officer has undergone reform, and the Surveillance Camera Commissioner and Biometrics Commissioner were merged into the Office of the Biometrics and Surveillance Camera Commissioner.

The HMICFRS are relevant to discussions had in the subsequent chapter given that in their PEEL Assessments, they have examined police organisations uae of BWV, including the establishment of scrutiny panels. The IOPC themselves have provided numerous BWV-related policy and procedural recommendations to police in the region (examined in Chapter Five, Section 5.3) and released a statement (IPCC, 2016) about their position on the technology. The role of the ICO comments on BWV technology is explored in the next chapter and the actions and comments of the BSCC regarding BWV technology is provided in the next section on BWV technology vendors. PCCs are relevant given that it is they who are responsible for leading and facilitating community scrutiny panels (Home Office, 2023), an important topic in the next chapter (see Section 5.2.2 'Public scrutiny'). Accordingly, these external oversight mechanisms have contributed to police's BWV policy and use in the region.

b) Internal oversight and improvement

As aforementioned, policing in England and Wales is divided into 43 territorial Police Constabularies. This decentralisation of policing powers in the region allows organisations to have organisational discretion (operational autonomy) for how they police their territories. To ensure that there is a national implementation of standards and policy, the National Police Chief's Council (NPCC) (formerly the ACPO) exists to connect the constabularies (NPCC, 2024b). Each Police Chief, which acts as the head of the constabulary, sits on the council. The NPCC has a range of committees which each contain several portfolios and certain organisations are given the 'lead' of this portfolio. Concerning, BWV technology, the lead is Acting Chief Constable James Colwell of Devon and Cornwell Police (DCP). Accordingly, DCP are the BWV lead and have produced the latest round of regional guidance (NPCC, 2022/2023/2024). They engage with other organisations regarding their use of BWV as well as with bodies such as IOPC, HMICFRS, and the CoP (#WeCops, no date). They have also aided with developing 'operational parameters' for use and 'monitoring' (scrutiny) of police encounters captured by BWV devices as part of the Police Race Action Plan (NPCC and CoP, 2022: 35). West Midlands Police were the first police organisation in the region to trial (Police Professional, 2022) and operationalise (BBC News,

2022b) the livestreaming of BWV technology, and are the current livestream NPCC lead (headed by Chief Superintendent Ian Green) (Police Professional, 2023).

This is relevant as this mechanism is an attempt to have leaders in certain technologies, strategies, and the like set 'best practice' for the region. They trial and operate technology and inform the guidance or relevant APPs which then guide or bind other police organisations in the region to follow those principles. This is important when discussing the next chapter on Transparency and Accountability, as Devon and Cornwell's policy and regional guidance (which they produce on behalf of the NPCC) indicates the trajectory for or lays the groundwork for future practice.

It is important to note that this aim of the NPCC is aspirational, as part of the regional governance framework, but given that constabularies have a large amount of discretion, in practice it may not follow the lead or proposed 'best practice'. This is something which both this doctoral and previous research critiques. If there is sufficient support, 'best practice' can become binding through the CoP's APP. As aforementioned, previous regional guidance on BWV use has attempted to become APP but was unsuccessful. Guidance on scrutiny panels remains guidance, while the operation of 'use of force' and 'stop and search' scrutiny panels are binding APPs and enshrined in legislation.

Attempts are made between standardization of service delivery and use of BWV technology versus local needs and budget. Where best practice remains recommendation, there can be non-standardisation of policy i.e. a wide variance in policy. This is the case for use of BWV outside of retention laws, use of police powers and includes community scrutiny panels and the use of livestreaming. The latest guidance also introduces emerging technologies (such as algorithmic integration) and evidently, there is likely to be much variance between police organisations in the region.

4.3 Vendors

The findings in Chapters Five to Seven explore the ways in which vendors (as designers, constructers, and providers) of the technology play a part in the impact of and mutual-shaping process between body-worn video technology and police organisations. The previous two chapters demonstrated the tendency within police research to neglect the materiality of technology, often overlooking the technical aspects as potential variables when examining the impact of the technology on policing. Although they arguably make the

same oversight in their publication, Sandhu and Simmons (2023: 595) correctly offer that "the inconsistency and confusion surrounding body worn cameras may be a function of unreliable and underappreciated (sic) variables that influence body worn camera use and implementation." This oversight is one which the dissertation aimed to address. As is explored in the next chapter, technology impacts police organisations and policing. Accordingly, the vendor and their specific technological designs and functionalities (oftentimes proprietary in nature) which a police organisation decides to contract with has the potential to shape policing. Consequently, it is apt to introduce the most prevalent vendors, to discuss proprietary features which emerged from the research data, and most importantly, to make a concerted effort to identify and outline the distribution of their technology in the region. As discussed below, this latter attempt was far more challenging than anticipated.

4.3.1 Vendor reach in England and Wales

Before examining the material differences amongst BWV technical systems offered by vendors, it is first necessary to demonstrate the distribution of vendor systems across police organisations in the region. Perhaps surprisingly, this information is not publicly available. The BWV leads for the region have indicated that there are around 130 000 devices in operation across the UK (#WeCops, 2024). While it would be preferable to know how many devices each constabulary circulates and which models they are, it is challenging enough to identify which vendor each organisation is contracting with.

Limited information has come to light because of the United Kingdom raising ethical concerns over the import of certain surveillance technology products from China. Based on a House of Commons (2021) report on atrocities, there were calls from non-governmental organisations and Ministers of Parliament, in 2021 (The Independent, 2021) and 2022 (BBC News, 2022a), for specific technology brands to be banned from use in the UK. This would later be exacerbated by security concerns over a spy scandal in Parliament in 2023 (Reuters, 2023). In response to this, the UK's Biometrics and Surveillance Camera Commissioner (BSCC) issued a survey in June 2022 requesting details about the use of overt surveillance camera systems across the policing organisations in England and Wales (BSCC, 2023b). BWV technology was included in the survey with the BSCC asking 'if your force utilises body worn video, please describe the system and its capabilities' (BSCC, 2023b: 13). However, only four organisations provided the specific name of the vendor providing their BWV technology systems, specifically Reveal and Motorola Solutions (previously Edesix)

(BSCC, 2023b). This underwhelming specificity in the police responses to the survey triggered a statement from the BSCC lamenting the withholding of information, while also finding that the adoption of Chinese technologies was widespread in UK policing (BSCC, 2023a).

Accordingly, the burden fell on the researcher to address this lack of information and to establish an outline of the vendor landscape. This allows for a discussion of proprietary BWV technology systems in policing in England and Wales i.e. the materiality of the technical system.
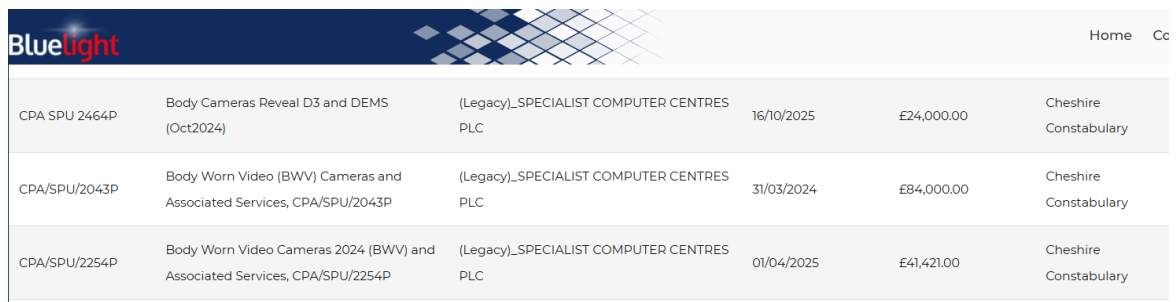
a) The search to identify the vendor landscape

To identify the vendor landscape amongst police constabularies in England and Wales, this research scoured the websites of individual constabularies to ascertain the identity of their BWV technology supplier. Vendors have featured specific constabularies' rollout of their products, although some of these featured articles are outdated and it is possible that the organisation has shifted to another provider. Examples include Devon and Cornwall Police (Reveal, no date-e) and Dyfed-Powys Police (Axon, 2019). Other sources included SCC Self Assessment Toolkits, BWV policy documents, and Freedom of Information (FOI) requests[1] submitted by members of the public which were hosted on forums.

While these FOIs were incredibly useful, responses from constabularies sometimes deferred the requested information by providing a URL link to a Bluelight Procurement Database containing fulfilled tenders. However, it appears that the database has since been privatised (BlueLight Commercial, 2022) and requires memberships for sellers and suppliers (and the provision of business details to sign up). Nonetheless, the Bluelight portal has a legacy searchable public contract register[2] which provided much information, although it provides incomplete records often dating back to 2022 and newer procurements aren't available for all constabularies. Evidently, this portal does not provide the full picture of the vendor landscape. However, intersecting these various data points through a common period (late 2022) does provide a sufficiently large and verifiable snapshot of the vendor landscape.

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[1] Requests for information from public authorities according to the Freedom of Information Act 2000.
[2] Available from: https://sell2.in-tend.co.uk/blpd/contracts [Accessed 18 June 2024].

FIGURE 3 SCREENSHOT OF A SEARCH VIA THE TENDER DATABASE.

An Excel spreadsheet was compiled of all the constabularies in England and Wales and various vendor information. A screenshot of the spreadsheet[1] indicates the constabulary, the vendor, the spend, and the date of the data. Those constabularies in yellow had no information available or the information was outdated with a high potential for a different vendor to have taken over the contract (given that 'asset refreshes' or contract renewals are required after three to four years).

FIGURE 4 SNAPSHOT OF SPREADSHEET CONTAINING PROCUREMENT DATA.

The landscape of that period includes three vendors namely, Axon, Reveal, and Motorola Solutions. No suitable information could be found for 11 of the 43 constabularies. Of those 32 constabularies, 13 were using Reveal devices and systems, 13 Axon, and six Motorola Solutions. It is important to note that the number of BWV devices and their systems are maldistributed across the regions given the size (and budget) differences between the territorial police organisations. For example, Greater Manchester Police (Axon) have five times the number of employees as Chesire Police (Reveal) and their 'spend' was also almost nine times greater. Moreover, the police BWV leads for the region suggested that there are around 130 000 devices in the region (#WeCops, 2024) and a 2024 FOI disclosure reveals that The Metropolitan Police (2024) alone account for 26 500 of those devices (Axon). Accordingly, while Reveal and Axon might have an equal number of police organisations

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[1] Attached as Appendix G.

(from the available information) at the end of 2022, there is likely be a large discrepancy between the two in terms of number of BWV devices.

b) Public procurement, systematic lack of transparency, and local obfuscation

Apart from the databases not having data for all constabularies, there are no standard referencing protocols for the listing of tenders, resulting in the search for BWV technology procurement becoming incredibly challenging, time consuming, and producing inconsistent results. While some organisations list information such as the type of technology and the vendor being purchased, others provide minimal information which required multiple keyword searches, searches by supplier and intermediary, and a manual search of all contracts that might seem related to BWV technology due to the amount of net spend or length of contract (3-5 years). As discussed below, there have also been clear attempts to obfuscate spending on BWV technology. The UK government does provide a tender search service[1], which has proven useful by providing insight into the large tenders placed for BWV technology as the names and positions of those involved are listed. However, the service does not include the functionality of indicating who won the tender and the agreed upon price. The procurement process is currently undergoing reform (BlueLight Commercial, no date) and will hopefully address many of these issues. Nonetheless, there is evidently scope for future research examining the marketplace and spend of police technology systems as well as the relations between police and vendors.

Aside from issues with the procurement databases listed above, there are specific issues which are created by the police organisations themselves. When responding to freedom of information requests, police organisations should refrain from linking to websites and database when providing information or assuming that information will continue to be easily accessible in the future. All the requested details should be included in the FOI response itself. Moreover, there were instances where the information provided in the FOI did not match the procurement contract (for example, the net spend of Dyed-Powys Police on their contract with Axon was off by more than 10%), which is concerning. While certain constabularies do host FOIs on their website, it is problematic that it is civilian websites, run on donations, that host most of the FOIs which the researcher has drawn from. As a result,

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[1] Available from: https://www.gov.uk/contracts-finder; https://www.find-tender.service.gov.uk/Search [Accessed 18 June 2024].

it is possible that many of the URL links contained in the footnotes and spreadsheet which provide valuable information are likely to terminate.

Public procurement for policing is aimed at creating transparency in the marketplace. However, when investigating the vendor landscape and market spending on BWV technology, it became clear that certain organisations have employed mechanisms for sidestepping the transparency and taken together, make it incredibly challenging if not impossible to identify their vendor and their spending. This is highly problematic for research and accountability purposes and ought to be remedied given that the huge spends identified as well as given the importance of knowing where technology is produced (as stressed by the former BSCC and discussed further in the subsequent section).

To provide the worst example, two FOI requests were sent to West Yorkshire Police (WYP) by private individuals (WYP, 2020; 2022). WYP's disclosures stated that they would not directly provide the information because there were alternative means of attaining the information. They instead provided a link to the Bluelight database's purchase ID. Unfortunately, like most URLs encountered during this search for procurement information, it no longer exists. A search of the Bluelight portal under that ID number does not return information.

On the portal, it is possible to search by reference/contract title. Using the terms BWV, camera, or similar terms returns no information. Cross referencing organisation (West Yorkshire Police) and vendors from a drop-down list such as Axon and Motorola also provides no information. This results from purchases completed through intermediaries such as Insight Direct and Airwave Solutions (a subsidiary of Motorola Solutions) for the purchase of Pronto (Motorola Solutions) software for five years at a total of GBP 3.9 million. The most likely candidate on the spend is from Insight Direct (now trading as Insight) for GBP 1.3 million and the contract is simply listed as 'WYP asset refresh'. This is based on the name of the internal person listed on the tender specification, who at that time (September 2022) was the 'digital solution delivery lead' at WYP. Due to these practices, there is no information on who the vendor is and whether this is for BWV devices. This is not a once off practice, with WYP spending 17.2 million (11.8 of which was for Microsoft software) on hardware and software, with minimal publicly accessible details, through Insight alone (across 22 tenders). A further keyword search for 'refresh' shows an alarming number of 'asset refresh' purchases made through Insight and other third-party platforms with no details on what the spending relates to.

Insight's stated aims include improving return on investment and efficiencies with police through their supply chain and procurement systems (Insight, no date). Evidently however, it seems that transparency is lost in the process. Further transparency is lost through regional collaboration between police organisations involving joint-procurement as one organisation's lack of transparency means that there is a loss of information across associated constabularies. Humberside and Yorkshire collaboration (Yorkshire and The Humber i.e. YatH) includes four constabularies, and their procurement is handled jointly (Humberside Police, [n.d.]). This means that a tender for a replacement BWV technology system worth GBP 20 million is not trackable (West Yorkshire Combined Authority, 2023). Further regional collaboration such as the East Midlands Strategic Commercial Unit (the first established in 2014, with a tender valued at GBP 18 million) is the result of several organisations forming a joint funding procurement framework (East Midlands Strategic Commercial Unit, 2018). Moreover, extensions of contracts which are required to be published do not necessarily disclose which vendor is the supplier, with Nottinghamshire Police being one such example (Nottinghamshire Police and Crime Commissioner, 2023).

As a positive example, Greater Manchester Police hosts a webpage on 'tenders and business' with useful information for finding tender information on their organisational website. While territorially separate, the Police Service of Northern Ireland similarly hosts FOI disclosures, under accessible headings, on their website.

c) Transparency matters

As introduced at the start of this section, there have been both ethical, political, and security reasons for UK government to be concerned about the providers of their security systems and this resulted in surveys being conducted. The former BSCC, Fraser Sampson, stated that:

> "Parliament has already acted to curtail the use of equipment made by several Chinese manufacturers from some areas of public life where security is key. Myself and others have been saying for some time that we should, both for security and ethical reasons, really be asking ourselves whether it is ever appropriate for public bodies to use equipment made by companies with such serious questions hanging over them." (BSCC, 2023a)

Evidently, when these issues emerge, it is essential for government (as representatives and servants of the public) to know the extent to which their systems are 'compromised'. A recent development demonstrating the need to know this emerged from a media report that Reveal

(vendor to 13 constabularies at the end of 2022) was using a Chinese manufacturer for component (lenses) parts of their devices (The i Paper, 2024). This issue has received no direct response (in the public domain) almost a year since the news article was published and the Chinese manufacturer still (at the time of writing) has Reveal Media listed as one of their clients on their landing page (Eeyelog, no date).

This issue has not been addressed and there is no information on the extent to which the affected devices and their systems are 'compromised'. Without knowing which constabularies use Reveal's systems, there is no way for the public to determine whether and to what degree they might be impacted. Most importantly, there was no way of determining whether this was confined to the devices themselves and not the operating (software) systems. If the public are unaware of the extent to which police in England and Wales use Reveal devices and which devices are affected, there is no way for them to organise and campaign for measures of recourse including pressuring their elected leaders to affect change.

While the topic of vendor reach, relations, and procurement is worth its own research project, a sufficient and nuanced examination raising all the associated issues falls outside of the scope of this doctoral research. A detailed examination was conducted, but the information gathered is admittedly haphazard and incomplete due to much of the information being outside of the public domain or obfuscated. Certain issues were flagged indicating the need for further research and examination. Obfuscation in combination with the nature of proprietary systems, globalised manufacturing, and unknown vendor relations with police organisations is a concerning topic, exacerbated by the vast amount of net spend on technologies. Once again, this element of this research echoes the former BSCC's sentiment in 2023:

> "The responses from this survey underline the fact that the more the police can do with public space surveillance, the more important it will be to show what they are not doing, to ensure trust and confidence. This will require trusted partnerships, with trusted partners working in a transparent and accountable way." (BSCC, 2023b: 4)

A systematic, multipronged research approach involving direct correspondence with police organisations and vendors and use of freedom of information requests, where such correspondence is not fruitful, is recommended. Especially, since the procurement process is (at the time of writing) currently undergoing reform.

4.3.2 Material differences between vendors

In terms of material differences between vendors which impact policing in England and Wales, it is relevant to discuss three developments in terms of design and functionality. Now that it has been established that the major providers of BWV technology to police in the region are Axon, Reveal, and Motorola Solutions, it is important to highlight the material differences across these major role players, which act as their unique selling points in this highly lucrative marketplace in the region. These material differences inform the descriptions and analyses presented in the subsequent findings chapters, specifically their relation to transparency and accountability and police protection.

a) Front-facing screen – Reveal Media

Reveal is unique in that their BWV devices have a front-facing screen which can display the image being recorded. The purported impact of this is discussed in further detail in subsequent findings chapter. At this stage, it is sufficient to mention that this is a unique selling point as few vendors have incorporated this capability. Various pages on the Reveal websites describe the feature as being 'unique' (Reveal, no date-a) and 'signature' (Reveal, no date-j) but a cursory search as to whether this constitutes a proprietary 'feature' (in the legal sense) did not return any conclusive information.

In 2018, Motorola Solutions offered a model of BWV device (Si500) which had a rotating ('articulated') lens would allow for the screen to be front-facing. According to their specifications sheet, it boasts a 'large screen with video preview mode for use as a deterrent' (Motorola Solutions, 2018b) This is distinct from Reveal's devices since theirs have two screens (one of which is always front-facing), while the Si500 has a single screen which can be switched to front-facing. It is unclear why this device was discontinued.

This front-facing screen is relevant to the findings in Chapter Six (Section 6.2.3) given that this design and functionality potentially influences the physical protection of police officers wearing the BWV device.

b) Real-time video analytics – Motorola Solutions

Motorola Solutions (MS) entered the visual surveillance marketplace by acquiring established companies. They began by investing heavily into video analytics, purchasing

Avigilon in 2018 for 1 billion US Dollars (Motorola Solutions, 2018a). They then bought into the BWV technology market by acquiring the parent company of Edesix (a UK-based company) in 2019 for $445 million (Insider, 2019). They completed their video analytics suite by acquiring Openpath in 2021 and Ava Security in 2022 (Motorola Solutions, 2023c) for $297 million and $388 million, respectively (Motorola Solutions, 2021a). As a result of the acquisitions totalling $2.13 billion, Motorola are, at the time of writing, the only vendor to offer first-party video data analytics which makes use of self-learning algorithms (Motorola Solutions, 2019) to monitor both fixed and body-worn video feeds ('Video Management Suite' integration) (Motorola Solutions, 2023e) and detect and notify users of persons and vehicles of interest (Avigilon, no date). Algorithmic analysis is an emerging technical functionality in BWV technology which is explored in Chapter Seven (Section 7.3.2).

c) Auto-activation accessories - Axon

While there are standard accessories as part of the BWV technical system such as docking stations, Axon was the first to introduce a unique accessory which had the potential to significantly shift the way police use their BWV devices. This shift is discussed in subsequent findings chapters, but at this stage, it is sufficient to explain that activating the recording of a device is currently a manual process - with officers deciding when to do so (affected by an organisation's activation policy). Devices used by police in England and Wales are placed into stand-by mode and recording begins when the user presses or slides a button on the BWV device, depending on the vendor and model.

Axon offered an alternative to this by developing magnetic sensors which, when triggered, automatically activate the device (begin recording). For instance, the sensor can be placed on a holster and when a Taser (conducted energy non-lethal weapon), CS/PAVA (carbon monosulfide/pelargonic acid vanillylamide) spray, baton, and/or firearm is drawn the device will automatically activate recording - if the officer has not activated the device already. These sensors can also be placed on the doors of police vehicles in which case the recording commences when the officer opens their door to exit the vehicle. This auto-activation can be considered a backstop ensuring that if officers haven't already activated the device during a crucial situation which is likely to be worth recording, that the device autoactivates and thus, there is evidentiary footage.

During an interview with a senior police officer, they indicated that this accessory has become so desirable and crucial for police organisations that Axon apparently removed the proprietary claim on the sensors allowing other vendors to manufacture a similar periphery. It was not possible to confirm this given the complexity of the intellectual property space. While it is difficult to verify the accuracy of this statement from the interview, Google Patents reveals that Taser International (now a subsidiary of and rebranded as Axon Enterprise) first attained a patent related to networking of Taser devices in 2006 (US 8166693B2) and later filed a patent for a holster sensor in 2014 (US987 9944B1, granted 2018). Yardarm Technologies later filed a series of patents (from 2015 onward) specifically addressing holster awareness and telemetry. Competitors such as Motorola Solutions and Audax integrate Yardarm's patented Holster Aware technology into their own BWV systems (Audax, 2023; Motorola Solutions, 2023a), while Reveal appears to have had this capability since at least 2017 (Police1, 2017), although whether this is proprietary or not cannot be determined from publicly-available data.

This sensor, an accessory providing additional functionality through auto-activation, is relevant to both findings chapters, as it potentially impacts officer discretion (in relation to transparency and accountability, discussed in Chapter Five) and officer protection (within the context of physical protection in Chapter Six).

Conclusion

This chapter has introduced the technology, the police, and the vendors (product information and distribution). It has provided information regarding the specificity of BWV technology as a technical system with its relevant material (design and functionality) components and discussed those historical and contextual elements of the social arrangements surrounding policing in the region of England and Wales.

The next chapter begins the second part of this dissertation and is the first of three findings chapters. It analyses the interview data and secondary sources to describe the impact of BWV technology on policing in England and Wales as it relates to the themes of transparency and accountability.

Chapter Five: Transparency and Accountability

Introduction

This research seeks to identify the impacts of BWV technology on policing in England and Wales. The interview data gathered contains deep strands related to the interconnected themes transparency and accountability. Moreover, the guidance documents introduced in the previous chapter heavily feature the themes of transparency and accountability, as potential benefits of BWV technology. This rhetoric is also mirrored in both academic interest and public discourse regarding the proposed benefits of BWV technology for the public, often in contrast to police benefits. Accordingly, the interconnected themes of transparency and accountability serve as a suitable lens to explore the impact of BWV technology on a police organisation (Peelford Constabulary) as well as policing more generally in the region, wherever possible. These themes were introduced and conceptualised in Chapter Two (Section 2.4.2) and, where relevant, components are reiterated in this chapter prior to embedding the theory into the empirical findings.

This chapter begins by exploring the link between transparency and accountability (as themes which emerged out of the interview data) related to policing and BWV technology. The bulk of this chapter describes and outlines the impact of the technology as it relates to these themes, specifically describing the emergent internal and external layers/mechanisms of supervision and scrutiny which are enabled and shaped by BWV technology. This draws extensively from interview data and is triangulated with secondary data sources such as independent reports (external governance) and organisational policy and regional guidance (internal governance). It is naturally followed by a discussion of the inherent and technical limitations of BWV technology-enabled police transparency and accountability and the potential implications of these emergent mechanisms.

Providing equal consideration to the materiality of technology is a core aim of this dissertation to address the gaps in the literature. However, one of the research aims was also to examine the impact, not simply the use (process) of police technology. Sufficiently describing and outlining the extent of the impact of BWV technology as well as limitations and implications required the full extent of this chapter. As it is, many of surrounding or smaller impacts could not be included. Accordingly, it was decided that a large section addressing the materiality of BWV technology and how it shapes the themes of transparency

and accountability, specifically the assessment of BWV footage, would be shifted to the epistemic chapter (Chapter Seven, Section 7.2). There, the materiality of BWV technology as it relates to the digital files produced i.e. BWV footage (central to transparency and accountability mechanisms contained in this chapter) are explored. Thus, this chapter appears more socio-legal in nature, and less technical, than subsequent chapters. When considered in isolation, the chapters have different flavours due to their particular focus (impact, process, and technology as a product) and the material that they mostly engage with. However, when taken together, the hope is that they meet the research aim of providing sufficient consideration of both the technical systems and social arrangements involved in the police adoption of BWV technology in England and Wales.

5.1 The link between BWV technology and transparency and accountability

From the outset, it is essential to map the rhetorical and historical link between BWV technology and transparency and accountability before progressing into the actual changes which have occurred.

Despite being trialled as early as 2005 in the UK, the role of using BWV technology for supporting trust, transparency, and confidence in state police would only be articulated in 2014. Trust, transparency, and confidence would later be rhetorically simplified and separated into the more tangible transparency and accountability which theoretically leads to improved levels of public trust and confidence in the police. Transparency and accountability (as is demonstrated in this chapter) are not merely rhetorically but instead have become codified, through regional laws, and embedded, through internal and external mechanisms – albeit variably across the region.

The first (both regionally and internationally) guidance document touched upon uses for professional development, stating that "increased use of these cameras has also allowed officers to develop their personal skills, aiding the professional development of newly appointed staff and their more experienced colleagues who can review their performance at operational incidents in detail" (PCSD, 2007: 5). However, there was no direct mention of increasing trust and confidence in policing nor mention of increased transparency and accountability. Instead, it was only formally articulated in the subsequent (second) UK guidance document released in August 2014 (CoP, 2014a: 3) - the final mention in a list of potential benefits. However, this shifted in 2013 when the Equality and Human Rights

Commission identified disproportionate policing of Black and Minority Ethnic groups and proposed systematic micro-monitoring of officer conduct (EHRC, 2013). This further intensified in 2014, during the Ferguson unrest in the United States, when policing faced a moment of crisis that arguably affected global public confidence.

The Obama administration called for significant financial subsidization of BWV technology for police organizations across the US (Time, 2014). It is possible that police in England and Wales witnessed the public support for such deployment of the technology and decided to shift their public rhetoric to justify the large expenses BWV systems. It is also possible that Axon (formerly Taser), a US-based vendor, may have played a large part in distributing this narrative shift given that, at the end of 2022, they have most likely become the largest supplier of BWV technology (according to number of devices) in the UK. While drawing causal links is impossible, there has been a significant rhetorical shift starting with the 2014 procedural document. The third UK guidance (NPCC, 2022) and subsequent annual releases place police transparency and accountability as a core benefit of BWV technology.

The regional guidance now places these themes within one of the four key Policing Principles for the overt use of BWV. Specifically, it is enshrined in 'Principle 4 – BWV is used to engage with communities to promote transparency and accountability'. The foreword of the 2023 guidance document was written by the then National Police Chief's Council's (NPCC) national policing lead for body-worn video, Acting Chief Constable Jim Colwell. In the foreword, he wrote that "body worn video has a vital role to play in building trust and confidence between our communities and the police and can offer a true and unbiased version of events. This is why *BWV plays a fundamental role in community scrutiny and allows us to be transparent and accountable* in our actions" (NPCC, 2023: 5; emphasis added). This is echoed in the latest guidance.

In terms of the academic research and literature on BWV technology, the potential benefit of BWV technology as a tool for transparency and accountability can be traced as far back as 2010, five years after the first BWV trial, four years after the first UK-based BWV technology provider (Reveal Media), and three years after the first regional guidance was released. In this, the earliest, article linking these themes with BWV technology, Harris (2010: 371) outlined many of the developments (wide-spread adoption, reliance, and varied uses) and the implications which have subsequently developed, stating that:

"We know one thing for certain: when a technology useful to law enforcement becomes available, law enforcement will attempt to make use of it. Head cams have arrived, and they can certainly serve a number of important functions for police officers and their departments. They can also serve other purposes. *Accountability of officers for their actions with citizens*-most of which would never have become visible in any way except via an officer's own written, and possibly self-serving, reports-is one purpose that leaps out at anyone looking for ways to assure greater compliance with the law in the course of enforcing it. No one would argue that BWV will solve deep-seated problems of police abuse or misconduct. Surely, however, having a permanent factual record of interactions between officers and citizens could at least help us begin to address the issues." (emphasis added)

Despite the initial benefits which were raised, there is a body of literature which raises several questions as to whether BWV technology can substantively improve transparency and accountability (see Newell, 2020 and 2021). Murria (2023) has recently produced findings which explore both the empirical and theoretical limitations of BWV technology on transparency and accountability for police in England and Wales as it relates to 'stop and search' powers.

Accordingly, it is necessary for this research to examine the impact on policing through these interconnected themes of transparency and accountability, exploring and analysing the changes as well as addressing the findings of researchers on the topic such as Murria (2023) and theoretical and practical concerns by authors such as Newell (2021) and those in their edited book (Newell, 2020). As will be evidenced, transparency and accountability are shaped and arguably, even enabled, by the technology, but have inherent limitations and are themselves shaped by the specific social arrangements of policing in the region.

5.2 New layers of supervision and scrutiny

The main finding related to impact of BWV technology on policing in England and Wales has been the emergence of additional layers of supervision and scrutiny. To evidence the 'newness' or development of these layers, His Majesty's Inspectorate of Constabulary and Fire & Rescue Services (HMICFRS, 2021: 19) indicated in their report entitled 'Disproportionate use of police powers' that:

"In almost all forces we inspected in our 2018/19 PEEL inspections, reviewing body-worn video footage was not part of structured internal monitoring processes, external scrutiny processes or regular debriefing with some supervisors. Only one of the 19 forces we inspected (Northamptonshire Police) included a review of body-worn video footage as part of its internal monitoring of stop and search. In five forces (Derbyshire Constabulary, North Wales Police,

> Northumbria Police, South Wales Police, Gwent Police), body-worn video footage was used as part of their independent external scrutiny arrangements."

An examination of interview data, police organisational policy, regional guidance, and regional laws indicates that there have been substantial shifts since this finding by the HMICFRS in 2018/2019. These will now be presented.

5.2.1 Internal use

The research data indicate that there are a wide range of internal uses of BWV footage within two police organisations (Peelford Constabulary and Bobbyham Constabulary – fictitious names) which participated in this research. These range from use of footage for training purposes, professional development (assessing whether a trainee student qualifies to become an officer), internal complaints mechanisms, for maintenance of professional standards by supervisors, and for information gathering and investigation by the detective unit. This illustrates a diffusion of technology (Rogers, 2003) within organisations (use expansion – more users and expanded uses) and not simply diffusion across organisations in the region (user expansion). An examination of organisational policy, regional guidance, and regional laws indicates that this expansion of use is not isolated to these organisations, but rather, is indicative of a broader development (or trajectory) within policing in the region.

Certain internal uses of BWV footage within a police organisation, although not accessible or visible to the public, do contribute to the discussion of transparency and accountability. They may not increase transparency of conduct outside of the organisation, but there is sufficient transparency within these mechanisms for internal, individual accountability to take place. While training and detection are interesting uses of BWV footage, it is the assessment of conduct captured in BWV footage that act as new layers of supervision and scrutiny, and these are enabled by BWV technology. Accordingly, BWV technology is a shaping force on policing in England and Wales related to transparency and accountability but is itself mutually-shaped (Boczkowski, 1999) by the social arrangements (organisational structure and policy as well as technology use expansion). Conceptually, it is important to note from the outset that these layers, acting as accountability mechanisms, constitute internal (Stenning, 1995), *individual* accountability (Uhr, 2001). All of this will now be described and examined.

a) Supervisory assessment of BWV footage

As was first highlighted by the Police and Crime Standards Directorate's (PCSD, 2007) regional guidance, BWV footage could be used for professional development to ensure standards are met and to resolve complaints. The guidance stated that "if BWV camera footage is available, it should be viewed by the supervisor receiving the complaint, who should ensure that the complainant is aware that the recording exists" (PCSD, 2007: 26). However, the interview data and an examination of organisational policy appears to indicate that there is an emergent blurring of the line between professional development carried out by a formal department and professional development as a function of police supervisors. One participant stated that:

> "Another kind of route that's going down is that supervisors will now have to review their officers' body-worn video, a lot more, randomly 'dip sample' while they're out and about once they've uploaded it, log in, review it." (Participant 1: Senior police officer)

'Dip sampling' is the random selection of footage and this form of selection matters given that, should an organisation's policy allow for this, officers using BWV devices would reasonably be aware that their uploaded footage might be viewed and assessed at any stage by their supervisor. However, given that these policies are not publicly available for all police organisations in the region, it is unclear whether dip sampling of *ALL* footage by supervisors is isolated to those progressive organisations or whether it depicts a unified vision/desire within the region to provide supervisors with greater review and monitoring powers.

Nonetheless, tracing the history of this development might provide insight into the direction (trajectory) and breadth of the development within the region. The HMICFRS' (2021: 20-21) report states that "forces should work to overcome any barriers to body-worn video footage being a regular part of internal monitoring and external scrutiny processes" and recommends that by September 2021 "forces should have a structured process for regularly reviewing and monitoring internally a sufficient sample of body-worn video footage to identify and disseminate learning and hold officers to account when behaviour falls below acceptable standards." In the report they cite CoP's (2016) updating of their Stop and Search Authorised Professional Practice (APP) in 2020, which calls for internal monitoring and external scrutiny mechanisms. The APP (CoP, 2016) provides that "there should be a transparent approach to the use of stop and search powers at individual, supervisory, force

and public scrutiny levels" and that "supervisors must monitor the use of the powers by those for whom they are responsible and address any issues identified." While this is limited to footage related to special use of police powers (stop and search), it is important to note that APPs are binding upon police organisations, providing them the legal weight to shape organisations as opposed to regular guidance for consideration. Notably, this APP provides a clue that this developing reliance on routine supervisory assessment of footage stems further back to 2013, with the release of the Equality and Human Rights Commission's (EHRC) report on racial disproportionality of stop and search entitled 'Stop and think again' (EHRC, 2013).

The EHRC report concluded that the disproportionality of incidents was itself disproportionally distributed across police organisations, with some organisations being largely responsible for skewing the overall results in the region (EHRC, 2013: 4). The report also concluded that its findings suggested that addressing this conduct at a local level or by individual had a significant impact (EHRC, 2013: 16 & 39). In their conclusion, they professed that one of the 'key steps' taken by those police organisations (who were responsible for much of the disproportionality) was "micro-monitoring to identify those 'outlier' areas and individuals with skewed race distributions which are driving overall disproportionality, to challenge them to account for their patterns" (EHRC, 2013: 40). This idea of micro-monitoring seems to be the driving force for supervisors being key role players in the assessment of footage. This development has subsequently become enshrined in legislation, with Section 5.1 of the Police and Criminal Evidence Act 1984 (Code A) providing that:

> "Any misuse of stop and search powers is likely to be harmful to policing and lead to mistrust of the police by the local community and by the public in general. Supervising officers must monitor the use of stop and search powers and should consider in particular whether there is any evidence that they are being exercised on the basis of stereotyped images or inappropriate generalisations. Supervising officers must satisfy themselves that the practice of officers under their supervision in stopping, searching and recording is fully in accordance with this Code."

POLICY AND PRACTICE WITHIN THE REGION

Based on an examination of a handful of these policies, there seems to be a disparity regarding the 'dip sampling' of all footage (which is currently recommended 'best practice'), not solely 'use of force' or 'stop and search' (which is legally binding). In the region, certain police organisations have their BWV policy hosted on their website while other policies are

available through FOI requests which have been archived on civilian websites making it challenging to establish a broad picture with isolated bits of information. Nonetheless, it is important to make sense of this development and to discuss potential implications in a later section. For example, an archived FOI disclosure (last reviewed May 2024) containing Kent Police's (no date) BWV policy states that "supervisors will review BWV on a regular basis and as they feel appropriate or necessary as part of their supervisory role." This demonstrates clearly that, according to their organisational policy, supervisors have full discretion to randomly select footage for assessment and does not limit it to specific types of incidents or use of special powers. As an aside, Kent's BWV policy was listed as 'Promising Practice' by His Majesty's Inspectorate of Constabulary and Fire & Rescue Services (HMICFRS, 2023a: 14) given that it effectively specified when and how to use BWV technology. This might indicate that their policy is a progressive example within the region.

West Midlands Police (WMP, no date) have taken this further by previously claiming that their policy has been for supervisors to review *all* (not simply random sampling) footage relating to stop and search involving use of force (in line with the legal provisions), stating that "as part of our commitment to transparency and accountability, supervisors have been using Body Worn Video to review every use of force. Over the past two years, this approach has resulted in a significant drop in the use of force without any reduction in officer safety." It must be noted that this cannot be confirmed given that WMP do not provide their policy on BWV use via their website and their policy which was released via a FOI request in October 2022, relates solely to operational use of the device and does not indicate how BWV footage is used internally or externally. Finally, the section quoted above has subsequently been removed from their webpage and their Police Race Action Plan makes no reference to supervisory review policy.

West Yorkshire Police (WYP), via their BWV policy on their website, similarly indicate that supervisors are allowed to review recordings (it seems to imply that this is random), while their Professional Standards Directorate may not, unless there is cause to do so. They state that "supervisors/senior leaders are responsible for reviewing recordings of incidents to aid development, i.e. assessing the employee's performance and supporting improvements" and that "Professional Standards will not routinely, or without cause, conduct checks of the system in relation to BWV to monitor policy compliance" (WYP, no date).

Earlier versions[1] of the Metropolitan Police Service's (MPS) BWV guidance included a section on Professional Standards Investigations, which stated that "investigators should only access footage for professional standards purposes where there is a clear and justifiable need to do so. Examples of this include - specific investigations, identified patterns of complaints in respect of a particular officer or where specific intelligence has been received that would indicate that viewing of BWV footage is proportionate and necessary" (MPS, 2014: 19). The MPS guidance indicates that there is room for investigators and management to assess footage, but that this is not random. Rather, selection must be supported by other evidence indicating suspicion i.e. the reason for viewing of footage is clear and justifiable.

Essex's Police's (EP) BWV operational policy, included in a FOI disclosure in October 2022, provides the clearest guidelines on the division between professional development/standards and supervision as well as a potential explanation as well as specific examples for professional standards assessing footage. Under Section 3.22 entitled Use by Professional Standards Department (PSD), they state that:

> "Essex Police PSD will not dip sample or routinely view BWV footage material. *BWV footage is subject to the principles outlined in the Data Protection Act.* This prohibits the random dip sampling of retained footage other than *for supervision* and/or investigation purposes as outlined above. …*Footage from incidents can be used to identify poor performance and learning opportunities.* …PSD Investigators should only access footage for professional standards purposes where there is a clear and justifiable need to do so." (EP, no date; emphasis added).

This policy appears to be at odds with itself. Stating that the Data Protection Act (DPA) prohibits random selection without a clear and justifiable need, but it includes the assertion that footage can identify poor performance – which could, arguably, meet this requirement. Especially, and this is the second respect, since the next section of 'Supervisory Viewing' indicates that there are benefits to supervisors reviewing footage as a supervisory tool. It states that "it is expected that supervisors should consider reviewing BWV footage relating to their officers as a supervision tool and as a means of improving performance or to identify training needs. This is especially important in areas such as stop & search (sic), where improved performance will increase community confidence."

Given that there is purportedly a benefit to reviewing footage, it begs the question why the DPA would preclude professional standards from dip sampling or routinely viewing footage,

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[1]An FOI disclosure, previously hosted on MPS' website, containing an updated version (5.2) dated 25 June 2021 has subsequently been removed.

but not supervisors. The distinction between supervisors and professional standards then could be the severity, in terms of outcome, of the review process. However, if a supervisor does detect a serious breach of procedure (misconduct), one would reasonably assume that this would trigger professional standards being alerted and an investigation would be initiated. This is something worth examining in future research to potentially identify whether there is a cultural/organisational reason for the hesitance to allow an external department to regularly and randomly selecting footage for assessment, especially considering the proposed benefits and needs (i.e. improving community trust and confidence).

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By way of capturing a snapshot of an incident by producing footage, BWV technology has enabled the assessment of footage. Use in this regard has expanded (use expansion) over time. The examples provided and described above reveal that although there has been an emergence of supervisory powers to review footage since the introduction of BWV technology, the broad discretionary nature of policing (operational independence) in England and Wales has resulted in variance across the region. Accordingly, while BWV technology as a technical system has enabled increased supervision, the social arrangements of policing (particularly the respective oversight mechanisms) have themselves shaped the impact of BWV technology across the region. This section reveals that these social arrangements are not static but evolving over time.

To ascertain the future trajectory of this impact, one might refer to regional guidance, which acts as 'best practice'. Such an undertaking indicates that there is a desire, from those who function as internal oversight within the region (the BWV lead on behalf of the NPCC), to move in the direction of increased supervisory powers for assessment of footage. While the NPCC's (2022: 30; 2023: 41) BWV guidance both indicate that "the review of BWV footage can help improve the professionalism of policing and provide a powerful tool for behavioral change and continuous improvement", it is in the amended version of the guidance document where they expand upon this by stating that "supervisors are encouraged to conduct regular reviews of their officers BWV, as this is an effective way of ensuring their officers are using BWV to record their policing encounters, and to maintain compliance with force policy and professional standards" (NPCC, 2023: 41). Crucially, the updated/latest guidance retains this section (NPCC, 2024a: 49), adds that "to ensure the public's trust and confidence in policing's use of BWV, strategic leads need to ensure that they are monitoring and dealing

with any incidents that may adversely affect this." This trajectory of increased emphasis on the role of supervisors was driven in large part by a 2022 'stop and search' report by the Independent Office for Police Conduct which provided 18 recommendations, some of which were directed towards the BWV policing lead in the region. This is further detailed in a later section (Organisational accountability).

In addition to the encouragement for supervisors to conduct regular reviews, the NPCC's (2023: 41) amended guidance immediately continued, stating that "any non-compliance with force policy in relation to not using BWV correctly or mismanaging the information should be investigated thoroughly." This organically leads to the next section where the footage storage system itself, not only the footage it contains, enables supervisors to monitor the officers under them, particularly those officers' use of the BWV device and storage system.

b) Digital evidence management systems and supervision

The previous section concerned the increased supervision focused on BWV footage, specifically the assessment thereof. This section relates to digital evidence management systems (DEMS), specifically their auditing functionality and data management/user interface design. In the previous chapter, BWV as a technical system was described as having a DEMS which hosts and manages the BWV footage. This section describes how the materiality of the BWV technical system, in terms of its capability with DEMS, is a factor shaping the impact on police transparency and accountability.

Peelford Constabulary, as the primary participating organisation, was making use of Reveal Media's systems. However, in-depth technical information on Reveal's proprietary DEMS (DEMS 360) was not publicly available. Nonetheless, such detailed information on system functionality was gathered from Axon - who are more transparent about their system design and functionality – which serves as an illustration. While the DEMS 360 was demonstrated to the researcher during an interview, the transcription does not capture the full extent of what was visually shared.

In the case of Peelford, BWV footage which is not marked as evidentiary will automatically delete after 31 days. This is in accordance with the latest regional guidance which provides that "all BWV files uploaded to the digital evidence management solutions (DEMS), should have a default handling position of automatically deleting after 31 days, to comply with obligations under the [Data Protection Act 2018] and [UK General Data Protection

Regulation]" (NPCC, 2024a: 40). Despite the limited retention of non-evidential footage, their DEMS, which is used to store and manage all their BWV footage, maintains a digital record/audit log containing information about the footage (metadata) such as when (and potentially where if the device was GPS-enabled) it was recorded and by whom, how it is/was stored (evidential or not), and who accessed it. This too is in accordance with regional guidance (NPCC, 2024a: 41) which states that "a BWV management platform must be able to provide a full audit record for every BWV file, both master and evidential clips, and be capable of meeting the logging obligations in accordance with Section 62 of the DPA 2018 (to log the collection, alteration, consultation, disclosure, transfer, combination, and erasure of any data)." Moreover, earlier in the guidance (NPCC, 2024a: 13), there is provision for additional considerations to comply with data protection legislation:

- "Securely hold all recordings in accordance with force procedures, with access to these recordings being controlled and fully auditable. All actions within the platform to be fully logged.
- Retain records of metadata, and details of disposal of any non-evidential recording."

Evidently, while footage itself might no longer be retained, a perpetual record remains and this indicates that a recording was made with its respective metadata. This functionality is contained in Reveal's (2021b: 4) technical document, which specifies that their proprietary DEMS 'securely store[s] all media with a unique footprint' and 'keep[s] track of any action performed in the system with an extensive audit trail attached to all digital evidence.'

This functionality of DEMS was also indicated by a participant from Bobbyham Constabulary concerning their use of Motorola Solution's CommandCentral DEMS:

"From other inquiries, that I get sometimes, very serious offences, sometimes less serious offences, but of course they're all serious to the victim. People said, 'I'm struggling to find this, I'm struggling to find that' and when I look, I can tell from the audit record that a recording was made, but it's autodeleted after ninety days, and it's gone." (Participant 6: BWV platform lead)

This intersection between user interface design (specifically search functionality) and audit functionality enables the examination of officers' recording histories, thereby facilitating the monitoring of compliance (or non-compliance) with organisational recording procedures, particularly activation.. For instance, given that regional laws dictate that all use of 'stop and search' powers must be recorded, a manual (or keyword or data-and-time) search for such incidents would indicate whether footage had been recorded and saved. Accordingly, the functionality of DEMS not only enables users to identify an absence of footage where policy

dictated there needed to have been (incident-specific non-compliance), but also to assess officers' recording history, more generally. This issue can be extended to identify a trend in their individual BWV use.

Based on interview data, Peelford were auditing compliance within DEMS, although whether this was a regular, systematised occurrence or simply an acknowledgement of such a capacity is not possible to discern from the data.

> *You only have to look at kind of a DEMS system to see 'Well actually, they haven't recorded in months. Oh, OK, this is part of the bigger picture.'* And you'd hope that we could bottom out pretty quickly and we could refer on any kind of issues to our kind of internal investigation department as well, just to start internally monitoring ourselves, scrutinize ourselves as well." (Participant 1: Senior police officer; emphasis added)

> and

> "I'm of the opinion that a lot of people are still doing it well. And we tend to give out blanket warnings to everyone about 'Oh, you know we're aware of this, and it needs to improve.' *But I think we're at position now where I can identify individuals*, and my preference would be to address individuals rather than keep giving the same key messages to many, many, many people, most of whom are actually doing it right. And I'm sure that probably reflects itself in various ways across many forces." (Participant 2: Senior officer; emphasis added).

Axon advertises using the data contained in an organisations DEMS, providing that 'analytics and audit tools enable admins to monitor system usage' (Axon, 2024d). It then offers a subscription service which can aggregate analytics on use, claiming that Axon Performance 'equips law enforcement supervisors with actionable insights into body camera activations to proactively drive policy compliance and accountability.'

Such functionality of DEMS allows for both individual cases to be identified but also suspicious patterns. This capacity is reflected in Essex Police's policy which states that "supervisors and accredited detectives must include a written reference to the existence or non-existence of any BWV footage within their Case Action Plans (CAPS) recorded in the Athena investigation review tab" (Essex Police, no date). Given that Essex Police contract with Axon (Essex Police, 2020), if they were inclined, they would be able to use Axon's subscription service which provides metrics on use of their BWV devices and systems. Specifically, Axon (2024a) provides that "with Axon Performance, supervisors and compliance teams are able to streamline the review process through randomized or priority ranked video audits."

Kent Police (no date), also contractors of Axon, extend upon this in their policy by providing that "supervisors will review BWV on a regular basis and as they feel appropriate or necessary as part of their supervisory role. Where continued non-use of BWV without justification is identified or non-management of their DAMS [sic] account/digital assets, it will be addressed as a developmental issue and appropriate supervisory action taken." Accordingly, the functionality to indicate non-compliance (isolated incidents and a broader trend) through DEMS exists in addition to organisational use policy with expectations for the recording, monitoring, and investigation of non-compliance.

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In comparison to the supervisory assessment of footage, there is even less data to generalise the impact and suggest that this functionality, enabled by DEMS, is increasingly being used by police in England and Wales currently. The latest regional guidance on BWV use tangentially touches upon this functionality of DEMS when discussing the misuse of BWV, stating that "the unauthorised viewing and sharing of footage is a data protection breach and should be dealt with accordingly. *The full audit and logging system of DEMS platforms can assist with proving this. Forces should try and be proactive in monitoring their BWV platforms to identify misuse, and technology can assist in this*" (NPCC, 2024a: 49; emphasis added). Nonetheless, the capacity (potentiality enabled by DEMS), examples of organisational policy, and general guidance exist to evidence that this is an emerging practice within the region.

These findings reinforce those of Terpstra et al. (2022) involving US police organisations, which is the only study to have focused their examination on police use of DEMS. They found that 26% of the agencies (36) in the US that responded to their survey were reviewing the metadata of their systems. In the 'policy and research implications' section of their report, they state that:

> "The report demonstrates that small, medium, and large policing agencies are following their internal policies by *monitoring and tracking compliance* with activation, uploads, and categorization of video footage. Importantly, these agencies are using footage for important public policy concerns – investigating use of force, resolving citizen complaints and for performance evaluations. They are releasing footage to the public as well. These are important considerations and show *how agencies are responding to the need for accountability and transparency*". (Terpstra et al., 2022: 10; emphasis added)

Interestingly, Terpstra et al. (2022) found associations between the size of the organisation, the maturity of the program, and analysing metadata. This might explain why Peelford (as a relatively large organisation) which had been using BWV technology since 2016/2017 stated that they were able to discern behavioural patterns from the metadata of their DEMS system.

While analysis of metadata is difficult to establish in the region, there have been cases of identified misuse of footage which was enabled by the DEMS system in Northern Ireland (part of the UK, but not part of policing in England and Wales). During a separate investigation being conducted by Northern Ireland's Police Ombudsman, this independent party found that 74 police officers had accessed a particular piece of footage without a legitimate policing purpose (Police Ombudsman for Northern Ireland, 2024). This shows how the audit logs of DEMS can identify the behaviour of those recording as well as those who accessed the footage. Interestingly, the Ombudsman provided a recommendation for a 'dip sampling' exercise to "evaluate the scale of unauthorised access to the body-worn video system." However, no further information is available.

5.2.2 External use

The first section on the emergent layers of scrutiny related to internal uses of BWV technology expanding across police organisations in the region. This section addresses the emergence of external scrutiny mechanisms which have been enabled and are shaped by police organisation's adoption of BWV technology.

Independent scrutiny

Within the governance framework of policing in the England and Wales described in the previous chapter, there are two external (arm's length degrees of independence) organisations which provide oversight on police constabularies in England and Wales on behalf of the public. Described as one of the Government's arm's length bodies (ALBs), the Independent Office for Police Conduct (IOPC) (replacing the Independent Police Complaints Commission in 2018) was established by the Home Office (Home Office and IPCC, 2018). The IOPC's mandate is to investigate serious complaints against the police, and describe themselves as completely independent of them (IOPC, no date). It is their independence from government which is potentially more of a concern given that this organisation is currently undergoing reform (awaiting a White Paper at the time of writing) after an independent review, initiated by Home Office, found issues regarding its governance

structure and a threefold increase in referrals, with less overall independent investigations being conducted (Home Office and Cleverly, 2024).

The other independent body is His Majesty's Inspectorate of Constabulary and Fire & Rescue Services (HMICFRS), which does not describe itself as an independent body, but does state that they conduct independent assessments (HMICFRS, no date). They deal with the operational aspects of police constabularies (as one section of their mandate) and report to a member of the Home Office (HMICFRS, 2019). They provide regular police effectiveness, efficiency, and legitimacy (PEEL) Assessments and release reports. These reports and assessments have been referred to throughout the chapter thus far and they indicate that the functionality, use, and policy regarding BWV technical systems of police organisations impact their ratings.

The Information Commissioner's Office (ICO) also serve an external role to monitor and enforce (audit) the DPA 2018 and UK GDPR and to provide guidance to law enforcement (ICO, no date). The ICO has provided substantial guidance on BWV system requirements (such as encryption and sharing) and retention, which has been incorporated into NPCC procedural guidance documents.

EXAMINATION OF BWV FOOTAGE AND DIGITAL EVIDENCE MANAGEMENT SYSTEMS

As aforementioned, BWV footage and DEMS has enabled additional forms of supervision and scrutiny. When the IOPC conducts investigations on police organisations, they provide that BWV technology is reviewed. This includes auditing systems and watching BWV footage. In their report on Stop and Search (IOPC, 2022: 29), they state that "BWV is a rich source of information, which enables post-incident reviews, complaints resolution (including those dealt with by the IOPC), effective scrutiny, as well as identifying valuable lessons to improve police-public interactions." There are also indications that the IOPC has 'dip sampled' footage recorded by officers to assess their interactions with the public, stating that "to consider the concerns around discrimination, we looked at comparative evidence, including sampling clips from the officer's BWV footage of previous interactions with other members of the public" (IOPC, 2020).

Previously, it was described how the Police Ombudsman for Northern Ireland (their version of the Britian's IOPC), made use of the Police Service Northern Ireland's DEMS system to

identify misconduct in the form of officers accessing footage where there was no legitimate police purpose (Police Ombudsman for Northern Ireland, 2024). There is evidence that similar system auditing takes place in England and Wales. While the incident did not involve misconduct, the IOPC did identify that BWV footage had been reviewed outside of binding Authorised Professional Practice (APP) governing the procedure of Post Incident Process (PIP) (IOPC, 2020b). Accordingly, while investigating cases, the IOPC have been reviewing the audit logs of DEMS systems.

ORGANISATIONAL ACCOUNTABILITY

The most crucial aspect to note about the IOPC's historical role as a governance body, independent from police organisations, has been their provision of organisational recommendations when investigating complaints. While they have held individual officers to account arising from investigations into public complaints, they have, in addition, identified when the outcome can function as an 'organisational learning' opportunity. When these have been identified, they are shared with the police organisation as a 'Recommendation' and published on the IOPC's website. Importantly, the responses of the police organisations (whether it was accepted and how they have implemented the recommendation) are also detailed, which offers insight into the impact that this scrutiny has on the organisation.

Pertinent examples include recommendations for both extension of the use of BWV technology and amending BWV policy. These include that the respective police organisation should:

- "amend their 'Body Worn Video Policy (BWV) and Procedure', to include direction for officers around use of body worn video in the post-incident process" (IOPC, 2023a);
- "review and amend their body worn video (BWV) polices to ensure they are consistent and explain any differences. They should also ensure their policies are in line with relevant national NPCC guidance." (IOPC, 2023b);
- [Police Organisation's] "Body Worn Video (BWV) policy should be amended to allow recording in the back of ambulances to ensure that any actions taken during conveyance to hospital can be accurately documented." (IOPC, 2023c);
- and "The IOPC recommends that the National Police Chiefs' Council (NPCC) lead for Body Worn Video (BWV) sends a message to all force BWV leads suggesting an update to their policies" (IOPC, 2021).

In 2020, the IOPC launched an independent investigation into 'stop and search', providing a report in 2022 which included 18 recommendations (IOPC, 2022). These supersede

organisational recommendations as they provide regional change. This report is crucial as it provides insight into the development of the supervisory role in assessing BWV footage (as it relates to stop and search) discussed in the previous section. In the report, the IOPC (2022: 32) recommends that "the NPCC supports Chief Officers to take steps to ensure that the structures they have in place facilitate appropriate monitoring and supervision of the use of stop and search powers, and that supervisors are allowed the time and are sufficiently trained to perform their supervisory duties."

The response from the NPCC and CoP provides specific actions including that:

> "The College will review current activity within forces piloting the use of procedural justice approaches by supervisors, with assessment considering the identification of trends, the impact on officer behaviour, communication and empathy. The College and NPCC leads will work with forces to establish a procedural values approach for supervision that goes beyond assessment of lawful activity, focusing on the fairness and respect in the use of police powers" (IOPC, 2022b).

The recommended power for supervisors to regularly monitor BWV use (for all incidents, not just 'stop and search') was introduced the following year in the NPCC's (2023) regional guidance. This was echoed in the 2024 guidance. Accordingly, recommendations from the IOPC regarding BWV use has seemingly shaped the impact of said technology on police transparency and accountability in the region.

Evidently, these existing external layers of scrutiny have benefited from the availability of BWV footage and DEMS (meta)data for the investigations and assessments. They have themselves contributed towards greater impact by recommending increased supervision. As important governance structures constituting social arrangements of policing in the region, there is evidence indicating that they have historically provided recommendations and assessments which have impacted the use and policy of BWV technology, often pushing for increased use and sharing of information with the community. Consequently, they have been key players and indicate the balancing act between police as users and controllers of the technology and the data it produces and the public as (in theory) funders of the technology and subjects of recording and police interactions. With these organisations pushing for increased police use (complete recordings of more cases) and disclosure of footage for the public scrutiny. Whether it is this trend that has resulted in the IOPC undergoing reform is worth researchers paying attention to.

What matters most however, in the next section is that investigations into individual complaints/incidents (individual accountability) provided opportunities for broader impact to be made (organisational accountability) – based on Uhr's (2001) conceptualisation of accountability mechanisms. This is pertinent to the untapped potential of community panels which are discussed next.

Public scrutiny: The rise of Community Scrutiny Panels

The previous section of external scrutiny by independent bodies revealed calls for increased use and disclosure to the public, and this naturally leads to the final layer relating to BWV technology and policing through the lens of transparency and accountability.

According to the College of Policing (CoP, 2016), community oversight has two components, namely community engagement and independent scrutiny. Community engagement derives from the legal requirement for police to engage with local communities as enshrined in Section 34 of Police Reform and Social Responsibility Act 2011. Independent scrutiny stems from the requirement under Section 5.4 of the Police and Criminal Evidence Act 1984 (Code A) which states that "in order to promote public confidence in the use of the powers, forces, in consultation with police and crime commissioners, must make arrangements for the records to be scrutinised by representatives of the community, and to explain the use of the powers at a local level." Police organisations have historically met this requirement by establishing various community scrutiny arrangements (CoP, 2016).

The latest arrangement which relates to BWV technology is the emergence of external scrutiny panels comprised of members from the local communities. This formation of external scrutiny panels has been referred to by various names. For example, The Metropolitan Police refer to them as Police Encounter Panels, Merseyside Police as Public Scrutiny Panels, and greater Manchester Police as Independent Community Scrutiny Panels. According to the draft guidance, on their establishment and management, by the NPCC and CoP (2023), these panels are officially being referred to as community scrutiny panels (CSPs) – and will henceforth be referred to in this manner.

Participants from Peelford Constabulary have purported that these panels were established to sample BWV footage and for the community to provide feedback on the ways in which the police officers were behaving in the footage. These panels are constituted by a

chairperson and interested parties from the communities within the jurisdiction of the respective policing organisation. It is important to note that unlike internal panels, these panels are made up of members who, although having an interest in policing in their community, do not necessarily have a policing background.

> "As well as that, we have a number of governance and scrutiny panels which are made up from members of the public who have expressed an interest in being part of those governance and scrutiny panels. They're subject to a professional conversation to understand their motives as to why they were going to be part of that panel, but they're invited to come along and review policing activities. That could be a random dip sample of stop and search encounters, for example, to make sure that the officers have acted proportionate, legitimate, necessary, that they've followed policing procedures and that they've been civil, courteous, where necessary, they've used appropriate levels of force, that kind of thing. *So that reassures the public that we're policing effectively. And that our offices are not abusing the powers that they've been granted.* Those panels will report back." (Participant 3: senior police officer; emphasis added)

This can be conceived of as bringing the community's perspective into the police organisation and giving the community access to seeing how policing is carried out locally. The regional police ombudsman similarly concludes that:

> "body-worn video footage, if made available to the public as part of a structured process, could open up policing to wider scrutiny, to help improve encounters and reassure the public. Given the concerns of communities, consideration could be given to creating a separate panel of independent community representatives whose sole responsibility is to review body-worn video footage at regular intervals and when specific incidents take place. They would observe the raw reality, including examples of positive policing, sometimes in extremely difficult circumstances, but also behaviours and cultures that need to be challenged and changed. Forces could then use the panels' observations to improve the behaviours of officers and staff." (HMICFRS, 2021: 20).

Examples of these outcomes are demonstrated by Devon and Cornwall Police (DCP), the BWV lead organisation in the region, which has done significant work to open the internal workings and findings/outcomes of these panels. Providing the panel with its own website, they host reports on the meeting minutes, feedback provided, rating of the interaction, and suggested outcome or information requested from the panel. Two contrasting examples are provided below (Devon and Cornwall Community Scrutiny Panel, 2024a; 2024b):

FIGURE 5 INDICATION OF POSITIVE OUTCOME OF BWV FOOTAGE ASSESSMENT.
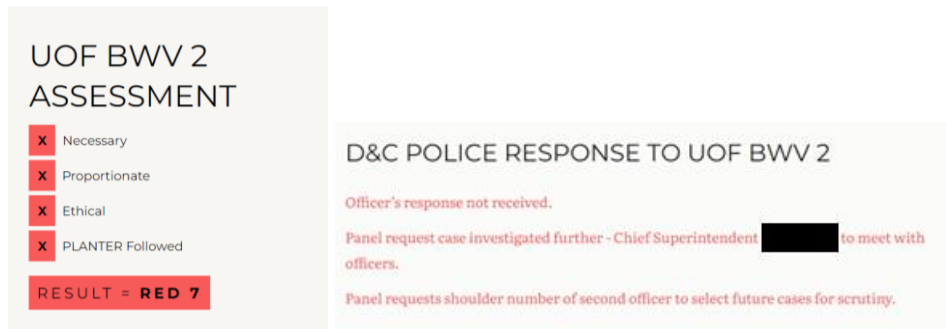
FIGURE 6 INDICATION OF POOR OUTCOME OF BWV FOOTAGE ASSESSMENT.

These two outcomes provide an indication of the potential impact of feedback. In the instance that an officer's actions were justified, and where they did follow procedure, there is a mechanism for providing positive feedback to the officer. Conversely, the panel can request that the case be investigated further, and it also indicates that the panel are willing to request an officer's employee (shoulder) number to be able to select more of their footage for scrutiny in the future.

ANSWERABILITY AND INDIVIDUAL ACCOUNTABILITY

These community panels or platforms can bring about a particular nuanced form of transparency and accountability. Specifically, by having police representatives at these panels and having to explain why the officer might have acted in a particular way and based on what information, the community is able to gain insight into the decision-making criteria or cultures within their local police. Thus, there is theoretically a record of the incident (even if it is perspective-limited to the officer's BWV device) meeting both the criteria of 'account ability' (Ericson, 1995) and answerability (Uhr, 2001).

The establishment of these external panels means that the public, to a degree, has an oversight function and can call for individual officers to be held accountable. Specifically,

where the panel concludes that there is potential misconduct, they can evidently request that the incident be investigated further. It is crucial to note that this accountability function is also individual conceptually i.e. it is individual behaviour which is being targeted. This becomes relevant, and is discussed further, in the next session.

Based on the conceptual discussion of transparency and accountability in the previous chapter, these CSPs constitute external accountability and answerability. Despite the conduct contained in the BWV footage belonging to a member of a particular organisation, the remedies act in such a way that they are limited to individual accountability.

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While these CSPs, aside from those panels specific to use of force and stop and search, have been established by certain police organisations for some time, there has not been set guidance on how they should be established and run. The CoP have guidelines for meeting the requirements of principles such as independence and representation for stop and search related panels, but there is no set guidance on how they are to be managed and the exact nature of the content which is presented to the members. DCP indicate that they were one of the first to establish a CSP, dating back to 2020 (Devon and Cornwall Community Scrutiny Panel, no date). Senior officers at Peelford, who participated in the research and were also early adopters of CSPs, indicated that this would hopefully change.

> "Most forces already do them. The problem is there's no set guidelines on how to do them. So, every force has done it slightly differently. [Peelford Constabulary] we're really lucky, and I'm probably quite biased in that we were one of the first to do the completely independent community panel…So to me, I'm like 'what do you mean you don't have a community scrutiny panel?! Like, we've had one for ages and it's run really well, it's really kind of impactive, and it's useful.'….But this minimum standard standards framework is full…basically some guidelines for all forces to follow. *The intention of it is that it will be made legislation, which means forces will have to follow it. Which is good because if forces are given guidance, they tend to get 'ohh, we might do it, but we might not. It's a lot of time, it's a lot of effort.' If it's made legislation, they have to do it*….That is the, that's well, that's the gold standard that everyone's hoping for. Whether it ends up being legislation, I don't know. If not, it will be Home Office Guidance that would publish to all forces, and it's in their best interests to set up a community scrutiny panel in order to fulfil the recommendations from the Police Race Action Plan." (Participant 1: Senior police officer; quotation trimmed and emphasis added)

However, the establishment and management of these CSPs resulted in guidance being produced and released, not by Home Office but instead by the NCPP and CoP jointly. Such

guidance is not an APP, nor does it form part of legislation, but instead remains a recommendation currently i.e. 'best practice' in the region. While it may result in best practice recommendations, it falls short of establishing cohesive community transparency and accountability mechanisms for the region. While there are regional laws requiring the establishment of CSPs assessing police use powers, the granular detail on how these CSPs are conducted remains guidance. As has already been shown, where there is organisational discretion, a strong degree of variance tends to develop in the region. The current management of CSPs is not an exception to this. Regional guidance on BWV use provides basic information on CSPs and states that more detailed guidance is being prepared (NPCC, 2024a).

It may be of value to propose areas of interests which guidance could address. Firstly, guidance could categorise their practice into 'minimum standards', 'guidance on best standards', and 'forward-looking practice' which would serve to indicate to organisations, decision makers, and the public the trajectory of police use of BWV technology in the region. Given that the guidance has seemingly become annualised (switching away from seven-year gaps between them), organisations now know ahead of time which direction they ought to be developing their policy, internal and external mechanisms, and technical systems to meet those higher standards or at least ensure they are on the necessary trajectory to avoid falling into the minimum standards category. Currently, there is no structured way of transparently disclosing the progressive principles which certain organisations are hoping to achieve. Furthermore, this endeavour could be paired with the HMICFRS assessing a technological component related to organisational policy, mechanisms, and systems and rank them as they do other aspects of policing - as depicted in the screenshot below, taken from their website (HMICFRS, no date).

	Providing a service to the victims of crime	Recording data about crime	Police powers and treating the public fairly and respectfully	Preventing and deterring crime and antisocial behaviour, and reducing vulnerability	Responding to the public	Investigating crime	Protecting vulnerable people	M: offer su
Avon and Somerset	Ungraded	Not inspected	Good	Good	Requires improvement	Requires improvement	Requires improvement	R imp
Bedfordshire	Ungraded	Good	Adequate	Adequate	Adequate	Requires improvement	Adequate	A

FIGURE 7 IMAGE OF SECTION FROM PEEL ASSESSMENTS 2023–25.

The second recommendation is to address the gap of organisational accountability. The IOPC examines individual incidents and yet it also aims to identify 'organisational learning' opportunities. Accordingly, it sees individual issues as potentially being indicative of larger systemic issues and uses these as opportunities to recommend change/improvement, in both policy and practice. Embedding this approach to the individual cases assessed by CSPs allows for more impactful community engagement, potentially creating meaningful change in how the community is policed. This is discussed in further detail in the next section.

This chapter thus far has, through the themes of transparency and accountability, highlighted specific impacts of BWV technology on policing in the region, more generally. Namely, the emergent layers of supervision and scrutiny which have been enabled by the footage produced by BWV devices and the (meta)data generated by and contained within BWV DEMS. A complex interplay between the technical system and the social arrangements within the region has been identified and described. More specifically, the impacts which have been enabled by BWV technology are themselves shaped by organisational discretion paired with the internal and external governance frameworks operating in the region. Where there has been oversight, the impact has been more generalisable across the region, whereas where there is discretion, there has tended to be a variance in the implementation and policy.

Now that the impact of BWV technology and the social arrangements have been discussed, the next section discusses the limitations and potential implications of BWV technology on police accountability and transparency in the region.

5.3 Social arrangements shaping BWV technology's impact on policing

This section discusses the ways in which the social arrangements relating to policing in England and Wales mutually shape BWV technology, particularly, constraining the impact it has on police transparency and accountability.

5.3.1 Limitations on transparency

Police as operators, controllers, and gatekeepers

It is clear from the respective legislation, that the police organisations capturing footage through BWV devices are the 'owners' of that footage. The same is true for the (meta)data

generated by and contained within DEMS. Additionally, it is the police organisations which decide what information to release to the public. These are inherent elements of the police technology environment given that it is the police who select, procure, operate, and maintain the technical system. The discussion below illustrates that there had been a shift, in the social arrangements, in an arguably positive direction towards releasing BWV footage and associated information through legal mechanisms, for media/publicity purposes, and towards increasing external community scrutiny.

According to the Data Protection Act (2018) and the General Data Protection Regulation, the police organisations are the data controllers of the information captured by and stored within the BWV technical system (devices, footage, and DEMS). Under the now removed Frequently Asked Questions section of Devon and Cornwell Police Constabulary's (the NPCC BWV lead) website, a section entitled 'Who owns the footage?', it stated that "The Dorset Police are the data controllers in respect of footage recorded on Dorset Police body worn video cameras. The Devon & Cornwall Police are the data controllers in respect of footage recorded on Devon & Cornwall Police body worn video cameras."

Within the UK, there are processes for accessing information[1] through Freedom of Information requests (FOIs) and Subject Access Requests (SARs) (NPCC, 2024; ICO, no date-a). However, as the latest regional guidance (NPCC, 2024a: 10) provides, "there are exemptions where a request is not obliged to be fulfilled, for example, if that disclosure would, or be likely to prejudice the prevention or detection of crime." Accordingly, it is the individual police organisation (within the confines of the respective legal provisions) which makes the final determination of whether to release information related to BWV technology.

Murria's (2023) doctoral research on 'stop and search' incidents in the era of BWV technology similarly indicates that it is the police who control what is recorded and who decide who gets access to the footage. Thus, they are effectively the gatekeepers to any transparency and accountability mechanisms. Murria (2023) correctly concludes that there needs to be independence in this process for transparency and accountability to be achieved. This section on the limitation of transparency reinforces these findings, by stating that despite the shifting sentiment towards public release of footage and (meta)data, it does not detract from the inherent limitation that police, who are in theory *the subjects* of transparency

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[1] Including misuse of and misconduct involving BWV use. See for example, INFORMATION COMMISSIONER'S OFFICE. no date-a. *A guide to subject access* [Online]. Available: https://ico.org.uk/for-organisations/uk-gdpr-guidance-and-resources/subject-access-requests/a-guide-to-subject-access/ [Accessed 23 June 2024].

and accountability mechanisms, in practice *control the technical system* which enables and facilitates this mechanism. Accordingly, police act as gatekeepers for releasing the very information which is meant to shape police transparency and accountability.

This constraint was raised by researchers on the BWV technology component of the INTERACT project (O'Neill et al., 2024) which consisted of field observation of officer use of BWV devices. While most of the findings relate to the theme of physical protection contained in Chapter Six, certain statements and findings contained in their briefing paper touch on aspects of transparency and accountability. They find that BWV technology belongs to and is controlled by the police. To address this one-sidedness, they (O'Neill et al., 2024: 5) recommend that "if a member of the public wishes to see the footage in which they feature, being able to do so should be made as easy and as accessible as possible (such as by offering a QR code that the person could scan to get to the correct website to register their request) in order to increase transparency."

This is evidently not a novel finding of this dissertation and police in the region have seemingly enjoyed operational independence, but it is crucial to emphasise how *central* the police, as controllers of the technical system, are to the technical/material components of the technology-enabled mechanisms which act upon them. Senior officers decide which technical system to procure, officers (users) ultimately decided when and what to capture, how to save the footage (evidential or not), supervisors and BWV leads decide whether to analyse use of systems and for the most part (aside from governing bodies such as the IOCP) decide which external actors get access to what information. Even the IOCP has publicly lamented the lack of BWV footage (officers not recording) available to them for their investigations and provided organisational recommendations that they ensure officers record when they are supposed to. This is not an insignificant issue given that the asymmetry between the police and the public, as it relates to BWV technology, is not something which can easily be addressed.

Requests to record

Fan (2020) offers a useful suggestion that police organisations provide witnesses and victims control over whether to record. While this has not been included in the regional guidance for general incidents (it is included in the Rape and Serious Sexual Offences section), Nottinghamshire Police's (2025) BWV use policy includes that "if a member of the public was to specifically request that any encounter or interaction is recorded, even if the user does

not feel that there is any evidential reason to do so and there is no clear reason to not record, the user should record such an encounter." Future regional guidance and policy which includes provision in this way could mitigate some degree of the asymmetry between the public and the police as it relates to BWV technology use.

Shifts in regional sentiment on public release of police footage

Relative to police organisations in the United States (US), British police organisations have historically been hesitant to release BWV footage, with certain US police organisations having their own YouTube channels for uploading footage. This hesitance in England and Wales first rose to prominence when the then National Chairman of the Police Federation of England and Wales, John Apter, made public remarks on the matter. In response to public capture and release of footage of police conduct, he is quoted as saying that:

> "these snippets rarely show the full facts. They are purposefully selective in what they show and can be incredibly damaging for public confidence in policing, as inevitably some people will believe the one-sided story often presented." and that "Body-worn video (BWV) is one of the biggest advances in policing in the last decade, as not only does it allow the collection of evidence, it also captures the full context of police interactions and shows the reality of policing." (DevonLive, 2020)

The Deputy Commissioner of the Metropolitan Police disagreed, being quoted as believing that it could have a negative impact on public perception (BBC News, 2020b). However, in response to these public remarks, the former NPCC BWV lead, Chief Constable Andy Marsh, provided a document of advice 'to assist decision making on the public release of Body Worn Video (BWV) footage', which included case studies for organisations to consider (NPCC, 2020). This advice stated that:

> "Forces should be more proactive in identifying BWV footage that can be shared in order to increase public transparency and build confidence in the legitimacy of our actions. The release of BWV footage must be for **a legitimate aim, and be lawful, necessary and proportionate.** On each occasion that the release of BWV footage is considered, professional judgement must be applied on a case by case (sic) basis, as no two scenarios will ever be the same." (NPCC, 2020: 6; their emphasis).

The National Chairman, John Apter, once again reiterated their initial public statement, this time being quoted as stating that:

> "What is frustrating is only a handful of forces have adopted the new guidance issued by the NPCC and many are not as proactive as they could be. It shouldn't be taking so long to do something which would support our colleagues." and "Not only are police officers being hung out to dry when these incredibly damaging, one-sided clips are posted on social media with absolutely no context, but they risk jeopardising public confidence in the service and undermines the criminal justice process." (DevonLive, 2021)

While it is not possible to individually determine organisational sentiment, previous regional guidance (NPCC, 2022: 23) limited its guidance to provide that "BWV may be released for journalistic purposes, for example a heroic act, to serve an educational purpose or to raise awareness of a particular issue. The release must be proportionate, necessary and for a legitimate purpose, and any decision to release made on a case by cases basis." The latest guidance (NPCC 2024a: 6) however, has been amended to include Chief Constable Andy Marsh's statement verbatim. Evidently, there has been a shift in sentiment amongst policing in the region to consider releasing footage to the public and this has been fortified through the inclusion in the latest regional BWV technology use guidance.

Public release implications: Aligning expectations with the limitations

Despite the assessment of footage having both technical and human limitation (detailed in Chapter Seven), there is a need for it for the purposes of enhancing police transparency and accountability. There are numerous incidents involving released footage of officers fatally shooting civilians who were thought to be holding weapons only for surveillance footage to reveal otherwise. A cursory search reveals that police have mistaken items such as a vape (DailyMail, 2022), mobile phone (The Independent, 2021), camera (NBC News, 2017), and wallet (The Guardian, 2020) for a gun. This can result in public outrage and damage to public perceptions of police. The usefulness of footage in being able to resolve these incidents shows that despite the potentially prejudicial nature of footage, a certain degree of prejudice is tolerated given its ability to provide detailed information of the incident. In their examination of public perceptions on releasing footage (Canadian context), Poirier et al. (2022: 85) rightfully conclude that:

> "The views of both the public and police officers regarding BWC footage disclosure must be considered when developing policies. It is not enough for police departments to simply equip officers with BWCs to promote transparency. The timing of public release of footage and the ability to draw accurate conclusions about police interventions are also critical in crafting and tuning BWC policies that align with the views of a significant portion of the population who fund BWCs and are recorded by these cameras. Otherwise, the

deployment of BWCs is a cosmetic measure of transparency at best, and an additional police surveillance tool at worst."

There may be incidents where it was reasonable for the officer to have made a mistake such as low-light conditions or when moving from a brightly-lit area to a dark one. However, where footage does not depict what an officer might have seen or heard during the incident is likely to prove overly prejudicial. If footage clearly reveals that a person is not carrying a weapon, but a human under specific environmental and risky conditions could have reasonably misperceived there to be a weapon, the footage could prejudice them unfairly. Conversely, in certain instances, this has proven to be a positive development, identifying officers reacting unreasonably to environmental stimuli. For instance, when an officer was walking outside of their parked vehicle and mistook the sound of an acorn dropping on their vehicle to be a gunshot and opened fire on the vehicle, with a subject in the backseat (WJHG, 2024). In their investigative report, the Office of Professional Standards (OPS, 2024) found that the officer's use of deadly force was not objectively reasonable and thus, constituted excessive use of force.

Despite positive outcomes of previous assessments, it is nonetheless probable that as UK police increasingly release footage attempting to sway public trust and confidence, they will difficult lessons worth exploring in future research. In the US for example, Keilon Hill, was arrested and charged with harassing a police officer, and later acquitted (Des Moines Register, 2019). Keilon recorded the interaction, which became public, and West Des Moines Police released the arresting officer's BWV footage to present their perspective (KCCI Des Moines, 2018). Accordingly, both the mobile footage of the officer and the BWV footage of the subject were available to the public (CNN, 2018), and yet depending on where the story was posted, the comments either defended the police officer or the citizen. Fortunately, this story has been chronicled (Just Voices, no date), and it serves as a suitable example that police releasing footage may not sway public opinion in the manner police authorities anticipate.

The case studies contained in the NPCC (2020) advice on releasing footage to the media did not contain case studies of ambiguous responses from the public, only those which indicated favourable responses from the public towards the police. Fan (2018b) offers an alternative approach to by calling for the 'democratizing of proof'. They proffer that the public submitting their own footage as evidence could address the issue of non-compliance (missing footage), the perspective bias contained of BWV footage (discussed in Chapter Seven), and police non-disclosure/policy limitations.

While police authorities hope that releasing footage to the public might bring balance, there is instead a possibility that exposing the public to footage might worsen perceptions of the police, especially where the relations between the community and the police are at their poorest and the reasonableness of the recorded conduct is contestable. One senior officer alluded to potential misalignment between police and community perspectives, when discussing the assessment of footage during community scrutiny panels, saying that "I look, go through the footage prior to showing them. I will look at one bit of footage and go 'oh, that's a really good bit of policing!' and then it will cause an absolute mayhem." (Participant 1: senior officer). The participant would further describe the mixed feedback they received in scrutiny panels which were composed of both professionals in policing and members of the public:

> "it's [scrutiny panels] still a very kind of very powerful tool because you'll have people from certain departments and you'll have your civilians which will still look at it from a member of public's point-of-view and some of them might not know the legal side of things. So, you still have that kind of element of it and a couple of them will say, and you'll be able to tell who all the cops are in the panel and who all the civilians are purely by their feedback because the cops will all say 'Useful. Yeah, 100% deserved it. I would have done the same. In fact, I would have done it sooner.' Civilians are like 'oh, really? Would you not talk for a little bit longer?' It's really, it's, it makes me smile every time because there were, there tends to be kind of two trains of thought."

Finally, this shift in sentiment to releasing BWV data is currently limited to BWV footage being released 'on a case-by-case basis'. It does not pertain to making organisational BWV policies publicly available across the region, nor does it relate to other relevant (meta)data stored on DEMS such as compliance rates or misuse.

5.3.2 Limitations on accountability

There are limitations to the accountability mechanisms enabled by BWV technology in terms of their variability across the region and the extent of their measures.

'Bad-apples approach' to accountability

External scrutiny from community panels is a relatively novel mechanism of holding police in England and Wales accountable. It can also provide a particular nuanced form of transparency, that of answerability in terms of understanding the decision-making of police officers in the field. There is evidently space being created within police in the region. For instance, the Metropolitan Police (no date) provide that:

> The main purpose of these panels is to improve public trust and confidence in the Met, by allowing the community to offer appropriate scrutiny and feedback of policing encounters. The panels aim to do this by: incorporating the community experience of policing; using these experiences to improve the way officers understand interactions with the public; allowing local communities to review broader aspects of local policing practice.

Nonetheless, the current guidance, how CSPs operate, the information provided to panels, and how the feedback is disseminated remains largely discretional. As has been shown, the feedback is often filtered through police before going to an individual officer. Consequently, CSPs in their current form are limited in their ability to provide accountability measures at an organisational level given that the focus remains on redressing and/or providing feedback for the actions of individuals (potentially, 'a few bad apples') on a case-by-case basis. Fan (2018a) refers to this 'bad apples' or case-by-case approach as 'transactional myopia'. They (Fan, 2018a: 1250) rightfully conclude on the topic of 'transaction myopia' that "at the aggregate level, over time and many cases and incidents, however, body camera big data may reveal potentially important patterns and practices." Accordingly, this current form of individual accountability is, arguably, a missed opportunity for broader impact in the form of addressing trends and organisational/structural issues affecting the respective communities.

MORE IMPACTFUL RECOMMENDATIONS BASED ON BROADER INFORMATION

Actions of police officers do not arise in a vacuum. They are trained, operate within organisational policy and culture, and can receive a large amount of background information before arriving at an incident. All of this can be examined if the focus is not solely on the footage and the interaction on display, but also the context in which that decision-making is taking place. This can reveal more about the organisation than simply holding individual officers accountable, especially if the footage is accompanied by broader (meta)data sets on compliance, previous examples of or trends in (mis)conduct. This can also be extended to technical capacities if the discussions include information about the nature of the devices being used to record as well as when the officer activated the device or how the video was 'clipped' (the editorial choices being made). This could even be applied to the BWV technical system, whereby the community could provide feedback on the quality of the footage, obstructions, audio quality, and capture point (point-of-view) for instance. Discussions around moment of activation and editorial choices could also have a positive impact on the organisation's future use, police, and selection of BWV technology. Such a

broadening of approach would be congruent with the HMICFRS' (2023a: 13) recommendation that:

> "we encourage forces to improve the independent challenge of the use of intrusive tactics. This should include challenge from the public about the *quality of the data* that was collected by the force, the evaluation of the value of those tactics and opportunities to improve outcomes." and "to maximise the benefit of external scrutiny, forces must make sure they provide members *with necessary data and information*, including access to body-worn video. Recommendations made by the panels should be actioned, and the results fed back to them and the wider community. This will help build trust and confidence by providing openness and accountability to the public." (emphasis added)

In addition to providing additional information which could reveal broader organisational trends/patterns of (mis)conduct, it is also possible for the CSPs to deliver feedback, which is aimed at the organisation, thereby providing not just individual accountability, but also organisational accountability (an important distinction raised by Bovens et al., 2014). As discussed in detail, there is already precedent for this from external bodies, specifically the IOCP. Like the IOCP, CSPs could seek to identify 'organisational learning' opportunities from the individual cases and make recommendations related to an organisation's BWV use, policy, and policy compliance.

Regional variance of policy and practice

As became evident during the discussions above, there is a notable issue regarding the variance of policy on transparency and accountability mechanisms within the region. Much of the regional policy on BWV technology and use is based on the notion of 'best practice', but this remains recommendation only. This both applies to the regional guidance document as well as the draft guidance on community scrutiny panels. Such a finding in this research adds to an existing chorus from governing bodies and fellow researchers.

The IOPC found deficiencies in organisational policy and recommended that those organisations bring their policy in line with regional guidance. The HMICFRS' (2023a: 13) report supports many findings and discussions in this chapter by concluding, under the section 'The use and review of body-worn video varies between forces', that "our inspections found much more widespread use of BWV in all forces since our last cycle of PEEL inspections. But the way the equipment was used varied. In some forces there was either no policy on the use of BWV, or policies weren't comprehensive, or not enforced and monitored." This finding also emerged in Murria's (2023) research which focused

specifically on 'stop and search' police-citizen interactions. In one of their findings chapters, they examined the issue of transparency and BWV technology and touched upon many of the same limitations to the theoretical promise of increased transparency and accountability offered by the adoption of the technology. Specifically, Murria (2023) finds that accountability is premised on the notion that someone is watching and they can hold the police to account. Crucially, she concludes that where there is broad operational discretion, this is not a guarantee.

This regional variance is further complicated when paired with material/technical variance of BWV technical systems across the organisations. The specific functionality of systems can vary depending on the vendor used and the nature of their proprietary systems. As aforementioned, Axon's ability to collate (meta)data based on an organisation's officer use is part of a subscription service (Axon Performance). Material variance has been directly acknowledged in the latest regional guidance (NPCC, 2024a: 40) under a section regarding 'Retention' where it is stated that "it is recognised that this guidance recommends that the retention of BWV is driven by its outcome within the criminal justice system and in line with legislation, and *this is largely dependent on the technology and interoperability of an individual's force's systems*. Regardless, forces should be working towards compliance with legislation and the implementation of national guidance published." (emphasis added).

This material variance of BWV technology across organisations in the region is further demonstrated by a former member of a regulatory body in the UK (Participant 12). Their response below highlights BWV technology serving as a case study problematizing the objection having vendors and their systems operating in the various regions.

> "[Talking to] police forces in England, Wales and Scotland about using Chinese technology for body worn video from companies that have been questioned or condemned by Parliament for some of their practices. And you had some police forces and leaders saying, 'well, we wouldn't use it here.' So, in X-shire we take a position that we're not using it here. And if the Police and Crime Commissioner for X-shire says, 'I'm not procuring body-worn video from a company that is associated with its misuse by the police in another part of the world.' But that's all well and good if you only depend in X-shire on that kit. But if X-shire is hosting a big protest or a sporting event, or a Beyonce gig, or heaven forbid a state visit from another country, you're going to call on forces from Y-shire and Z-shire. And they may not have the same approach. In which case, if you've said to your citizens in X-shire, 'don't you worry, you will not see those cameras here attached to the vest of an officer when you approach them in the street for help.' Well, you can't make good on that promise, because it's not true. Because mutual aid will mean you will get people from all over the country. And they, their local sort of vernacular policies, may not accord with yours."

This could be extended to the functionality of a system. For example, if one police organisation uses facial recognition as part of the BWV devices and systems, the concern is that these systems might still operate in a region where this is otherwise not acceptable for their local organisation.

5.4 Analysing police transparency and accountability

This chapter has shown the impact of BWV technology on police organisations and policing in the region more generally through the lens of transparency and accountability. This section critically analyses the rhetoric of police transparency and accountability, drawing from the preceding section on limitations as well as employing the conceptual toolkit to examine materiality, design intentions, and implementation. It then examines implications of increased supervision for police officers. While these important implications cannot fully explore, it does raise three interrelated issues which are relevant to the proceeding chapter on officer protection. For a more in-depth discussion on the impact of increased monitoring of officers, see Löfstrand and Backman's (2021) review paper on the topic, where the authors categorise the motivation for BWV technology implementation into contrasting rationales of surveillance and control.

5.4.1 Analysis using the conceptual toolkit

While BWV technology is publicly justified in England and Wales as a tool for transparency and accountability, the conceptual toolkit reveals that this benefit is conditional rather than inherent. The previous section outlined limitations conditioned by the social arrangement of policing in the region, including governance frameworks, organisational discretion, and current police approaches to the burgeoning mechanisms afforded by BWV technology. Meaningful police transparency and accountability require externality and independence, whereby systems and information access must exist outside of police control. In practice however, the current BWV technical system situates all enabling artefacts and mechanisms (device, data, access, interpretation) inside of and controlled by police. Design intentions of BWV technology reveal much the same. Accordingly, BWV technology has in practice afforded routine internal monitoring (scrutiny) and micro-surveillance (supervision) of officers, under the rhetorical guise of transparency and accountability. This is arguably rooted in the Equality and Human Rights Commission's 2013 recommendation for structured micro-monitoring of officer conduct and a 'bad-apples' approach to police misconduct. This is shifting, with community scrutiny panels holding much promise but

there are concerns about the future of an independent Police Ombudsman in the region, which is responsible for several positive developments in BWW technology use across police organisations in the region.

In terms of agency, BWV devices have material agency as they produce digital snapshots and traces which shape behaviour. However, in England and Wales, that agency is directed toward officers, not by or for the public. For example, the system automatically produces metadata which enables supervisors to audit officer activity even where no misconduct is suspected. This is amplified by proprietary features in DEMS such as Axon Performance which makes use of algorithmic analysis. Vendor statements about BWV devices such as 'independent witness' (detailed in Chapter Seven) disguises that the witness is not independent, but rather reports to police, not about police. While the social arrangements are shifting, design intentions and organisational practices reveal that BWV technology is more of a performance management tool rather than a meaningful public accountability mechanism. Accordingly, the broader BWV system affords internal monitoring and constrains external scrutiny.

In terms of material design, several design choices contradict the notion of transparency. For example, certain BWV devices have upward-facing monitors and no front-facing screen (detailed in the proceeding chapter) which informs (affordance) the user (officer) of the device status (affordance) and does not inform (constraint) the subject/public when recording commences and ends, or what is being recorded. Stealth Mode (no lights or indicators of recording) affords covert recording and constrains transparency. The situatedness (placement) of the device on the officer affords a user/police perspective in the footage and biases interpretation. These material design choices reveal design intentions, namely that the technology is designed for the user, not the subject or public.

Technical functionality renders visible what designers intend the system to be capable of doing, irrespective of immediate use. Three inherent functionalities are relevant to transparency and accountability. First, users have control over activation and capture point and thus, it is officers who ultimately determine when accountability is possible. Second, retention and classification of footage grants police control over evidential status and the deletion of potential evidence. Third, backend access and audit logs afford supervisors the capability to monitor officers. Critically, there is nothing in the base functionality of BWV systems which provides direct access to footage and metadata – as emphasised by Murria (2023) who used a police-assigned laptop under supervision to assess police footage.

Consequently, technical functionality demonstrates that BWV technology enables internal monitoring before transparency and public accountability.

In terms of situatedness and control, BWV devices are situated on officers, facing outwards; BWV footage, metadata, and DEMS themselves are situated on cloud-based servers controlled and gatekept by police; and algorithmic analytic functionality are increasingly developing within restricted ecosystems, outside of public purview. Control is solely maintained by the organisation as the owner and operator, with officers deciding when and what to record and management deciding what footage to share and with whom. As aforementioned, this creates a BWV technology paradox: The system that is meant to make policing transparent and hold police to account is controlled those who are being held to account. Moreover, while shifts towards greater externality such as community scrutiny panels hold promise, they are constrained by control over context, footage selection, and metadata which remains controlled by police. They also employ a bad-apples approach and lack the ability for structural analysis of deeply-rooted causes or larger behavioural patterns (see Fan's various works on this). That the police ombudsman (IOPC), who have direct access to BWV systems, has made several positive changes to police BWV policy and practice in the region indicates that meaningful accountability stems from the decoupling of BWV systems and police control.

There is, consequently, a misalignment between rhetorical claims of enhancing police transparency and accountability and design choices of BWV technology. An analysis using the conceptual toolkit instead reveals that the design logic favours user-centrality and an organisational-control rationale.

5.4.2 Implications of increased supervision and scrutiny

With the rise of additional layers of supervision and scrutiny, there are potential increased burden on those who would be required to monitor and those who would be monitored. In their book, White and Malm (2020) discuss the various supervisory reviews conducted within the police organisations they studied in the US and find the majority of organisations have provisions for these supervisory powers. However, they do rightly raise the issue implication that:

> "We do acknowledge a tension between the need to monitor activation compliance on a routine basis and the resources required for such a monitoring program. *This task can become especially onerous for firstline supervisors*. For

example, let us assume Sergeant A has ten officers under his command, and each officer generates three hours of video per shift, or a total of 30 hours of video per day. If officers work a fourday week ("four tens"), that is 120 hours of video generated per week. How much time should a sergeant devote to reviewing video? Sergeants perform a variety of tasks that are vital to the successful day-to-day functioning of the organization, from reviewing reports and mentoring young officers to providing the first level of accountability. The added responsibility of reviewing BWC footage will necessarily take up time that could be devoted to these other tasks." (White and Malm, 2020: 109; emphasis added).

As for those being monitored, there are issues related to non-compliance with policy to record. Specifically, with potential presumptions of wrongdoing. As was indicated by a senior officer (Participant 3):

> "And it's now as body-worn video is starting to become more embedded. The grace period of kind of officers not recording, it's almost come to an end now. There was always that grey area of 'oh, well, if you didn't record, why didn't you record?' And it was that question…was starting to get asked of you… 'well, what are you trying to hide?' *So, the tables have now shifted to a 'OK, we've told you have to record and now you don't. What are you hiding?'* And it's almost even, even in kind of my mind and I'm sure [police officer] will feel the same. Even we now will question cops "But hang on a minute, why wouldn't you record?" And because they're not recording, one, that's an interest to us and it's policing as a whole because as you can imagine, the people that aren't recording are probably…*there's a reason why they're they don't want their actions being recorded and then potentially being shown on kind of scrutiny panels or we or being viewed by the supervisors."* (emphasis added)

The impact of this additional requirement for officers to record and issues surrounding missing footage (non-compliance) is likely to be addressed through auto-activation technology described in the previous chapter. The same senior officer went on to temper the assumption of wrongdoing by highlighting the nature of certain incidents and that they are looking to address it through auto-activation.

> "We need to focus on them, but also, people do forget in the heat of the moment, you can just, we forget to go press up, press our buttons to say we've arrived an incident. We do that all the time. So actually, let's take that situation away and we'll just activate your cameras anyway."

Boivin et al. (2022) discuss the issue of activation compliance (activating the device according to organisational policy) and suggest that auto-activation accessories might render the issue moot by removing officer discretion which underlies the issue of non-compliance. However, the issue of missing footage and auto-activation has been raised by Fan (2017: 91), who examines the topic of missing footage from a legal/judicial viewpoint and introduces the temptation for organisations to rely on further technology to address the issue.

Aptly, in so doing, Fan (2017) highlights that these are not complete solutions as technology contains its own fallibility, but rather, invites technological circumvention. This is something which emerges in the research data.

> "Well, it it's very clear…it's very clear. So, there are people keeping footage to artificially inflate retention numbers. So, the guidance I give on retention is we are missing opportunities to not just keep footage, but where we have a statutory obligation to identify and preserve relevant materials. So for us our retention period is ninety days, so occasionally, what I'll do is I'll go on the system and look for footage that's about eighty-days-old, and if it's not been kept, there's no chance that they're gonna do it in the next ten days, and then I scroll through that, and I can see the thumbnails, and jobs will jump out of me. There'll be someone in handcuffs. There will be someone pinned to the floor. There'll be someone in the back of a van for transport in handcuffs. So, you know they've been arrested, so we got a statutory obligation to preserve that footage as part of an investigation. So, this is how I know that we are failing to preserve materials." (Participant 2: Senior police officer).

Circumvention is a significant issue which contravenes organisational policy, regional laws, and binding CoP Authorised Professional Practices. Nonetheless, senior management using auto-activation technology (such as Bluetooth triggering, geolocation/geofencing, sensor triggers, and response triggers) as a solution to existing misuse of BWV technology can impact protection – as is discussed in the following chapter. Accordingly, for the purposes of improving transparency and accountability mechanisms i.e. ensuring that evidentiary footage is captured, there could be a cost of reducing the protection that officers receive. This potentially pits the interests of the public against those of officers.

Conclusion

This chapter has, through the themes of transparency and accountability, highlighted specific impacts of BWV technology on policing in England and Wales. Namely, it described the emergent layers of supervision and scrutiny which have been enabled by the footage produced by BWV devices and the (meta)data generated by, and contained within, BWV DEMS. A complex interplay between the technical system and the social arrangements within the region has been identified and described. More specifically, the impacts which have been enabled by BWV technology are themselves shaped by organisational discretion paired with the internal and external governance frameworks operating in the region. Where there are regional laws, the impact has been more generalisable across the region, whereas where there is regional guidance paired with operational discretion, there has tended to be a variance in the implementation and policy.

The chapter highlights the mutual shaping of technical systems and social arrangements at both organisational and regional levels. Discussions revealed that the materiality of BWV systems (their design and functionality) includes proprietary elements and remains dynamic. They enable and shape increased transparency and accountability through their provision of footage and (meta)data concerning use and retrieval. These potential impacts, proposed by senior police as ways of increasing trust and confidence in police (the underlying goal of transparency and accountability), are themselves shaped (in some cases limited or constrained) by the particular social arrangements in the region. This mutual shaping between users/organisations and technology has been identified and described by Boczkowski (1999; 2004) and is something which was emerging in research prior to the success of sociomateriality. This research continues this act through showing impact and, in the process, also revealing the relevance of materiality of technical systems and showing the ways in which technical systems and social arrangements enable and shape one another.

This research seeks to examine the impact of BWV technology on policing, with an emphasis on the relevant material components of BWV systems. BWV technology can enhance transparency and accountability, within inherent limitations which are explored in Chapter Seven, but this potential can only be enabled if the social arrangements are in alignment with the objectives of transparency and accountability. This is what was referred to as joint optimization of the social and technical in socio-technical theory applied to organisations (Trist and Bamforth, 1951). While there are indications that policing in the region is heading in a positive direction, the variance leaves room for organisations to fall below regional 'best practice' standards and to not meet the interests of the public in the process. There are evidently attempts at increasing the functionality of BWV technical systems to provide more information for transparency and accountability mechanisms, while the social arrangements are trending towards a direction of being able to use the BWV technology to maximize transparency and accountability mechanisms in the region.

Given that there are, arguably, attempts at optimizing policing arrangements (with their respective control and governance mechanisms) and technical systems, it is crucial to conclude on the fundamental limitation within this environment. While the subjective nature or interpretation of BWV footage for the purposes of assessment were briefly touched upon and the design and functionality of DEMS and the (meta)data it contains was emphasised, it is the situatedness of BWV technology as an entire technical system which is the greatest obstacle to the proposed impact of increased transparency and accountability. Situatedness is discussed in the conceptual toolkit proposed in Chapter Seven and refers to where the

technical system and its components are situated by design. In this instance, it problematizes the fact that police are *central* to the BWV technology despite being the subjects to the surveillance functionality and the accountability mechanisms it enables. While the particular social arrangements of an organisation, or the region more broadly, can shape the impact to increase transparency and accountability, the *fundamental* limitation is that it is the police who select, own (procure), operate, and maintain access to BWV as a technical system. While a functional or effective governance system can place limitations and requirements on police organisations in the region, all parties but the police are external to the technical system. Fan (2018b) has called for the democratization of proof by citizens providing their own footage and for citizens to have access to big data, but even such a radical suggestion does not change this fundamental asymmetry of police as central to the operationalization of BWV technology.

As aforementioned, transparency and accountability can be conceived of as the public benefits stemming from police adoption of BWV technology. Analysis now turns to the organisational and frontline priorities, engaging with the topic of physical protection.

Chapter Six: Physical Protection

Introduction

The previous chapter described and examined the impact of BWV technology on policing in England and Wales through the lens of transparency and accountability. Despite incidences of BWV footage and (meta)data use in the respective governance mechanisms having the potential to clear officers from public complaints/allegations of misconduct, the BWV technology-enabled police transparency and accountability discussed in the previous chapter is primarily seen as a benefit to the public – as a means of justifying the technology. The converse of this rhetoric is that BWV technology is adopted to better serve the needs of police organisations and their officers. While there are many proposed organisational and operational benefits to the organisation, the benefits at the centre of this chapter relate to those material designs and technical features which protect frontline police officers. Specifically, it focuses on protection from aggression and violence committed by the public during public-police interactions. Accordingly, this chapter shifts from the focus from *the impact* of BWV technology on policing, to examining *the use* of BWV technology, specifically as it relates to the design of the devices paired with the functionalities of the broader technical system.

Given that this research is qualitative in nature, it is limited to speak to the perceived (self-reported) protection which BWV technology offers, not the more objective protection which can be quantitatively measured using incident data. Nonetheless, this chapter seeks to analyse and triangulate data from the interview and field observation data in combination with the quantitative research of others as well as policy documents, and manufacturer manuals and marketing materials. Consequently, it aims to explore the proposed benefits of police protection, the relevant material considerations, and ultimately, the potential social implications endemic to the specific interactions involving technological use for police protection.

6.1 BWV technology deterring violence against police

6.1.1 Historical and theoretical development

User safety (that of the police officer) is claimed as the primary driver for BWV technology adoption for police in Germany (Kruse et al., 2023), for emergency medical responders in the UK (NHS England, 2021), and for traffic wardens in West Yorkshire, England, most recently (BBC News, 2025). Nonetheless, transparency and accountability have, arguably, overtaken officer safety as the rhetorical driver in recent UK police guidance (NPCC, 2024a), becoming part of one of four principles in the document, while protection has received a few general mentions. The media has however, swung in the opposite narrative direction. After a decade of widespread adoption and implementation in both the US and the UK, the media has become increasingly critical of what they see as police organisations' failure to deliver on the promise for BWV technology to improve policing.

In 2014, Obama asked for the administration to assign millions of dollars to subsidise the technology to improve trust and confidence in the police and in so doing, to protect the public from abuses of the police. The expectations of the public have seemingly not been met. Accordingly, headlines such as those from BBC News have vacillated over time, in terms of proposed benefits and judgment about the success of their adoption across the UK. Headlines regressed from 'Grampian Police hail body-worn camera success' in 2011 (BBC News, 2011) to 'Issue with police body-worn camera system revealed' in 2017 (BBC News, 2017). In 2018 and 2021, the headlines had improved to 'Police body cameras reduce the need to fire Taser' (BBC News, 2018) and 'Police body cams would see spike in guilty pleas' (BBC News, 2021). In 2023, the headline had again pendulated to 'Police officers widely misusing body-worn cameras' (BBC News, 2023c). This story cites a short BBC documentary on the misuse of BWV technology by UK police entitled 'Bodycam cops uncovered' (BBC News, 2023a). Media articles abroad have claimed that instead of being a tool for transparency and accountability, it has, in practice, only protected the police (The New York Times Magazine, 2023) since they are in control of footage and failing to release it (USA Today, 2021). This relates directly to the issue of police as central to the control and release of BWV technology footage and (meta)data as discussed in the previous chapter.

The proposed benefit for BWV devices to change the behaviours of those being recorded can be traced back as early as 2007, where the first BWV technology use guidance (PCSD, 2007) listed it as a key feature of BWV technology. Under the heading 'anti-social

behaviour', the guidance (PCSD, 2007: 8) states that "officers using BWV at anti-social behaviour hotspots have noted that persons present significantly reduce the level of their behaviour when officers with head cameras attend." The argument is that the presence of the BWV device has a deterrent effect i.e. it improves the behaviour of both the wearer (police officer) and the subject(s) that the device is facing (member of the public). The concept and empirical studies testing the theory have already been discussed in detail in Chapter Two (Section 2.4.1).

Essentially, the use of BWV technology, especially the BWV device, is meant to protect officers against physical violence from members of the public. Given these claims and some research evidence in support of this, England's National Health Service began a three-year BWV trial with its ambulance first responders as part of its violence prevention and reduction strategy (NHS England, no date). RAND was contracted to evaluate the project, using a mixed-methods approach which included a survey of NHS staff but did not include incident data, such as number of assaults on staff. The RAND researchers concluded that "the evaluation found that while BWCs provide comfort to staff and may contribute to violence reduction under supportive conditions, their effectiveness is variable and is influenced by numerous factors" and that "the evaluation cannot definitively recommend the continuation (or not) of BWCs" (Maistrello et al., 2024: v).

In Germany, it is reported that unlike in the UK and US where the narrative remains that devices are rolled out to protect the public, the regional German police forces are rolling out devices to "enhance the self-protection of [police officers] and to facilitate the collection of evidence for possible subsequent criminal investigations" (Kruse et al., 2023: 2). Kruse et al. (2023) provide that there are numerous theoretical perspectives, acting together, in support of the argument such as socially desirable responding (Paulhus, 1984), theory of self-awareness (Duval and Wicklund, 1972), deterrence theory (Ariel et al., 2015), and rational choice theory (Cornish and Clarke, 1987). The argument is that those individuals who are more self-aware will act more in accordance with accepted norms, that BWV devices increase this awareness, and that thinking rationally, those being recorded will perceive that their actions are being recorded and are therefore more likely to act in accordance with these accepted norms – reducing the likelihood of violence which is against accepted norms. It is important to note that this expectation is extended to all of those being recorded, including the wearer of the device i.e. the police officer.

This, self-reported, deterrent effect is reinforced by a frontline officer's response concerning their experience with BWV use. When asked by the researcher 'when you're recording, how has this impacted your sense of safety?', they responded that:

> "It also stops people, not everyone, when they realize the camera is running, their interactions change. As I said, they won't stop everyone and not everyone cares. But a lot of people once they realize they're caught on camera, it reduces the aggression levels because they know that what they're doing is being captured and it's going to show them in a bad light. And it's evidence for us going forward." (Participant 10)

Kruse et al.'s (2023) findings from six German police departments looking at officer's perceptions on the aggressiveness and cooperation of subjects being recorded reveal several important findings. The first is that perceived aggressiveness of the subject decreases from the initiation of recording compared to the recording simply being announced. While they found that the presence of the device alone has a small deescalating effect, it is the activation of the recording which has the greatest impact on perceived aggressiveness. A second finding is that those under the influence of alcohol and in acute mental distress are not positively affected by the presence and recording of BWV devices. They are likely to be both more aggressive and less cooperative, and the authors argue this adds evidence to the theoretical explanation that the deterrent effect arises from self-awareness and rational choice theory – i.e. those who are in mental distress or under the influence of substances are less likely have the requisite level of awareness and rationality to be deterred. This also emerged from the RAND report which evaluated the NHS trial of BWV technology, with the report providing under 'finding 4' that "interview participants suggested that cameras may not deter abuse from individuals who are not in control of their actions (due to, for example, mental health issues, drug or alcohol intoxication)" (Maistrello et al., 2024: iv). This is reinforced by a response from the frontline officer:

> "When you get somebody that's in that state [under the influence of alcohol], nothing's gonna change how they're gonna interact. It just affects how we deal with them later on in regards to the evidence that we've got. It's, I said, it won't stop everyone. Majority of people dial down their behaviour once they realize it's on the recording. Some people play up for the camera. You're not gonna be able to stop that. It's just how we deal with the situation going forward and having the evidence to deal with it." (Participant 10)

These findings are not insignificant and the impact of subjects' substance use and mental vulnerability on the deterrent effect is analysed in Section 6.2.5.

6.1.2 Focus of the chapter: Physical protection of officers

The ethnographic (field observation) research component of the INTERACT project which examined the use of BWV device by police officers in England and Scotland, produced a report (O'Neill et al., 2024) which is useful to engage with. Two of their key findings were that BWV is used as protection and BWV changes behaviour. This conceptualisation of protection (within the structuring of their findings) focuses on the post-incident protection from false complaints (information in transparency and accountability mechanisms) and reprimand in court (evidence in court), while they place the behavioural change (deterrent effect) outside of protection as it can change the behaviour of the officer too. While the structuring of their findings differs, their key points and implications are engaged with throughout this chapter as there are significant overlaps.

It is important to clarify that this chapter will focus on the use of BWV technology to physically protect officers from public violence and aggression. Protection from complaints and its relation to securing officer buy-in during the early implementation stage of BWV technology was part of an earlier draft of this chapter – and O'Neill and colleagues in their 2024 report are apt for raising this point. However, there is a benefit in reducing the scope of the overall analysis of protection to allow for a more in-depth technical analysis of physical protection. There are several reasons to focus on this element of protection, in addition to the historical and rhetorical developments already detailed. These include that it is a significant motivator for use and, as expressed in Chapters Two and Three, most of the research on the topic has been quantitative in nature - with only one project examining the material factors involved. Accordingly, this chapter discusses those designs and technical features which relate to the physical protection that officer's feel the device provides to them through the deterrent effect and this operates *during incidents*.

The material design considerations of physical protection relate to increasing the deterrent effect and protecting officers from physical attacks. Technical functionality relates to those emergent capabilities of BWV technology which increase officer safety by providing the location of officers if they have been attacked, support tuning into their livestream if they suspect they are in danger, and potentially identifying dangerous members of the public at the point of first contact.

6.2. Material design considerations for protection

Material design refers to the physical and/or digital construction of individual components of the artefact, in this case the BWV device. This section introduces three design components of the device which are pertinent to the physical protection of their users (police officers), particularly frontline officers. The implications of these design considerations are then addressed.

The material design considerations are premised on the 'deterrent effect' discussed above. A central conceptual component of the deterrent effect is that of self-awareness. Consequently, it can be argued that certain conditions can increase the likelihood of the deterrent effect arising and the effect thereof: the subject(s) of the recording must know firstly, that the device is capable of recording; secondly, when they are being recorded by the device; and thirdly, seeing themselves being recorded.

6.2.1 Notification icons

Notification icons or stickers placed on a BWV device are a design choice aimed at informing subjects that the BWV device is capable of audio and video recording. As discussed in Chapter Two, Ariel et al. (2016) found a discrepancy in the deterrent effect of police use of BWV devices leading to variable outcomes across organisations/research sites. Assaraf et al. (2024) proposed that this was possibly due to the varying degrees of awareness of the device and their study attempted to test this by measuring differences in use of force incidents within the jurisdiction of the Maimi Beach Police Department, with officers (experimental group) wearing a yellow notification on the device and those officers without (control group). The independent variable being the yellow stickers on the device indicating that the device is recording video and audio – as illustrated below.

FIGURE 8 THE VISUAL DIFFERENCES BETWEEN THE TWO DEVICES USED DURING THE STUDY.[1]

UK guidance recommending that officers verbally notify subjects has been discussed (see Bowling and Iyer, 2019 and O'Neill et al., 2024) and there are studies which found that it is best to announce the recording of the device to increase its effectiveness (Demir, 2023), but there is an absence of research on the visual notification process. The Assaraf et al. (2024) study tested the idea that should subjects be increasingly aware that the device can record, there is likely to be an increased deterrent effect, de-escalating volatile incidents and preventing an increase of aggressiveness and thus, use of force would decrease. Paradoxically (as is included in the title of their article) however, using quantitative data analysis, Assaraf and colleagues' (2024: 15) find that "officers in the experimental group, equipped with BWCs with yellow stickers for visual warning, were significantly more likely to report the use of force than officers without a visual warning." The authors offer an explanation, integrating reactance theory and procedural justice, but admit to these being speculative and they rightly call for more research on the topic. What is interesting here is that the icon, not the device itself, might be impacted by the design of the icon itself as well as the structural environment in which it is occurring. While awareness, in theory, might be central to deterrence, the way in which awareness is visually triggered requires research.

As for the applicability to policing in England and Wales, according to the latest regional guidance (NPCC, 2024s: 7) there are several downloadable icons, as provided by the Home Office's technical guidance (Nortcliffe, 2018b) which organisations can display to indicate that BWV technology is in operation. These are included below and available from the Home Office (2017) website. Considering Assaraf et al.'s (2024) findings and the similarity of the yellow and black icon with text (illustrated below) to the sticker used in their study, it is

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[1] Image duplicated from Assaraf et al. (2024: 8).

potentially detrimental that the website indicates that "the icons can be downloaded to create general signage, individual badges *or for display on the devices themselves*" (emphasis added).

6.2.2 Indicator light(s)

The indicator light is a material design consideration which indicates how a device is operating. It is relevant to this discussion as it aims to indicate when the BWV device is recording. Aside from the officer having to state that they are recording, this LED light, should arguably, serve to indicate to the member of the public that the device is actively recording them, increasing their awareness that they are being recorded.

Inherent limitations of LED indicator lights

Given that one of the functions of the indicator light is to indicate to subjects that they are being recorded, in this capacity, it is essential that it is both noticeable and recognizable/perceptible. Examining the design considerations of the indicator light to achieve this function reveals an entire range of issues facing vendors, scientific/technological development, and industry standards. As a form of visual communication, there is a body of scientific knowledge on the topic of sign lighting covering issues such as legibility, ease of recognition, glare distance, and visibility during ambient light versus nighttime (Wu et al., 2019).

The reason that designers show a preference for red indicator lights is due to human perceptibility. Research on traffic lights found that there are significant differences between red, yellow, and green signals according to response time and missed signals when the signals had the same luminosity i.e. brightness (Suozzo et al., 2000). Accordingly, early standardization guidelines (Schreuder, 1981) for traffic lights in the United States dictated that green signals had to be multiple times brighter than the red signal (twice as bright for

green and over four times as bright for yellow, see Huang et al. 1999). A subsequent scientific report would confirm this (Bullough et al., 1999). Traffic signals were originally incandescent bulbs with colour filters, while light emitting diodes (LEDs) have a different chemical composition for each colour bulb. For this reason, traffic signals and many electronic devices switched to using red LEDs but were hesitant to use other colours which would require more energy and create more heat to have the same perceptibility as red (Conway and Bullough, 1999). Accordingly, switching to an indicator light signal which is more universally understood (for example green for activated, red for inactive, and yellow for standby), could result in the indicator being less perceptible to the public or would require an increase in brightness which would potentially increase the heat of the device and drainage on battery.

To further draw knowledge from the paradigms of Human Factors and Cognitive Interpretivism, Koelle et al. (2018) note several limitations with indicator lights and create an experiment with design experts to find superior alternatives to LED indicator lights for BWV devices to communicate to subjects and bystanders. This raised two issues that need to be considered which are relevant to this section. The issues include that 1) the LED indicators are not well noticeable. Previous research had found that they go unnoticed when subjects are occupied with other activities; and 2) that the LEDs are not always fully understood. Not only are light displays learned conventions, but as they are not the primary users, subjects and bystanders are likely to be unaware of the meaning of a display. The researchers, using an expert design study, achieved this by consulting sixteen experts in design from several universities and had them work in pairs to address the question of 'How and where could a smart camera communicate to spectators whether they are being captured and what the images are being used for?' Half of the teams prototyped a 'displayed camera image', revealing to those subjects exactly what is being captured (i.e. a front-facing screen). The authors recommend that in terms of understandability, there should be an avoidance of any element that has to be known (written language), learned (colour codes) or cannot be guessed easily (complex, unfamiliar icons) (Koelle et al., 2018: 184). Accordingly, indications would have to be intuitive or self-evident such as feedback displaying what is being captured.

Technical requirement for and regional relevance of indicator lights for policing in England and Wales

According to the latest regional use guidance (NPCC, 2024a: 22), "it is essential that people are made aware that they are being recorded. Devices can have icons and text displayed on the cameras to assist with this, along with indicators such as a visible red light when recording is activated. At the start of a recording, or as soon as circumstances allow, the user is to make a verbal announcement that they are recording both visually and audibly." The Home Office's Technical Guidance (Nortcliffe, 2018b: 8) provides that the 'functionality that is considered appropriate' under the 'recording indicator' section is an "indicator such as a red light visible from the front of the device when recording is activated" and "additional indicator may be required to inform the User when recording is activated." It is important to note that this requirement, as contained in the regional guidance, stems from the respective UK data protection legislation. While nothing within the guidance documents links the indicator light to the theme of protection, there is, nonetheless, a crucial linkage which is discussed below.

Peelford Constabulary, the primary participating police organisation, were using Reveal's D-Series devices (D3 and D5). The indicator light of the D-series is depicted below.

FIGURE 10 PHOTO OF REVEAL D-SERIES DEVICE'S INDICATOR LIGHT (REVEAL, 2025).

To see how these issues unfold in practice, and before discussing a potential ideal standard, it is necessary to examine current devices on the market from the three most contracted vendors in the UK. For example, Axon Flex 2's indicator light operates in a way that can be confusing to the public. Blinking green indicates that the device is in buffering mode (it is pre-recording 30 second segments) and blinking red indicates that it is actively recording – counter to generalise green/red logic (Axon, 2023d). Reveal D-Series' indicator light turns

solid red when the device is on, orange for pre-recording (buffering mode), and blinks red when recording (manually activated) (Reveal, no date-d). If the camera is triggered by a sensor (auto-activation), the indicator light blinks blue or green. This has also changed between the older D-Series and the newer K-Series devices, which is illustrated below (Reveal, no date-h).

FIGURE 11 REVEAL K-SERIES INDICATOR LIGHT NOTIFICATIONS.

Motorola Solutions VB400 and V500 have two LED indicator lights which activate when the device records, as depicted below. The lights on the device turn to solid red when recording – the top light is for the user to see, and the front-facing light is for subjects to see. Their V300 device has separate indicator lights for status (power on, standby, etc) and recording. When recording both turn solid red and while in standby mode, the front LED turns off and the top (status) LED turns red (Motorola Solutions, 2021b). For Motorola Solution's latest device, the V700, there was no publicly available user guide at the time of writing.
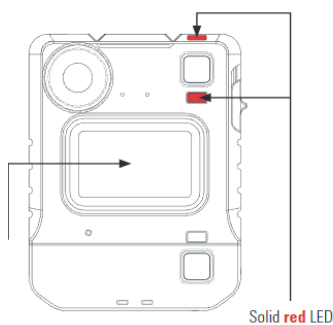
FIGURE 12 IMAGE OF MS' VB400 DUAL INDICATOR LED LIGHTS FOR RECORDING (MOTOROLA SOLUTIONS, 2025B).

Based on the above discussion, there are clear differences in the number, positioning, and operation of indicator lights between devices used by police organisations in England and Wales. This lack of consistency is problematic for the public being able to ascertain whether a device is recording them. Even if the design includes an element of configurability for how indicator lights operate, there is minimal guidance on the topic in the region. This lack of standardization and subsequent lowered recognizability is problematic for the physical protection of officer's given that they are meant to indicate their operation and in so doing, deter violence.[1]

From a privacy perspective, this issue is set to intensify with the increasing functionality of the devices (for instance, livestreaming, conduct analysis of feeds, and live facial recognition). There is seemingly no feasible way for LED indicator lights to indicate to members of the public that the device is currently operating these advanced functionalities.

6.2.3 Front-facing screen

As aforementioned, the officers at Peelford Constabulary were using Reveal's D-series devices (D3 and D5 models). Reveal's devices feature dual screens, one of which is a front-facing screen. While some vendors produce devices - for example, Hikvision (2024), Digital Ally (no date), and BOBLOV (no date) - with front-facing screens, none provide them to police organisations in Britain. It is potentially for this reason that Reveal, a British-based company, claim to produce 'the only *police* body camera with a front-facing screen' (Reveal, no date-g) (emphasis added).

FIGURE 13 PICTURE OF REVEAL'S FRONT-FACING SCREEN FROM THEIR WEBSITE (REVEAL, 2025).

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[1] The requirement for devices to have indicator lights, as per the regional guidance documents, was borne out of data protection legislation. Given that both privacy and officer protection benefit from increased subject and bystander awareness, the variance of LED light design and operation is a privacy concern too. For a discussion on LED bystander-centric design, see Flammer (2016).

This front-facing screen displays the visual information which the lens is capturing. Accordingly, subjects (members of the public who are interacting with the police) can see themselves and their behaviour reflected on the device. This is seemingly a popular feature at Peelford Constabulary.

> "On the whole, officers accept body-worn video now as a daily part of their life. They accept that it is a vital part of their job. They now appreciate that it is saving them a lot of aggravation. Not least because *the models that we have, have got a little screen on. So, if a person comes up and it aims to attack one of the policemen, he can see that he's being recorded, so that's a visual deterrent.*" (Participant 8: Internal manager of BWV technical system; emphasis added).

It is important to note that this front-facing screen can be de-activated by the user/officer without ending the recording or powering off the device. A section from an interview with an officer (Participant 10), who uses the BWV device daily on the frontline, explains why this might be desirable in some instances:

> "Researcher: And what are some of other people's responses to seeing themselves being recorded?
>
> Officer: A lot of them don't want the camera on. Or tell us [we] can't come in if the cameras on.
>
> Researcher: And how do you navigate that?
>
> Officer: Unfortunately, that's part and parcel of what I do. It's, the camera is going to be on. I might switch the screen off if it makes it more comfortable for them, so they can't see themselves on it. But the camera's not gonna be switched up [off] because they want it off."

Reveal has advertised that the front-facing screen has a 'pacification effect'. Reveal's June 2021 product brochure also states that "this signature Reveal feature has a proven calming effect on people being recorded and maximises transparency with the public" (Reveal, 2021: 5). On their website, they list five core impacts of BWV technology. Under point two 'Protect workers by deterring crime', they state that: 'Making the camera obvious to the public has an immediate impact by demonstrating that actions are being recorded, leading to fewer assaults on frontline workers' (Reveal, no date-b). More specifically, under the heading 'The benefits of body cameras with front-facing screens', they state that 'front-facing screens are a unique feature of Reveal body-worn cameras. With scores of body camera models on the market that record covertly, our cameras are designed to calm situations before they escalate' and that 'when recording, because the person being recorded can see themselves on the screen, it adds transparency to the situation. This brings a new dynamic to the interaction between the public and law enforcement' (Reveal, no date-a).

Most importantly, the webpage goes on to state that '*front-facing screens can de-escalate and prevent aggression towards officers*. An *awareness* that a camera is rolling generally improves the conduct of both sides of an encounter' (Reveal, no date-a) (emphasis added).

The front-facing screen not only signals that recording is in progress (for privacy purposes) but also heightens subjects' awareness of themselves and their behaviour. By displaying what the lens captures, it can, in theory, enhance the deterrent effect and thereby protect officers. Nonetheless, the design has not seen widespread adoption across the region, and this is now discussed.

Regional relevance of the front-facing screen

Given the previous discussion on the necessity for subjects to become aware that they are recorded, the front-facing screen seems to be an effective design feature for police to increase the deterrent effect and thus, protect themselves from violence. Moreover, this is a feature which design experts proposed in Koelle et al.'s (2018) research which sought ways to transcend reliance on LED indicator lights on body-worn recording devices. Seemingly, this is a feature which one might expect to see universally adopted across vendors. Yet, Reveal is the only vendor in policing in England and Wales to employ this material design.

There is no evidence to indicate that this is a proprietary feature, and a detailed search found further models of BWV device currently available with this feature (none of whom seemingly have a market share in policing in the region). The devices have either a single front-facing screen (Reveal's devices have two screens, one for each side) or an articulated camera head/lens which allows for the single screen to be set to front-facing - akin to Motorola Solution's discontinued Si500.

The nature of the procurement process in the UK might have to do with this feature not being more widely selected by police organisations. As the former lead of a BWV platform stated:

> "You can't really ask something that's going to exclude most of the providers unless you've got a really, really strong case for it. So, for example, Reveal have the cameras with the front-facing screen, which officers really like. They feel that it has a calming effect sometimes on people as soon as they see themselves on screen, they might tone down any aggression. So, if we had really strong evidence the time and time again, that made a massive difference, as I understand it, we could potentially say, this is so important to us that we will only look at suppliers that have a front screen capability which would rule out a lot of people.

So, you have to have a very high level of justification to do that in on the grounds of fairness really." (Participant 2)

While this might explain why the feature is not uniformly selected by police organisations, it does not explain why other vendors do not adopt the front-facing screen design practice. One technical reason could be the trade-off in size and weight[1], and a front-facing screen is an additional drain on the device's battery. Reveal could compensate for this drain by increasing the capacity of the lithium battery, but this would potentially increase the manufacturing cost and weight of the device. Despite these technical and feasibility options, it is curious that this feature has not received research to validate the claims made by the vendor given that Reveal were producing devices with front-facing screens within the UK since at least 2011 (Mass Transit, 2011). A thorough examination of their websites and advertising references anecdotal evidence (interview quotations from their clients) or referring to the deterrent effect of BWV devices more generally from Ariel et al.'s (2015) Rialto study.

While no research directly testing the efficacy of the front-facing screen in deterring violence was found, a German study does briefly mention this design feature. Kersting and colleagues' group discussions found that participants did not believe that the front-facing screen had much impact, largely due to its small size; in some cases, people reportedly even moved closer to inspect it, undermining officer safety (Kersting et al., 2019: 122-123). There is evidently a need for an examination of the effects of the screen to ascertain whether they do increase officer safety and under what conditions.

6.2.4 Potential implications for policing in England and Wales

This section has revealed is the relevance of material design of BWV devices to the physical protection of officers. While notification stickers and indicator lights are currently envisioned as privacy notices, they have potential to impact police officer protection by increasing the awareness of the subject that the device can record and when it is recording. Accordingly, this section links design and use of the device for police to protect themselves. While there has been less attention to the icons/stickers used and the potential for indicator lights to increase the deterrent effect, the front-facing screen is central to police protection.

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[1] For instance, MS's VB400 is comparable in weight to Reveal's D3/5 but is 10mm slimmer and the same difference in thickness applies to MS' V700 which is comparable to Reveal's K-series. Axon's Body series device dimension data is not publicly available.

Especially, at Peelford, where almost all participants from the organisation mentioned the design feature.

While all three of the design choices work towards notifying subjects of the BWV device, it can be argued that there are crucial distinctions in their operation and impacts. Since this notification theoretically heightens subject awareness, increasing the deterrent effect and thereby protecting officers, its implications deserve careful consideration. Specifically, icons or stickers indicate that the device can record audio and video, while indicator lights and front-facing screens signal when it is active. The latter not only confirm activation but also display the subject's own behaviour, potentially heightening their self-awareness.

Assaraf et al.'s (2024) research found that the presence of the yellow notification sticker on the BWV device significantly increased the reported violence against the officers wearing it (in comparison to those officer wearing devices without the sticker). While increasing awareness of the devices capability to capture audio and visual information overall, certain iconography, colour, and/or text might illicit detrimental, unintended responses from the public (unforeseen effects). While front-facing screens can in theory create the highest levels of self-awareness through its reflective power, there has been a potentially concerning development in the UK. Specifically, while the front-facing camera is designed to depict what is being recorded, a recent trial of Reveal's K-series devices for a live facial recognition project showed that the screen was used not to reflect what is being captured, but rather as a static image/notification display. This capability to repurpose the front-facing screen is not listed in any of the website information or user manuals.

The project was a trial of the on-board facial recognition technology (FRT) functionality of the K-series BWV device by private security ('bouncers') outside of nightclubs and bars (BBC News, 2024). However, the video and picture contained in the news article shows that the front-facing screen was set to display a text notification and QR code. It is unclear whether this ability to display a custom static image is a general or custom function. If this is a general function, it is concern given the wide organisational discretion in the region. Police could create their own notification messages with no forethought on how this impacts officer protection.

FIGURE 14 SCREENSHOT FROM BBC NEWS ARTICLE SHOWING EMBEDDED NOTIFICATION.

O'Neill et al.'s (2024) recommendation for officers to have a notification with a QR code is a means of informing the public and providing ease of access to request footage of themselves. However, it is unknown what impact this might have on protection of officers and potentially attracting unwanted attention or people approaching officers. It would be a different matter if upon request, those who have been recorded are able to scan a QR code which temporarily displays on the front-facing screen. It is recommended that both the design choice for the front-facing screen and the impact of notification messages receive further research. While it might be ethically questionable to assign yellow stickers to an experimental group where there is evidence from different policing contexts that it increases violence, there ought to be further investigation into the potential interpretation and responses to notification stickers within the field of applied psychology (the paradigm of cognitive interpretivism).

Material design and police use

It is crucial to highlight that while the front-facing camera has, anecdotally, a deterrent effect where the subjects are not in a state of mental health crisis or under the influence of substances, many incidents that the police respond to involve subjects who are vulnerable or intoxicated (this became particularly apparent during field observation). This seemingly requires officers to be judicious in discerning whether to deactivate the front-facing screen on a case-by-case basis. It is worth hypothesizing that further research on the topic might reveal that the design feature has a strong deterrent effect, but that it is highly variable, and potentially increases violence under particular conditions (to quote the frontline officer,

where "Some people play up for the camera"). This would signal an intensification in the variance/pattern already visible in studies on the deterrent effect of BWV devices more generally. Such context-specific variance that relies on effective decision-making would interplay with levels of officer experience and discretion, and this could be a risky design choice for organisations in the region struggling with staff retention. Staff retention issues in the region (Police Federation, 2024) have been identified by Charman and Bennett (2022).

It is essential to examine the materiality of technical systems (as a designed and constructed product) in the role they play in policing as they are not passive nor, as O'Neill et al. (2024) point out, are they neutral objects. They are constructed by vendors to have an intended impact on public-police interactions. Crucially however, this section has shown that material design choices can be made by vendors to protect their users, but this intended effect is not pre-determined. Conceptually, it can be reasoned that increasing awareness will increase the deterrent effect and in turn, protect police officers. However, how this operates in practice is shaped by social and environmental factors. Accordingly, the value of materiality should not be overemphasized, and techno-deterministic beliefs should be avoided. As this dissertation has put forth from the start, there is complex mutual shaping between technical systems and social arrangements. Vendors can envision and construct the most well-intentioned designs considerations, but how these are used and interpreted during public-police interactions is variable and unpredictable. While the 'best' design principles should be used, their actual outcomes should also be explored. This section has identified that research on this is substantially lacking.

The next section takes this discussion further by discussing the technical functionality which is increasingly being adopted in the name of protecting police officers, indicating how physical protection of officers is shaping the development of BWV technology.

6.2.5 The limits of deterrence and the burden of officer discretion

As aforementioned, the theoretical deterrent effect of BWV devices stems from a specific cognitive mechanism: that the subject is aware of being recorded, understands the implications of the recording, and changes their behaviour accordingly. The research discussed above demonstrate that this mechanism only functions effectively under conditions where the subject possesses the required rationality and self-regulation. It is however routine for police to have interactions with individuals who are under the influence of substances and/or are experiencing severe mental distress. As Kruse et al.'s (2023)

findings and the RAND report demonstrate, these individuals are not only less likely to be deterred from committing acts of violence, but they might also become more aggressive or dysregulated when exposed to a recording device. This presents an operational paradox, whereby the incidents most likely to involve violence and risk to officers are often the incidents where BWV technology provides the least amount of protection.

Consequently, officers are likely to develop informal decision rules such as when to announce the BWV device, when not to activate it, and when to prioritise de-escalation over evidentiary capture. This can occur irrespective of organisational policy as such informal decision-making is supported by the National Decision Model, which grants British police officers ultimate discretion so long as they record their justification if their decision breaches policy. However, these judgements require experience and contextual awareness. As one frontline officer expressed, "nothing's gonna change how they're gonna interact" (Participant 10) when the person is intoxicated or distressed. Thus, what is designed as a "safety technology" shifts the burden of risk assessment onto officers. Inexperienced officers, who may not yet have developed sufficient knowledge and field experience about when the activation of BWV may escalate rather than temper a situation, might be disproportionately exposed to harm.

The conceptual toolkit exposes several tensions on this matter. First, BWV devices afford deterrence only when the subject is capable of rational self-regulation. In other conditions, the same design and functionality becomes a constraint, raising tension or provoking escalation. This is, in theory, exacerbated by devices with front-facing screens. Here the effect is potentially amplified in both directions, de-escalation and escalation. Considering the Kersting et al. (2019) study, whereby research participants indicated that the front-facing screen attracted unwanted attention, this design feature could be as much of a liability as it is a deterrent.

Second, the *situatedness* of the device means that officers must continuously assess, in real-time, whether or not activating their device (or enabling Stealth Mode) is appropriate during volatile interactions. While increased visibility of the device is intended to provide deterrent benefit, certain conditions make reducing the device's visibility a priority for officers to assess. During these volatile situations, *control* of activation rests solely with officers, which could inadvertently raise tension. Moreover, the decision not to activate may later be viewed with suspicion (see Section 5.4 in the preceding chapter), while activating too early may provoke someone who is already in a state of dysregulation. As O'Neill et al. (2024) argue,

police and the public might be better served by granting subjects greater say in when recording commences. Their suggestion illustrates a problem with BWV technology's current design principle of user-centrality (police-centred control). Accordingly, discretion over activation has real implications for officer safety and police accountability.

Third, there is a misalignment between the designer intentions and policing realities. While vendors actively construct BWV technology as a universal deterrent with slogans such as 'capture more truth', 'independent witness', and 'real-time situational awareness', officers routinely encounter conditions where these design intentions are at odds with the volatile nature of police work. While functional flexibility exists (such as disabling recording notifications) to address the wide range of interactions officers have, this highlights the centrality of users and their decision-making. In practice then, BWV technology's promise of deterrence is conditional and situational instead of universal, placing an additional cognitive burden on frontline officers.

The next section begins by describing a 'Code Zero' event, one such example of volatile situations officers risk facing.

6.3 Technical functionalities enhancing protection

Technical functionality can be examined as the full range of *inherent* and *intended* capabilities which an artefact or technical system is given by the vendors who design and construct it. These functionalities are not static but develop over time. A more detailed discussion is provided in the following chapter, as part of a conceptual toolkit. While the material design relates to the physical and digital design components of the system, technical functionality refers to what the system and its component parts can do. The functionalities of BWV, as a technical system, relevant to the protection of police are detailed and analysed below.

6.3.1 Geolocation and remote activation

An emergency incident ('code zero') which took place at Peelford Constabulary during field observation is an example which highlights the nature of existing functionality, developing functionality, and the desire for additional functionality which could physically protect police officers. The functionality discussed in this section is enabled by the presence of a SIM card slot (a material design feature) within the BWV device, which provides mobile

connectivity (LTE/4G). This mobile connectivity in turn enables geolocation (GPS) and remote activation functionalities. The emergency incident further encapsulated how an organisation and individuals had the potential to shape BWV technology through its selection and use for officer protection (operational considerations).

The 'Code Zero' system is an emergency system officers engage when they are in danger and need immediate assistance. This is based on radio codes used by UK police (and other international police organisations) when communicating via their radio systems, with a 'State 0' meaning 'panic, emergency assistance.' A button, usually on top of their radio transmitter, is pressed and it is designed to override the organisation-wide radio system.

Depending on the organisational system, this transmission overrides other officers and can override dispatchers too. It essentially transmits audio from the officer's radio microphone to all receivers for a few minutes and then the radio operators at HQ speak for a few minutes to all devices, including the officer who pressed the button. This rotates back-and-forth until the system is deactivated. During this initial period, no other radio signals can be transmitted over the system. This allows for information to be given to all officers to locate and ascertain the situation of the officer in distress and prioritises their need for assistance without other radio transmissions interfering. Moreover, the officer's location should be transmitted to HQ via their radio's built-in GPS transmitter, as soon as this button is pressed allowing for reinforcements to promptly arrive in support.

Field observation

As the researcher arrived at the response unit at Peelford Constabulary ready to begin field observation of a day shift with frontline police officers, there were conversations about an officer having been attacked during the prior shift (night). The known details of the incident were explained during the duty briefing which the researcher was included in. During this incident, the officer's location was unknown despite pressing the 'Code Zero' emergency button on their vest and they were unable to communicate their location as they were being strangled by the attacker. The officer's radio had malfunctioned and had not been able to transmit the GPS location. Thus, the officer was being attacked by a suspect, something which all officers could hear over the radio, and there was no way at the time to support them during the attack. Apparently, it took several minutes for other officers to arrive. Fortunately, neighbours looking out of their windows witnessed the officer being strangled

and went out to intervene, removing the attacker from the officer. Officers were acutely aware that this could have ended much worse had the witnesses not involved themselves.

In the response department, where the researcher was located, and going into the briefing room, there was an atmosphere of tension and uncertainty as officers didn't know all the details of what happened, how and why the 'Code Zero' system had failed, how the officer was doing, and what had happened to the perpetrator. During the take-over (overlap) period where one set of officers end their shift and other officers begin, there was informal discussion about the event, with senior management not yet having addressed the incident. Response officers entered the briefing room knowing that one of their colleagues was attacked and that the system which was meant to protect them had failed to work as intended, realising that it could have been one of them in that situation. The informal details circulating around the unit was that it took place during a routine search for a suspect.

During the briefing, the shift commander confirmed that the suspect was in custody, that the radio-based locator had failed to provide the officer's location, and that they were investigating the system failure. Officers asked if the camera (a D5 model) had captured the event. The officer had started recording but the lens had moved during the altercation and thus it was facing the sky and not the suspect. This meant that the face of the suspect was not recorded during the attack. It was mentioned that the sound from the footage might be sufficient. During the briefing, senior management explained that the footage had been 'cloaked' (hidden from users without the necessary managerial access on the footage management system) and they asked officers not try to access or disseminate the footage. There was also mention that the new model of BWV device (model improvement pictured below), the D7s, (which firearm officers had access to) were GPS-enabled and might have been able to locate the officer had he been wearing one.

	D3	D5	D6	D7
Memory	32GB	64GB	64GB	64GB
12 hour battery	✔	✔	✔	✔
Ultra low light	✔	✔	✔	✔
AES-256 encryption	✔	✔	✔	✔
Live streaming WiFi		✔	✔	✔
Bluetooth triggers		✔	✔	✔
GPS aware		✔	✔	✔
Onboard GPS			✔	✔
Live streaming 3G/4G				✔

FIGURE 15 MODEL VARIATIONS ACROSS REVEAL'S D-SERIES FROM THEIR 2021 PRODUCT BROCHURE.

Furthermore, it was mentioned that with remote activation, the lens could potentially have been adjusted remotely to capture the face of the suspect during the moment of the attack. It was also stated that if the officer hadn't turned on the device, at least the new D7s could be remotely activated by the control room at the police station. The officers asked if these were going to be rolled out to non-armed response officers. There was a sense that the radio system had failed the officer, and the other officers wanted to know why and how this could be addressed in the future.

The allure of additional functionality for protection

While the device evidently failed to protect the officer, through deterrence, in this incident, the functionality of BWV devices and their systems can extend to include the officer's location and potentially remote activation if they did not activate the device themselves.

> "LTE [mobile connectivity] gives you the flexibility to have that outside the premises. It gives you, so operationally, I say, when this actually get used is very rare, but it's the situation of officer is down, someone's beating them up. No one knows what's going on, you want to remotely activate their body-worn camera. So, it's a, it's a kind of outside use case, but it's a very important use case." (Participant 9: member from BWV vendor)

This observed incident was a powerful demonstration of the demand for additional functionality which serves the needs of police officers, specifically those which protect them. Several months after the incident, the former head of the BWV platform (Participant 3) at Peelford was interviewed and they revealed that remote activation is something which is important.

> "So, what I'm talking about is remote activation of cameras. So, if we had a situation where let's say an officer was an officer was kidnapped or an officer was incapacitated, knocked over, whatever, with the right level of authorization, I'm talking about Chief Officer level, we might be able to remote activate that officer's camera. But obviously, there's risks incumbent with doing that. So, all of these things would need to be strategized and would need to be mandated and would need to be appropriately governed. But I think that's a that's a capability that needs to be there when it comes to protection of the individuals. So yeah, I think definitely there are challenges but definitely there are benefits."

However, when the Code Zero incident was raised during the interview and they were asked if there was an increased demand after the incident, they responded that they do not see an increased demand for the features. It is important to note that the financial cost is a factor when considering whether to invest in the features of remote activation and geolocation. The

interview response also signals an unsurprising conflict between the need of officers to protect themselves and concerns over increased surveillance. As Participant 3 went on to state:

> "The body-worn video cameras that we are starting to introduce in our force now, some of them have GPS tracking, so it records as part of the metadata the latitude and longitude of the recording at the time. *I don't think there's a[n] increased demand from the workforce at the moment for remote activation.* Because, and I don't think that's driven by fear, I think if it were to be explained to them the rationale as to why we have the capability and we reassure them about the level of permission which would be needed to activate it, they'd get it. We're already in a position where our control room can if necessary remote activate the microphone on the police officer's radio. So, to be able to do the same with body-worn video seems to be the next logical step, but we would have to reassure our officers about the permissions that would needed to be granted in order to do that, so it couldn't just be an ad hoc thing. But I don't think there's an increased demand from our officers at the moment to have that capability and I don't see that need to be there. I think it's one of those, it's that, I refer to it rightly or wrongly as that 9/11 scenario. *It's that worst case scenario that you never know when it's going to happen but when it does happen, you wanna be able to do it. So, it's a lot of investment to have something that hopefully you'll never need.*" (emphasis added).

6.3.2 Facial recognition

It is important to raise the functionality of facial recognition technology (FRT) given that it is a feature which is currently available to police organisations through their respective BWV vendor platforms (depicted in the next section) and is being marketed to police organisations as a means of improving officer safety. Reveal, for example, advertise their Face Match feature as 'promoting safer working environment' and that using their K-Series AI-enabled cameras 'move[s] society towards a safer and better future for everyone' (Reveal, 2021a).

Neither Peelford or Bobbyham Constabulary were using this feature regularly, but it remains important to demonstrate that the functionality exists should operational demand and legal justification grow in the future. It is also important to note that there are police organisations (such as the Metropolitan Police and South Wales) in England and Wales using facial recognition and thus, there is precedent for this operational use case within the region. The salient organisations include the Metropolitan Police (no date-a) and South Wales Police (2022). As shown earlier, this is being trialled elsewhere in England for private security outside of nightclubs and bars (BBC News, 2024).

A participant from Bobbyham Constabulary raised this functionality and the use case for police organisations in the region during one of the interviews when asked about the future of BWV technology.

> Participant 2 (head of Bobbyham BWV platform): "I think technology wise. Looking forward to this discussion now about live facial recognition. I don't know if you come across it. So, we haven't moved in that direction yet. We were trying to get some senior officers to decide on options, for a live facial recognition potential so similar to South Wales, you know you can have a major event, information that is going to be some people attending for serious disorder, and they might be banned from that location. So, in theory you could publicize what you're doing, put their pictures into the Memory Bank and the server, or whatever, for a comparison list, and then use the cameras to try and find them."

> and "So for the camera, obviously it films at thirty frames a second. So, I'm guessing all you'd need to do is identify one of the frames that it's got a good angle in good lighting of that person's face, and in theory, within a matter of seconds, if they've previously been arrested, it will probably bring them back. So, you know who you're dealing with and straight away you might know that they have serious mental health issues, and they might tend to hide bladed weapons on their body."

> and "they might be wanted for offences elsewhere in the country. *But your primary concern at that moment in time is probably your safety and their safety.* And the more you know, the more you can take that into account in terms of how you deal with them until you get them to custody and go through the whole procedure. …So, really anything like that, like facial recognition could potentially reduce some risk." (emphasis added)

An interview with a member of a third-sector organisation advocating human rights issues surrounding surveillance technology, provided insight into police technology use. According to a member of a third-sector organisation (Participant 11):

> "There are a number of steps which should be done if this kind of technology is to be used in a way which is compliant with international human rights standards. So, it's not that the police decides to use these technologies and that's it or they need to say that we're using this technology and we think it is necessary for whatever reason and we're gonna do this and this circumstances etc. There, the details and the specificities they matter. So, what's important is that at the very first step you need to figure out whether the use of this technology is going to be legitimate and whether it is going to be necessary and proportionate because these technologies will violate a number of fundamental rights. So, the violation is only justified if it is legitimate, necessary, and proportionate. Now the necessity, especially the necessity and proportionality they absolutely need to be taken into consideration for each and every specific use, each and every thing you're planning to do with this technology."

Evidently, there was a use case for police to be able to use this technology when they interact with members of the public. Officers knowing who they are dealing with and whether there are warnings on their file is a means of reducing the risk of violence to officers. It is also important to note that the upgraded BWV devices already have the functionality for facial recognition using on-board facial datasets uploaded to the device (which automatically syncs every time the device is docked) (Reveal, 2021a).

Accordingly, even if a device does not have mobile connectivity and livestreaming enabled, it is still able to match faces. However, as the participant from the third sector continued, certain technologies are more invasive than others.

> "We've been after this face recognition technology, which we've said, we've seen, many have studied and keep studying this, fortunately, many voices from the academia to civil society…not only the industry voice about what this technology can deliver…have raised a number of challenges…have said that this might be extremely discriminatory because of the way it's performed, the way its trained, the databases they don't reflect reality. So, we have a lot of problems in there and this is a problem that is procedurally linked to the development of the technology, of how it performs irrespective of whether it's used in a public street or a closed room. Certain technologies for example, taking the biometric data of your face is going to be much more invasive than other technologies simply because we will never be able to change your face. So once that data is collected, there is no way back in a way. So, you can say 'ok, I'll erase the data' but then you need to guarantee that those are really erased and how and when and by whom and so on and so forth. Certain technologies have an impact that is very complex to undo."

Facial recognition technology is one of those technologies that is particularly problematic in terms of its invasiveness as well as issues regarding the training and application of the recognition system. White and Malm (2020: 117) are decisive in their conclusion against certain use cases of facial recognition, stating that "certain products are categorically unethical to deploy. Chief among these is real-time face recognition analysis of live video captured by body-worn cameras. Axon must not offer or enable this feature."

South Wales Police originally had the use of the technology struck down by the court (BBC News, 2020a) and, after an independent review (South Wales Police, 2022), have recommenced using the technology (BBC News, 2023b). If the journey of police use of automated facial recognition in South Wales is any indication of wider rollout by UK police, facial recognition will continue to be strongly contested by the public. Interview data reveals that there is an awareness of the public sentiment in limiting the use of facial recognition technology. A senior police officer (Participant 2) responded that:

> "What I don't think it will be is the idea that you could just walk down the street and have it on and it would just ping every time it recognized someone. The human rights in this country I don't think would allow that. I'm not suggesting that anyone's pushing for that. But I think when you look at public perception, that's probably what the public would imagine it. So, your communications about how you manage these things are really important. So, you don't get massive misconceptions and distrust."

Senior management (Participant 4) further indicated that there is an awareness of the balancing act between fundamental rights and operational benefits, stating that:

> "there are complex considerations about how technology is used objectively, fairly, and within existing legislation to support policing purposes, balance against the needs of human beings in terms of the privacy, rights of fair trial, et cetera, data protection. But, you know, and those are the subject of ongoing discussions at the moment. You know, facial recognition is a perfect example. You know, there is a legitimate space where facial recognition, used properly, and with the appropriate controls and considerations in place, can massively assist the policing purpose, which in turn impacts on public safety and reduces the risk to communities." (Participant 4: Senior police manager)

Evidently, there is a use case for facial recognition as it relates to protecting police officers. This has led to the development and offering of this functionality as a service within BWV devices and systems by vendors. The adoption of this functionality is, however, shaped (constrained) by the social arrangements within the region, particularly the legal framework, but also potentially by the prevailing public sentiment as understood by senior members of the police.

6.3.3 Livestreaming

In addition to enabling geolocation and remote activation, mobile connectivity allows BWV devices to livestream what they are capturing to the system's online platform. In the case of the three main vendors in the UK, this platform is the same as their DEMS. This section examines the rise of livestreaming in policing in the UK as it relates to protection of police officers.

Discussion about livestreaming dates to the original BWV guidance (PCSD, 2007: 25), where it provides that "future developments of this technology include the ability for live streaming of the images from the BWV unit to a nearby vehicle or command centre, or in combination with automatic number plate recognition technology." There are many additional use cases of livestreaming which do not fit categorically within police officer physical protection such as major event surveillance (control-and-command). The former

BWV lead indicated that they use livestreaming for major events and described the development of mobile connectivity:

> Researcher: "Are there plans to incorporate mobile connectivity?
>
> Participant 3 (senior officer, former BWV lead): Yes. Yep. The providers do it now. It's down to the individual force as to whether they want to take them up on the option. Once they do, we can work with the providers…We used it successfully for Operation London Bridge, when our officers were deployed up in London. And we used it as recently as last week when the [event] took place from down in [area]. And we've got plans to use it in the future…So livestreaming is now a regular thing for us. I'm aware of other forces as well that also use livestreaming. *We're starting to see the technology now where newer generations of cameras allow you to upload via a SIM card via LTE direct from the camera, so you don't even need to go back to the station.* More and more can be done remotely whilst out in the field. So, the technology is constantly evolving, constantly advancing. *And mobility I think is going to become a big thing moving forwards*." (emphasis added)

A further interview response indicated that Peelford are in the stage of finding a sufficient use case for livestreaming and that they are cognizant not to overextend their use of BWV technology, potentially putting their gains at risk.

> "Livestreaming is like a little good half-way house, I think. I think that is going to be the next push. But again, it is just trying to find out the use case for it and making sure we're not overusing body-worn video. Making it, using it for the sake of using it. It's a really good camera, that's what it's there for first and foremost. We don't want to start encroaching on other, putting other stuff at risk just because we want as much tech as possible. So, it's a really fine balance." (Participant 1: Senior police officer)

Bobbyham Constabulary appear to be further along with implementing livestreaming.

> Participant 2: "I think everyone's in the same position nationally. Pretty much, I think live streaming is the next big step for body-worn video. So, the big suppliers have got it in different degrees." and
>
> "So, we've done a proof-of-concept earlier in the year. It worked very well. We needed to make some technical changes, and we think we're right on the verge of being able to go back testing, livestreaming, and hopefully go live early in the New Year. So livestreaming is a big feature. I think it's got a strong future, but it's contextual…that kind of thing where it might have tangible benefits for remote command. *And officers needing urgent assistance, you know, if we can see what's happening, we might be able to direct resources to them more quickly*." (emphasis added)

Nonetheless, it seems that the operational uses pertaining to senior command staff and interorganisational efforts (command-and-control and surveillance purposes) have driven the acquisition and testing of the livestreaming technology, while the everyday, mundane use cases emerging on the frontline of policing are driven by police protection.

> "Some people are a bit nervous about live streaming, but when you talk about officer's safety, they very quickly see it quite differently. So, I think they're in favour of that. In fact, when I spoke to [police organisation] I found a couple of things that they weren't expecting. So, if an officer was single-crewed and go into a confrontational situation, they might ask the Controller to monitor their body-worn video just in case things started getting out of hand. Yeah, so it was a proactive request from the offices for that." (Participant 2)

Given financial constraints (The Independent, 2025) and retention issues facing police organisations in England and Wales, livestreaming may serve as a 'technical plug' for the emerging safety gap faced by single-crewed response officers, particularly when they anticipate volatile situations. If officers can request a Controller at headquarters to access their livestream, this step may obviate the need for remote activation, especially when tensions begin to rise. Motorola Solutions offer this functionality, claiming that 'with high-risk incidents on the rise, responders need real-time situational awareness to support better decision making and safety in the field' (Motorola Solutions, 2023b).

Axon have designed a 'Watch Me' button for their Body-series devices (Axon, 2024e). When pressed, this button sends an alert to a police organisation's control room requesting that an operator accesses their livestream. Thus, if an officer feels that insecure about being single-crewed or needs the assistance of their supervisor, they can make a request for support. They claim this Axon Respond feature offers 'real-time support' (Axon, 2024b).

In an annual report, the Biometrics & Surveillance Camera Commissioner provided that West Midlands Constabulary (WMP) were using livestreaming functionality, stating that "this will mean that, once the function is activated, officers in a control room can watch events as they occur, make quick assessments and issue commands – including the need to send reinforcements – without being physically present at the scene" (BSCC, 2023a: 78). WMP was the first constabulary in the region to implement this functionality for their frontline officers (BBC News, 2022b), and a FOI disclosure specifies that they use it for public events, critical incidents, officer safety, and supervisory support (West Midlands Police, 2022).

As WMP's vendor, Axon released a case study on the use of this functionality (Axon, 2023c). Much of the article speaks about operational benefits which centre around officer safety, effective decision-making, and increased transparency. While Axon is providing a system with advanced functionalities, other vendors in the region are offering comparable artefacts and platforms. Reveal, for example, released an article detailing their livestreaming functionality entitled 'The evolution of police use of body-worn cameras: From evidence capture to live support' (Reveal, no date-f). Police contracted with Motorola Solutions can access livestreaming functionality through the CommandCentral Aware platform, which includes video analytics (Motorola Solutions, 2025a).

Evidently, the technical functionality exists, vendors are marketing it, and police organisations in England and Wales are interested and at varied stages of trialling or implementing the functionality.

6.3.4 Potential implications for policing in England and Wales

This section has identified three key technical functionalities which are being offered by BWV technology vendors, and which are in various stages of implementation across police organisations in the region. There are three components to the potential implications which these technical functionalities have on policing in England and Wales.

The first core component is that these functionalities are not solely technically possible, but they are being actively promoted and marketed by the three main vendors that have a market share in the region. The second component is that there are significant trade-offs to these functionalities. Geolocation and remote activation embody greater surveillance capacity on police officers in the field. Facial recognition technology has significant civil rights concerns given the nature of the biometrics being collected and evidence showing discriminatory results for minority ethnic populations. Livestreaming is a substantial advancement of technical functionality, constituting significant function creep and enables additional functionality, including algorithmic integrations such as real-time computational analysis (as is discussed in the next chapter).

The third component is that these functionalities offer significant operational benefits to police organisations. Chief among them is the protection of police officers. Police officers using BWV technology in ways to protect themselves is understandable given the dangerous nature of frontline policing, especially if there are sufficient transparency and accountability

mechanisms counterbalancing this technology-enabled benefit. What is worth critical analysis is the broad-sweeping use case or police purpose of police protection which evidently exists within police organisations and the weight that is afforded to these considerations. Especially, where these considerations conflict with increased officer surveillance, civil rights concerns, and the enabling of significant function creep. As aforementioned, the intended impact embedded in the material design of BWV devices does not necessarily determine the actual outcome on public-police interactions. Whether these additional technical functionalities provide increased protection, in practice, needs to be ascertained, examined, and weighed in relation to the interests (and where relevant, the rights) they conflict with.

Discussions on the additional functionality also reveal the weight of police considerations over other stakeholders' interests. It is not an insignificant finding that the development of BWV technology is moving in the direction of police interests. This needs to be examined within the regional context where there are indications of an appetite for expanded digital technologies with algorithmic decision-making. For example, the College of Policing (CoP) called for expert opinion on their draft Authorised Professional Practices (APPs), which aimed to provide governance frameworks for these expanded capabilities (College of Policing, 2024c). These APPs have subsequently been adopted, specifically for 'data driven technology' (CoP, 2024a) and 'data ethics' (CoP, 2024b),. Amongst other functions, they outline frameworks for the assessment and implementation of advanced algorithmic systems and the need for impact studies.

The latest BWV procedural guidance (NPCC, 2024a: 20-21) speaks directly to these functionalities for increased protection, stating that "technological capabilities within the cameras themselves can enhance real-time situational awareness through capabilities such as live- streaming (sic) of footage and built in artificial intelligence (AI) features to monitor and analyse behavior, sound, and faces. BWV that includes wireless connectivity can afford users the protection for all parties, without the restrictions of having to be within your own force, or even returning to police premises to dock cameras and upload footage." It is concerning that the guidance proposes these benefits without producing evidence in support, nor providing 'best practice' guidance on the use of these expanded functionalities for those police organisations in the region who are already using, trialling, or considering them. That the technology also enables the interests of other stakeholders such as increased police transparency and accountability (central to the previous chapter) does not necessarily counterbalance this trajectory if it emerges that the technical development favours one

interest over the other, or completely conflicts with it. This is explored in the next chapter, using the example of BWV footage which has competing design considerations.

Conclusion

The previous chapter described and examined the *impact* of BWV technology on policing in England and Wales using the themes of transparency and accountability which emerged from interview data. This chapter shifts the focus to analyse *use* of BWV technology by police in the region in relation to the theme of police protection. As the objective of the research to address the gap in literature overlooking the material considerations, this chapter paid greater attention to those technical aspects of the data. This chapter might appear fractured having been separated into two sections with their own potential implications, seemingly constituting their own conclusions. However, the material design and technical functionality components of BWV as a technical system each tell a nuanced side of the story between BWV technology and police protection. Taken together, they depict the larger interplay between police in England and Wales and their selection, use, and shaping of BWV technology.

From the analysis of BWV technology use, it emerged that the devices and their systems are not neutral objects. Instead, an examination of the material design and technical functionality speak to the intentions of vendors (as the designers, constructors, and advertisers) and the use purposes of police organisations (as customers, users, and shapers). The chapter has also shown that the materiality of BWV technology is not static but has instead developed, and continues to do so, over time. Unsurprisingly, these developments have arguably been in the direction of police interests, specifically increasing the ways in which the technology can protect frontline officers. This is understandable given that it is the police who select, procure, and primarily operate the BWV technical system. The main users of the devices are frontline officers, and this has impacted the design and functionality of the product to meet their need for protection. The 'code zero' incident described during field observation speaks to this rare, but very real danger involved in frontline policing. If frontline officers are given a tool that can be used to protect themselves, they are going to use it accordingly.

Vendors who have been operating in the region for more than a decade are clearly aware that police protection is a genuine concern and a primary driver of technology adoption and use. They create additional technical functionalities, offer it to their clients, and attach with it the rhetoric of protection. Police looking to adopt these additional functionalities, for the

operational benefits they bring, can rely on the protection rhetoric given that it is a legitimate use case. While designs and functionalities can be tailored to achieve the outcome of protection, such an outcome is not guaranteed. Certain designs and functionalities might not have the intended effects proposed. Nor might they offer sufficient benefit of police protection to justify the interests (and rights) which they might infringe upon. Accordingly, materiality of technology is essential to include in an analysis of police technology use in terms of its impact, use, and intended outcomes. The next chapter attempts to build on these two chapters, weaving their overlapping parts together and offering a conceptual toolkit for police technology adoption.

Chapter Seven: Technology as a Product

Introduction

Functioning as an epistemic chapter, this section of the dissertation constitutes a quasi-findings and discussion chapter. As explained in the methodology chapter (Chapter Three), this research seeks to examine the impact of body-worn video (BWV) technology (Chapter Five), police technology use (Chapter Six), and BWV technology as an artefact. Hence, this chapter aims to introduce further empirical findings and augment them with literature from other disciplines to offer an alternate way in which police technology adoption is examined, particularly with BWV technology as a designed and constructed product.

This chapter introduces a point of interest for examining the ways in which meaning is given to the properties of BWV technology through interpretation and use. Specifically, it uses the assessment of BWV footage as a rationale to reveal and make sense of the underlying assumptions and to contrast them with the properties of the BWV devices and what they produce. It uses this opportunity to show that while technology can take on different meanings or rationales (sometimes contradictory), there are limitations to this before problematic misalignments arise. In this way, it engages with both theory and empirical data to problematise radical social constructionist notions of technology adoption and attempts to demonstrate that adopting a critical realist and soft determinist approach to examining police technology can provide novel and significant findings. This approach forms part of a conceptual toolkit for examining the relationship between police and technology.

It is crucial to note that this exercise of engaging with theories on human and technology interactionism to develop a conceptual toolkit of police technology adoption is not an attempt to reinvent the wheel but rather, is more a case of retrofitting (with lessons and tools from other disciplines) an old wheel which was left on the side of the road at the turn of the century.

7.1 Broadening criminological paradigms with HCI

This section aims to address gaps in criminological analysis and to propose the adoption of ideas from Human-Computer Interaction (HCI) to firstly, understand criminology's journey of examining technology adoption and secondly, to provide a more complete examination

of police technology adoption, which embraces the need to examine the police technology as a designed and constructed product.

To first evidence the gaps in and journey of criminological research on police technology adoption, one can draw from an article that signals the shift from second to third wave of HCI. Entitled 'The Three Paradigms of HCI', Harrison et al. (2007) highlighted that there are three paradigms at work within HCI as a discipline. The first two paradigms represented the first two waves of HCI and include 1) *Human Factors* and 2) *Classical cognitivism/Information Processing*. These are two empirically driven approaches to studying the interaction between humans and computers. Human Factors examines 'the fit' between humans and computer i.e. if the device's design fits the needs of the user (user-centred design). The second examines the way in which humans interpret the technology or rather, how the human brain makes sense of and is impacted by the technology (user experience). The third paradigm, which Harrison et al. (2007) argue constitutes the third wave of HCI, is the *Phenomenologically-situated*. This examines the way in which the interaction is shaped by the broader social aspects. The issues which Harrison et al. (2007) list as emerging from this paradigm include 'dynamic use context', 'socially situated', and 'indirect and multiple goals', addressing the role of emotions, and embedding ethical/moral stances on certain technologies. These emergent issues being examined in the third wave will sound familiar to criminologists and sociologists as they are what social scientists have been predominantly focused on when examining the relationship between humans and technology (see for example, Adams and Mastracci, 2017; Stoughton, 2018; and Willis, 2022).

Evidently, HCI and criminology started at different ends of the empirical-phenomenological spectrum but are expanding towards each other. HCI began by focusing on the practical, empirical, and technical components of their analysis and moved to embrace more of the social elements in their third wave around 2005 (Bødker, 2015), for example, proposing a feminist methodology (Bardzell and Bardzell, 2011: 677) and thus, aligning HCI and social sciences. Conversely, criminology is beginning to examine the human factors such as ergonomics (Suss et al. 2018 on the placement and fit of BWV devices) and material design (Assaraf et al. 2024 on the yellow sticker attached to a BWV device) and technical functionality (Dymond's (2014-) body of work on Taser and Miranda's (2022) concept of the mobility of the BWV device) as well as cognitivism (Boivin et al.'s (2017) and Jones et al. (2018) work on body camera perspective bias and subjective assessment of footage). This attentional shift towards the pragmatic and empirical examinations of the impacts of

technology are not unique to the discipline of criminology, with Information Systems (Hanseth et al., 2004) and Organization Studies (Hultin, 2019) going through similar transitions. Importantly, Harrison et al. (2007) argue that these paradigms can mutually exist within HCI and provide their own contributions towards the discipline. Arguably, this signals an opportunity for criminology to embrace the more technical/empirical aspects of analysis when examining the interaction between police and technology. Lastly, this attentional shift is paired with the shift towards relational ontologies in criminology identified by Milovanovic (2022), signalling a new wave within criminology.

Arguably, there is room within criminology to address their gaps of knowledge and be more pragmatic with its studies of technology adoption, while embracing its abundance of knowledge about the social/phenomenologically-situated elements of police and policing. There is no need to 'throw the baby out with the bathwater', a concern which (Bødker, 2015) had during HCI's shift towards a third wave. If criminology as a discipline cannot embrace such a shift, the alternative is for police research to step outside of criminological tradition entirely and embrace HCI methodologies. However, this could mean losing valuable contributions from criminology in addition to the more critical lens it offers. This dissertation argues that criminology can be aligned with other disciplines and adjusted in ways that enable better examine the impacts and implications of technology adoption, integrating insights from the human, natural, and technical sciences while avoiding the technological determinism of the past.

The next section will focus in on BWV footage as it relates to fields grounded in human fit and cognitivism paradigms.

7.2 Product study of BWV footage: Applying human factors and cognitivism paradigms

Relating to the assessment of BWV footage, there are several assumptions about humans and body-worn video technology. These assumptions are identified through quotations from interviews with participants, evidenced by vendor advertisements, and then analysed and problematised using literature from a range of disciplines. These intentions (Orlikowski, 2000) or rationales (Green and Hurley, 2005) for using BWV footage to assess public-police interactions and the conduct involved are termed *arbitrator of truth* and *depicter of perspective*. These rationales have underlying assumptions which are identified, discussed,

and problematised. Moreover, the notion that footage can fulfil both rationales, without contradiction, is also contested based on the distinctive material design choices of BWV devices associated with each rationale. Up until the recent 2023 BWV procedural guidance, these assumptions and limitations of using BWV footage for assessment were not overtly acknowledged in police documents. Finally, interview data, discussions observed, and vendor product information further perpetuate these assumptions and ignore the limitations, especially that the rationales contradict each other.

7.2.1 'Arbitrator of Truth'

Assumptions found in the interview data, which are perpetuated by vendors, include that BWV footage is objective, external or independent, and can therefore, arbitrate the truth of what happened during an incident which the device records. These assumptions are evidenced by interview quotations:

> "the more consistent that we can use body worn video to really shine a light on those encounters in a way that's *objective, truthful and irrefutable*, rather than relying on memory either of the officer involved or the member of the public involved, and I think that goes into *the heart of transparency*." (Participant 4: Member of police senior management; emphasis added)

> "So body-worn video in policing is there to corroborate an officer's evidence and to provide an *unbiased recording* of an encounter with a member of the public, as was experienced by the officer at the time, and then that video footage can be made available to those that need to see it. Be that supervisors, for the purpose of organizational learning. Be that disciplinary panels, if necessary, based upon the encounter and allegations that've been made. Or be it the judiciary to be able to exactly what the circumstances were leading up to and during an encounter. So body-worn video is there that to provide an *unbiased, unedited* account of the circumstances as they were when they occurred in front of the officer." (Participant 3: Senior officer; emphasis added)

The rationale is also present in vendor narratives via their websites and advertisements. Axon claims their Body 3 device grants the ability to 'see truth in the moment'[1] and that their Body 4 device can 'capture more truth.'[2] Motorola Solutions (MS) claims that their devices 'enable you to see events unfold in real-time and capture indisputable, high-quality video evidence.'[3] Furthermore, MS claim that with their VB400, 'an independent witness captures

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[1] AXON. no date-a. *Axon Body 3* [Online]. Available: https://www.axon.com/products/axon-body-3 [Accessed 31 July 2024].

[2] AXON. no date-b. *Axon Body 4* [Online]. Available: https://www.axon.com/products/axon-body-4 [Accessed 31 July 2024].

[3] MOTOROLA SOLUTIONS. no date-c. *Police body cameras* [Online]. Available: https://www.motorolasolutions.com/en_us/video-security-access-control/body-worn-cameras/police.html [Accessed 31 July 2024].

the whole situation.'[1] MS proceeds further by also claiming that the device 'enables you to foster trust between your team and your community by providing an unbiased independent witness'[2] and that 'having an objective, unbiased witness matters.'[3] Reveal, referring to their BWV devices, also partake in this rhetoric by offering that 'more so than ever, police require an independent, impartial witness, and a means of providing transparency to the public.'[4] Additionally, Radio Commz branded their BWV devices to 'Witness'[5], while Hikvision advertise their cameras as a 'wearable witness for the truth.'[6] i-Pro rebranded their video recording system and BWV device to 'Arbitrator' and market this with the slogan 'Discover the power of truth', as depicted below. These vendor narratives foreground claims of objectivity and independence as defining features of BWV technology.
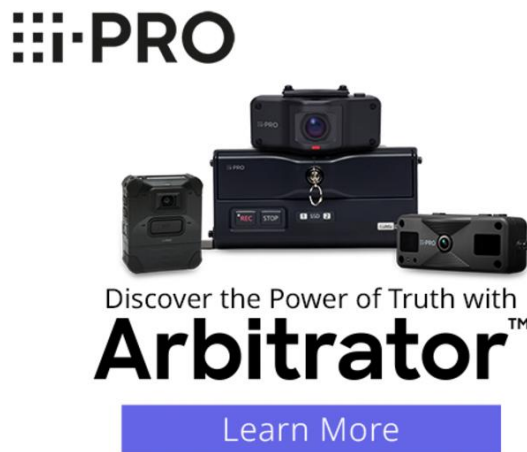
FIGURE 16 ADVERTISEMENT FOR I-PRO'S ARBITRATOR SYSTEM

There are two critical assumptions about BWV footage, and the devices which record the incident, underlying the rationale of arbitrator of truth, namely that footage is independent and objective. These two assumptions will be interrogated below, building upon prior research.

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[1] MOTOROLA SOLUTIONS. no date-b. *BWC evaluation* [Online]. Available: https://namrinfo.motorolasolutions.com/bwc-evaluation [Accessed 31 July 2024].

[2] MOTOROLA SOLUTIONS. 2022b. *VB400 body camera* [Online]. Available: https://web.archive.org/web/20230608063802/https://www.motorolasolutions.com/content/dam/msi/docs/products/body-worn-cameras/vb400-brochure_law-enforcement_nam.pdf [Accessed 31 July 2024].

[3] MOTOROLA SOLUTIONS. no date-a. *Body cameras for police and security* [Online]. Available: https://www.motorolasolutions.com/en_xu/video-security-access-control/body-worn-cameras.html [Accessed 31 July 2024].

[4] REVEAL. no date-g. *High-performance police body cameras* [Online]. Available: https://www.revealmedia.co.uk/industries/police-body-cameras [Accessed 23 October 2025].

[5] RADIO COMMZ. no date. *Critical View* [Online]. Available: https://radiocommz.co.uk/critical-view/ [Accessed 31 July 2024].

[6] HIKVISION. no date. *Body-worn cameras* [Online]. Available: https://www.hikvision.com/en/products/portable-products/portable-products/body-worn-camera-series/ [Accessed 17 February 2025].

Assumption that footage is independent

In terms of independence or externality of the BWV device, Sandhu and Simmons (2022) article 'Police officers as filmmakers' provides insight into the influence and control which users of the BWV device have over what information (mostly visual) is captured by the device, processed, and shared. An element of control includes how the user decides to frame what is captured (the field of view) through the movement or posturing of their bodies. It should be noted that certain vendors offer devices with an articulated lens/camera head which can be manually adjusted by the wearer, further enabling this process of directing what visual information is captured. Further elements of control include deciding when to begin recording and how it is trimmed and presented during the post-incident phase. These directly conflict with the assumptions that the footage is an independent party during a police-public incident. Interview data confirmed that officers do have the ability to frame what is captured and how it is presented.

> "Once in a while I might move back or move sideways just so that I know I'm captioning something in particular, or I'll move the camera to capture if I think it's something that's going to be important. Most of the time it's in a fixed position." (Participant 10: Frontline user of BWV technology)

and

> "Obviously, the 'gold/master' copy is untouched, but they can make a copy of the footage and can edit it such as, you know, they can do redaction on it, to get rid of phone numbers or anything that is delicate - that people don't really need to see. They can redact that. They can also, if you've got like a four-hour piece of footage, and the interesting bit is only five minutes long, they can clip that four-hour footage and just create the 5-minute clip, which would then actually be used in court." (Participant 8: Internal management of BWV systems)

Most importantly, the blend of organisational policy, regional guidance, and binding laws and professional practice in England and Wales reveal that it is police who are owners of the footage and are responsible for deciding how footage is saved through their respective digital evidence management systems (DEMS). Officers categorise footage as evidential or non-evidential (and assign it a case number), which determines whether and for how long it is retained. Accordingly, police organisations and the users are central to the operation of BWV devices, the produced footage, and the systems that manage it. This contradicts the underlying assumption that the device is independent or an external third-party. It is not a

free-floating device with a cinematographic mind of its own which decides when and what to record, nor does it exist as nomadic digital information. This particular assumption of footage is reminiscent of Haraway's (1988) work on the 'god trick' where processes involving human intervention are made invisible to provide the illusion that something is objective and/or independent.

Assumption that footage is objective

The second underlying, and arguably most problematic, assumption of this rationale is that footage captured by a BWV device is objective. When examining the technical components of BWV technology, Guzik et al. (2021) engaged with the issue of objectivity and concluded that there were two distinct senses of the word 'objectivity' being used. The objective capacity of the device to store a digital snapshot of events in the form of a file is relevant to this section. According to the authors, these can be transmitted electronically and are objective in the sense that they do not necessarily change across space and time (Guzek et al., 2021: 109). This speaks to the world's first BWV guidance (produced for England, Wales, and Northern Ireland at the time) which, when discussing operational benefits, concluded that "one of the perceived advantages in using BWV equipment is that the user is able to produce a 'perfect memory' of everything they saw and heard at the incident they have attended. Any video recording of an incident is likely to provide better evidence than an officer's recollection and subsequent note or statement making" (PCSD, 2007: 13). While these elements of transmissibility and consistency add to the overall discussion, this research builds upon a long-lineage of research which problematizes the overarching conception of objectivity which Guzek et al. (2021) imply that these two elements constitute. They may be consistent over time and digitally transmissible (unlike human memory recall), but that does not necessarily make it objective given the inherent limitation of *'capture point'* which will now be introduced.

This assumption of objectivity has been refuted in the literature for almost forty years and this refutation has been extended specifically to BWV footage more recently. Lassiter and colleagues have been questioning the objectivity of footage since the late 1980s, across varying types of crimes, contexts, and populations (Boivin et al., 2017). Lassiter and Irvine's (1986) research on the assessments of confessions which were videotaped from three different capture points ('points of view') first revealed the existence of *camera perspective bias*. This bias has been found to exist repeatedly across their subsequent studies which included different populations and recorded simulations. Essentially, using footage recorded

from different angles has produced different results in the viewer's assessments of the behaviour being captured. Lassiter et al. (2002) attributed the emergence of this bias to *illusory causation,* whereby causality is overattributed to a subject because they are the focus of the footage. Accordingly, footage which is produced by a BWV device, from an officer's capture point, focusing on the subject (member of the public for example) potentially creates this bias in those who assess said footage. Concerning footage in general, Lassiter and colleagues found that relevant expertise did not mitigate the bias given that experienced police interrogators and trial judges were also affected by the bias (Lassiter et al., 2007). Crucially, they also found that the bias existed in both simulated and authentic interrogations (Lassiter et al., 2009).

Boivin and colleagues have been central to extending this perspective bias to research on BWV technology. Boivin et al. (2017) began testing the effects of BWV footage with an assessment of police intervention. This study included university students and police candidates as research participants. The results confirmed the existence of camera perspective bias in the BWV footage and thus, referred to it as *body-worn camera perspective bias*. The results further revealed that the bias did not affect everyone equally (university students were less affected) and the authors stated that the underlying cognitive forces were still unknown. Boivin and colleagues (2020) expanded participation to include experienced officers and proffered an explanation for the emergence of the bias in participants. Specifically, that the underlying cause of this effect stems from the first-person perspective of BWV footage, which triggers *self-imagery*. This explanation, differing from that offered by Lassiter and colleagues, proposes that viewers tend to imagine themselves in the incident which they are assessing. Certain groups such as police practitioners and experienced officers are theorized to be more affected by the bias than others such as university students given that, the former are, generally, more able to imagine themselves in those situations. The authors concluded that "the results of that study [2017] are concerning because, contrary to what is widely believed, BWCs may not provide a complete and objective view of controversial interventions" (Boivin et al. 2020: 3).

There may be some conceptual murkiness when attributing the lack of objectivity to the BWV footage itself. The various works of Lassiter, Boivin and their colleagues discussed above have shown that it is when footage is assessed that bias potentially emerges. Despite the perspective bias only arising during assessment, the source of bias is inherent to the footage itself. This analysis contends, based on the above research, that while the perspective bias arises in humans, it is the BWV footage itself which is not objective. This lack of

objectivity is attributable to the 'capture point' or first-person perspective from which the footage is recorded, irrespective of whether the underlying cognitive force is Boivin and colleagues' self-imagery or Lassiter and colleagues' illusory causation.

While a recording may be consistent over space and time, something which Guzik et al. (2021) attributed to an aspect of objectivity, it consistently provides a snapshot of events from a particular capture point. Consequently, footage from a police officer's BWV device which is first-person in nature, focusing on the subject is, in theory, less objective than footage such as CCTV (or BWV footage captured by an assisting officer) which is third-person in nature and captures both parties, not focusing on one over the other. This has legal potential implications for the assessment of BWV footage in court, which will be discussed later in further detail.

Even if footage were objective, the assessment thereof is not

Granot et al. (2018) examined the assessment of footage brought to trial and synthesised several strands of research to demonstrate how assessors of footage miss key information (repeatedly). Moreover, the visual information which they do select is interpreted and filtered through individual, cultural, and political biases. The various selective attention tests and eye-tracking studies cited in the article reveal that much of the conclusions drawn from viewing footage reinforce pre-existing beliefs and, more crucially, that the assessors are unaware of these cognitive processes. Jones et al. (2018) draw attention to their participants believing that they (*bias blind spot*) and police officers are less susceptible to the impact of cognitive biases. (Jones et al., 2021) add further dimensions to the issue of subjective assessments and bias regarding the impact of knowing contextual information about the subjects (members of the public), for instance, their mental health when making an assessment. Accordingly, Granot, Jones, and their colleagues work reveals that *even if* footage were to be objective, the assessment thereof is subjective and laden with many biases - at times participants were unaware of their bias or believed that their assessment was not impacted.

What is clear from the research included in this section is that the underlying assumption of objectivity in the process of assessing footage is highly problematic, in terms of human (pre-existing biases) and technical (capture point) limitations and how these two act upon each other. It is important for those respective parties responsible for using, releasing, and regulating BWV footage for the purpose of assessment to be reflexive of these limitations

and their potential implications. Crucially, that certain BWV technology vendors are actively contributing to this incorrect assumption through their marketing and branding ought to receive more attention.

7.2.2 'Depicter of perspective'

The second rationale being examined is using BWV technology during assessment 'to see what the officer saw'. The notion that footage depicts an officer's perspective assumes that the device captures their perspective. The previous chapter on transparency and accountability explored how police adoption of BWV technology (footage and DEMS) enabled additional layers of supervision and scrutiny. Particularly, while it is a positive development for BWV technology to have been able to allow external and independent parties to assess the conduct of officers, especially where special police powers are used, there are important limitations, explored below, which should be taken into consideration when making these assessments. The following quotation provides a useful illustration of this rationale and emphasis is added to those themes which are addressed in subsequent sections.

> "body-worn video just gives you that instant *point-of-view* of actually what's happened…you can't edit it… You can't hide from it…*it doesn't give you the whole bigger picture*, it doesn't give you the context of what's going on behind you or the information you've already got. It just gives you that one officer's point-of-view." (Participant 1: senior officer; emphasis added)

A frontline police officer who uses BWV device alludes to this rationale when asked what they think the role of BWV is within their job responsibilities as a response officer.

> Researcher: "Say that you and [officer] get paired up again, or something like that, and an incident occurs, do you ever look at each other's footage to see which sort of footage is more suitable to cover the incident?
>
> Frontline officer (participant 10): No…I wouldn't use [theirs] evidently for me. I could only go with what I know and what my footage captured because [they] could be, it's useful *to see perspective from a different side* after, but it's not something I'll would use for my evidence." (emphasis added).

Again, certain BWV technology vendors actively contribute to this assumption through their marketing. In their V300 BWV device brochure, Motorola Solutions (MS) claims the device captures 'crystal clear video and audio of every encounter from the perspective that matters most' (Motorola Solutions, 2023d). Reveal states that their Sony IMX sensor offers 'the

power of always replicating what the wearer can see with their own eyes' (Reveal, 2025). Similarly, Axon's marketing once blurred the line between truth and perspective by asserting that the Axon Flex 2 provides 'clear and accurate evidence from the officer's perspective,' along with 'the truth from your vantage point' (Axon, 2020). Axon have subsequently replaced this with the more muted claim that the head-mounted peripheral can 'capture unique perspectives.' This, however, has not stopped them from postering a quotation from a police Lieutenant on their latest device's landing page which contains the assumption that the livestream feed captured by the BWV device provides an officer's perspective (Axon, no date-b). Further, Axon quote their Senior Director of BWVs as stating that 'that's been one of our big focuses: accurately representing what the officer saw' (Axon, 2023a). In an advertising email sent to the researcher through Officer.com, MS claimed that the V700 model's '1080p sensor delivers excellent video quality in low light conditions to accurately capture what the officer witnessed.' The implication that a device with a high definition, low-light sensitive lens, accurately captures what the officer witnessed is particularly concerning.

Clear Recording

1080p sensor delivers excellent video quality in low light conditions to accurately capture what the officer witnessed.

LEARN MORE
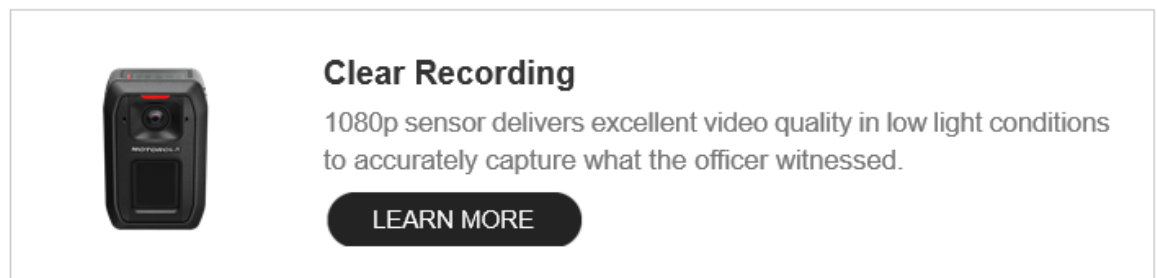
FIGURE 17 EMAIL MARKETING MOTOROLA'S V700 DEVICE.

Much like the previous rationale, the underlying assumption that the device captures the wearer's perspective deserves critical examination. To challenge this assumption, this section draws on sensory ecology and applied cognitive science.

Assumption that footage capture's users' perspectives

According to Dangles et al. (2009: 52), sensory ecology is "the study of how organisms acquire and respond to information about their environment" and such study reveals that organisms have their own array of sensors, with variations between individuals and populations of species, referred to as *sensor morphology*. On a mechanical-level, sensor morphology is the physical structure and operation of these sensory systems, converting stimuli from the environment into signals which can be processed by the nervous system

into sensory information (Iida and Nurzaman, 2016). Essentially, sensory ecology is the study of how an organism's sensor morphology operates and adapts in the environment in which that organism exists. The biological understanding of perceptions of organisms is that they interact with the mind-independent world by receiving information input through sensors which is interpreted through our nervous system. Each organism having their own array of this sensory inputs and interpretation which was first referred to as *umwelt* by Jakob von Uexkull (Burnett, 2011). On this mechanical-level, one might readily examine the important differences between the specific sensory and processing organs of various insects with their own sensor morphology (detecting a broader spectrum of light or having many eyes, for example) and those of the average human with their sensory organs and nervous system – the conclusion being that their perspective of the external world is quite different to humans.

These fundamentals of sensory ecology are useful in that the same logic can be applied to BWV technology, particularly the BWV device, and can therefore be used to contrast the human organism (an average human) and BWV devices on this mechanical-level. Specifically, we can examine and compare certain the sensors and sensory processing of BWV devices and the footage they produce with that of humans (their sensory organs, central nervous system, and brain), and the information/stimuli they are able to detect and process from their environment. Such a process reveals crucial differences that are relevant to the assessment of BWV footage.

Despite the highly technical language used in this section, the core component to understand from this analysis is that compared to humans and their array of sensory organs and processing, the BWV device *simultaneously captures both more and less informatio*n that the user is exposed to during an incident. Applying this to police as users of the device, not all the environmental information available during an incident, which is captured by the device and produced as footage will have been detected and cognitively processed by the officer. Despite the quoted frontline officer's earlier assertion that it captures their perspective, when asked a more specific question related to this rationale, differences were mentioned between human sensory processing in the heat of the moment versus what the footage depicts during post-incident assessment.

> Researcher: "And when you're watching, do you ever feel that the footage has captured what you've seen?

> Frontline officer (Participant 10; emphasis added): Sometimes, you see more than you would actually notice because you're watching it *through the lens* after the fact. Whereas when you're dealing with something, *you're focused on one point*. So afterwards you might notice things that have gone on around you that you haven't noticed at the time.
>
> Researcher: And do you feel that it captures your experience or your sense of the incident as it unfolded?
>
> Participant: More or less. Yeah, obviously, it doesn't when the device gets knocked, but it picks up all the audio. If it's something that's close quarters, then all you're gonna see is the clothing of the other party."

To critically examine, using sensory ecology and cognitive science, the assumption of capturing the user's perspective, this analysis focuses on the sense of vision and smell.

VISION

As part of our sensor morphology, human vision involves the eyes as sensors and brain for cognitive processing. The limitations of human vision are core to the differences between human vision and BWV device capture. The images which we, as humans, are conscious of are essentially the result of subconscious processing. Our visual field, with both eyes, is 200° (degrees) horizontal (Loschky et al., 2017). However, while we have a clear image of whatever our eyes are focussed on (around 1.7°), our central visual field extends only around 5° to each side of that fixation point – with most of our visual field constituting peripheral vision (Rosenholtz, 2016; Loschky et al. 2017). This study of the central vision is also referred to as our functional vision (foveal view) or perceptual range, because that which falls outside of that range is either largely excluded/unprocessed or fabricated by the brain. Remarkably, humans have a blind spot in each eye, we only see the colour of objects within our central visual field, and our noses partially obstruct our line of sight. All these visual issues are 'corrected' by our brains to provide a coherent visual image.

Learning this, it becomes evident that a BWV device's camera lens capturing a clear, high-definition image of 120° horizontally (standard for Axon Flex-2, Motorola-Solutions VB-400, and Reveal D6, D7 and K-Series), is in many ways far superior at capturing and storing more visual information, in greater detail, than average human vision. While some vendors do provide devices with configurable settings between 90°-120° horizontally, it is crucial to note that the UK Home Office's BWV technical guidance (Nortcliffe, 2018: 7) indicates that high-definition lenses must have a field of view between 120° and 170° horizontal. The latest

device by Axon (Body 4) has returned to a 160° lens used in previous devices, further widening the gap between human range of perceptible vision and what the lens captures.

In addition to the field of view morphologically varying between human vision and BWV lenses, low-light sensitivity and light-dark adaption are also important. Vendors advertise the technical capabilities of their lenses as being ultra- and low-light sensitive (measured in lux). For example, Reveal's technical documents indicate that their D- and K-series devices (those designed for law enforcement) function at 0.05lux and MS' technical documents show a capability of <0.1 Lux for their V700 and 0.2lux for their VB400 (the device being rallied out nationally in Scotland). This means that these devices work in light conditions equivalent to what researchers Kyba et al. (2017: 1.32) suggest is reflective of average moonlight (0.05-0.1lux), with a maximum value of 0.3lux for a full Moon directly above. While humans can see, albeit not without difficulty, in these low-light conditions, it is the speed at which the lenses adjust from light to dark environments which considerably outperforms humans. In human vision, adjusting from light to dark (dark adaptation) is a two-stage process with the cones in the eye taking 9-10 minutes and the rods 30-40 minutes (Woodcock, 2025). Conversely, lenses of BWV devices adjust within seconds, with Axon providing that their 'cameras adapt to dark or bright conditions very quickly, typically in a second or so (Axon, no date-d). The behavior is quite different from the human eye.' They proceed to frame this as a positive, as opposed to a problematic, development by claiming that 'their ability to *quickly* adapt to changing light conditions suits the fast-moving nature of the incidents officers respond to, lending to a very strong overall low-light performance' (their emphasis).

Interview data indicated that this superior-to-human capacity of the BWV device is one reason why there has been a hesitance for some in the region of England and Wales to adopt devices with improved lenses (higher fidelity and increased light sensitivity) given the potential impacts on BWV footage assessment.

> "In terms of night vision, yeah, there's kind of a danger that if you have a camera that can see better than the human eye, then if you have an incident, and it was scrutinized afterwards, and people were looking at some of the footage, when clearly it's not a knife in his hand, and there was no need for that level of force. But you are there as the person on the ground, and if in those lighting conditions you thought that that person was holding a knife and was about to assault you, then you'd be justified in using the high level of force. So, it's kind of misleading after the fact if the camera is better than the human eye. And similarly for infrared, I think that was an option. I don't know if anyone's taken infrared. I can't remember anyone saying that they have. It would be like post-instant analysis rather than what you're seeing and dealing with there and then in real-

time, so wouldn't really see a massive market for that." (Participant 2: Senior police officer leading BWV platform at their organisation)

And:

"Speaking to some senior members of the police force. One of the things that they are concerned about is that the technology is going to be better than the eyesight of an officer and sort of what are the implications of that, you know, if it's in 4k and it's got night vision." (Participant 9: staff member of a BWV technology vendor)

Evidently, there are key differences between the capabilities of human vision and the BWV devices which produce footage of the incident for assessment. There is far greater visual information which is captured by a BWV device and is available for assessment post-incident than what an officer might have gathered and cognitively processed during the incident. There are, arguably justified, concerns over this dissonance widening further as the various sensory components of BWV technology continue to improve over time.

SMELL

Smell is not captured *directly* by the BWV device as it lacks a suitable detection sensor. Meanwhile, an officer could be subconsciously reacting to pheromones, chemicals, and intoxicants or consciously reacting to the smell of drugs and/or alcohol. Concerning the latter, police officers are provided guidance to verbally state into the microphone of their device that they are detecting any relevant smells. For example, Kent Police's (no date) policy acknowledges this disparity of sensors between humans and BWV devices when it states that "BWV users should alongside the visual recording, verbalise and document what they see, hear or smell. This can add greater context to the viewer of what the user is experiencing that may not be captured on camera or audio."

Such an instance occurred during the author's participant field, where a formerly incarcerated individual was being given an eviction notice by their leasing agent who reported them as a danger to themselves and others – thus, requiring policing assistance. The smell of cannabis in the home was incredibly pungent and the researcher vividly remembers feeling nauseous from the overpowering smell. The effects of the drug on the subject visible to all parties present and even though the researcher has not seen the footage from the incident, the BWV device would easily have been able to capture the subject's lack of balance and weak state, but it is the smell which was key to understanding why they were in this physical state. For this reason, the officers asked if the subject was on medication and

they were able to treat them as a vulnerable person. An incident which further illustrates this dissonance was reported in the media. US police officers were, reportedly, able to locate a suspect in hiding because of the strong smell of their cologne (Officer, 2024), something which assessors would not be able to verify through the footage.

Abstracting sensory ecology beyond living organisms to technological products has shown how mechanical comparisons of sensor morphology (sensors and sensory processing) can be useful in describing the core differences between the wearer's perspective and that of the recording device. The rationale that footage the depicts the wearer's perspective when assessing footage of police-public incidents is problematic given the increasingly large dissonance between the information that the devices capture, which can be slowed down and viewed repeatedly, and the information that the wearer gathered and processed during the incident.

The potential of BWV footage to prejudice in court

According to the various research findings presented in the preceding section, the first-person perspective of BWV footage has the inherent limitation of creating bias in assessors. Specifically, BWV footage from the first-person perspective can prejudice the subject of the footage i.e. the person being recorded, such as a member of the public. While the causal explanations for this bias are contested, the impact has been demonstrated repeatedly by researchers. Conversely, a BWV device which captures both more and less information than the wearer, such as a member of the police, can gather and process. This captured footage is then presented post-incident for assessment and in the process, potentially prejudices them. This has legal implications given that most legal systems, including English law of evidence, preclude evidence that will negatively affect the fairness of the court proceedings.[1]

7.2.3 Rationales embody contradictory design considerations

For the BWV device to fulfil the function of arbitrating the truth, it would have to capture as much information about the incident as possible in the highest possible fidelity. Accordingly, the consequently design consideration of the BWV device would be to include highly sensitive sensors (lenses and microphones) that would far exceed those of humans. The footage would not only have to be captured in the highest possible fidelity (with the best settings enabled by organisations) but also be shared with assessors in the highest possible

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[1] Section 78 of the Police and Criminal Evidence Act 1984.

quality i.e. no lowering of the resolution. This design consideration produces an inherent dissonance between what is shown in the footage and the amount and quality of the environmental information which the officer gathered and processed. Moreover, as these technical components continue to improve, this dissonance is likely to intensify. For the BWV device to fulfil the rationale of depicting the wearer's perspective and address the dissonance, the consequential design choice of the BWV device would be to bring the sensors more in-line with those of human capabilities. This would mean reducing the quality of the footage by potentially decreasing the lens field of view (number of horizontal degrees), reducing the low-light sensitivity functionality of current lenses, in addition to lowering the resolution. Alternatively, it could mean recording in the highest fidelity but presenting a downgraded version to assessors.

Accordingly, these two rationales have contradictory material design choices. Suss et al. (2018) sum this up by stating that "the main concern here is whether footage should depict what an officer could potentially see with his or her own eyes or an enhanced representation." There are significant contributions and disparate discussions on the distinction between human vision and BWV device capabilities as well as a growing awareness of the potential implications, yet this has, arguably, not received mainstream recognition and institutions have not addressed it directly despite the ubiquity of BWV footage and its use. The former Independent Police Complaints Commission (now, the Independent Office for Police Complaints) released a position statement on BWV technology and they were apt in the detailing of its limitations, stating that:

> "the coverage captured by BWV provides only a limited view of an incident; it shows only one angle; it does not record what might be happening behind the lens or behind the officer who is filming; it does not record smells, feelings of tension or the atmosphere surrounding an incident. There is also the risk that undue weight might be attached to its evidential value and caution should be exercised in this respect. It is potentially compelling viewing and there is a risk that other important evidence could be ignored or given less value. At worst, the footage could present a positively misleading picture of the whole situation." (IPCC, 2016: 1-2).

The difference between human vision and BWV lens capabilities has also been pointed out by Boivin et al. (2017: 139) when stating that "by capturing anything that could have been visible to the officer – whether or not the officer was actually aware of it or considered it in the decision to use force – BWCs not only provide a strong incentive to analyse the situation with 'the 20/20 vision of hindsight' that the U.S. Supreme Court prohibited 25 years ago, they do so by providing more information than was probably perceived by the officer." It is

likely for this reason that the first regional guidance on BWV technology use (PCSD, 2007: 35) recommended that "the field of view to be covered by the lens should approximate the human visual system, i.e. about a 40 degree (sic) horizontal angle of view."

Additional contributions include work conducted by Critical Incident Review (2024), which was released in a police media outlet (Police1, 2024b). This work does well to illustrate several issues regarding the assessment of footage. It should be noted that the distortion from wide-angled lenses ('fisheye' effect) impacting assessments was raised much earlier by Boivin et al. (2017). It is crucial that Axon, one of the largest distributors of BWV devices globally, recently has partially responded to the issue that their devices capture more visual information than the wearer can gather and process. While they do provide technical details about the significant limitations of human vision, providing that 'it is possible that the body camera footage covers things that were not in the officer's field of view at the given moment, or the other way around, officer saw more than was captured', they offer a solution to the issue which their devices create by offering an auxiliary product, stating that 'Axon has a Flex POV camera that can be attached to the eyeglasses or helmet to make the fields more aligned' (Axon, no date-d).

While the field-of-view of most BWV devices is far greater than the PCSD's 2007 recommendation of around 40 degrees, this issue took 16 years to be mentioned again in regional guidance documentation. The Home Office's 2018 technical guidance document correctly states that "a camera's Field of View (FoV) cannot be compared with the complex human visual system" (Nortcliffe, 2018: 7). However, the 2023 core BWV guidance (NPCC, 2023: 21) was the first to address this dissonance between human vision and the capabilities of contemporary devices and concluded that the Crown Prosecution Services (CPS) has determined that *best quality footage* is the consideration to take. Accordingly, regional guidance on BWV footage, which constitutes best practice in the region, prioritises evidence gathering instead of depicting an officer's perspective. This position, which is also repeated verbatim in the updated 2024 guidance (NPCC 2024: 20), provides that:

> "when BWV was first introduced, the camera was designed to mimic that of a human eye, as to not introduce additional scrutiny of an officer's testimony in court, for example if a user claimed they saw something when the camera shows something else, and this is used to undermine their honest held belief. However, with technology moving forward, and cameras now capable of recording in 720p and 1080p, alongside increased scrutiny on police actions, there is an argument for having technology that provides us with as clear evidence as possible. The view from the CPS is that the best quality footage to enable identification of offences/suspects/weapons, will produce the best outcome at court. Any forces

that increase the definition of their footage would be advised to get a written document from their supplier, detailing the sensitivities of that camera recording in that definition, and how this may include detail that may not be visible to the human eye."

While this section itself begins with the underlying assumption that highest fidelity equals best evidence, with the CPS reportedly indicating that this produces the best outcome at court. This link between highest fidelity and best outcome deserves attention. Secondly, while that position evidently applies to footage being used in court settings, there is nothing mentioned about design considerations, device and system settings, and the quality of the footage shared at community scrutiny panels and for public release. This absence might imply that police organisations have discretion over footage released in these latter two contexts. If this is the case, several pertinent questions naturally arise. Firstly, should there be different standards regarding fidelity, capture point, and sensory information gathered for the differing legal, community, and public contexts? And secondly, if so, who decides and based on what criteria?

While the preceding section examined BWV footage as a product and demonstrated how it can reshape organisational practices and accountability, the next section shifts focus from what BWV produces to how it is designed, configured, and adopted. It develops the conceptual toolkit used throughout this dissertation, drawing together the concepts that guided the analysis and places them within debates on organisational technology adoption more broadly.

7.3 Conceptual toolkit for police technology adoption

The previous two sections show the emergence of additional paradigmatic analyses of BWV technology and their usefulness. This section provides a detailed conceptual toolkit of technology as part of the theoretical and empirical examination of police technology adoption. Given that the research seeks to give equal weight to technology's materiality, it is necessary to develop and outline the terms. This toolkit acts as a taxonomy of components constituting a technical system. The concepts can be theoretically parsed, but in practice there is much overlap between them. While the concepts of agency and materiality focus on the technology itself, situatedness and control include environmental design considerations, whereby artefacts are intended for deployment in certain environments and under specific conditions.

Leonardi and colleagues' (2012) edited book, especially Leonardi's individual chapter, does much to create conceptual clarity regarding materiality of technology including socio-technical and sociomaterial approaches to studying the impacts of technologies on organisations. Some of these ideas are adopted, some discarded, and others are extended, drawing from design engineering. Hubka's (1982) book which serves as a foundational text for the discipline of design engineering, especially their glossary of terms, also serves as a valuable text to draw from given the specificity with which the author defined technical systems.

7.3.1 Agency

The first component of technology is that of agency. It is the theoretical and empirical understanding that technology is not socially determined. Instead, it has the capacity to shape. The degree to which it shapes and is shaped by humans (the social) is an empirical question. This is distinct from human agency in the sense of free-will or autonomy, but rather the determinant is that it has the capacity to shape. Leonardi (2012: 36) builds upon Kaptelinin and Nardi's (2006) work, when discussing this material agency of technology and states that these technologies "represent a particular kind of cultural object that produces effects and can realize the intentions of humans (e.g., the people who designed, built, or implemented them), but that they cannot act according to their own biological or cultural needs." This is a useful way of understanding the way in which technology influences despite lacking innate human qualities such as intention and is considered a critical realist position.

In the previous chapter, it is shown that the BWV device has the capacity to shape by having a deterrent effect. It is crucial to include that it is not just the device, as a monolithic entity, which can shape, but also the component parts. For example, a front-facing screen which depicts what is being recorded (scene capture point) could also increase the deterrent effect. Similarly, an ultra-high-definition lens with low-light sensors (superior to that of human vision) could provide assessors with the mistaken belief that an officer might visually detect and process information which they didn't, or it could provide crucial evidence of officer wrong-doing in fine detail. Thus, while the system and artefacts have agency to shape, its component parts should also be examined to identify how and to what degree they shape. This is supported by Dymond's (2016) dissertation which extended actor-network theory by seeing Taser (a police technology referred to as conducted energy devices) as an actant but discussed both its physical design (shaped after a firearm) and technical functionality

(discontinuous current/auto-deactivation) as being important considerations when examining the impact of the technology.

7.3.2 Materiality

Materiality refers to a technology's composition i.e. a technology has component parts. Conceptually, BWV technology as a technical system has a series of physical and digital artefacts (a human-made/constructed object) including the body-worn device, digital evidence management system, footage, and auxiliary devices. These artefacts are comprised of various components, which design engineers refer to as properties (Hubka, 1982). In the case of BWV technology, these are both physical and digital, further complicating attempts to make sense of BWV technology and its impacts. As demonstrated below, there is much overlap when conceptualising materiality. This itself is a feature of technology given that to separate it down into component parts is an artificial process and much of the technology is reliant on other parts for it to function. When empirically pointing to a BWV device for example, one is pointing towards a series of interdependent component parts. Nonetheless, it is important to create a conceptual distinction to capture as many variables as might be possible when performing an analysis on the relationship between police and technology.

In terms of this toolkit, materiality can be further distinguished into two significant conceptual divisions namely, the material design and technical functionality.

Material design

Leonardi's (2012) version of materiality is strongly informed by Orlikowski's and Kallinikos' various works. They detail that "matter (or whatever constituent materials out of which a technology is fashioned) and form together constitute those properties of a technological artefact that do not change, by themselves, across differences in time and context. It is this combination of material and form that I call 'materiality'" (Leonardi, 2012: 29). This is akin to what is referred to here as material design. Particularly, it is the physical and/or digital construction of individual components of the artefact itself.

While Leonardi (2012) speaks of matter as substance which is formed into a particular design, it is important to see any complex technology as an aggregate of individual components or what Hubka (1982) refers to as properties. Hubka (1982) discusses complexity as the notion that technical systems can be made up of smaller component parts which are themselves

assembled from properties. For example, a BWV device is a complex artefact which is constructed from smaller components such as lenses, microphones, microchips, and motherboards – all of which are themselves composed of physical properties. As aforementioned, each of these component parts is potentially imbued with its own agency to shape. Using the product study of BWV footage assessment, there are contradictory design considerations of the BWV device. The device could be designed with sensors more akin to those of humans to depict the perspective of the officer or it could be designed with the best possible sensors to capture the best possible evidence (the most visual and audio information in the highest possible quality/fidelity).

As aforementioned, material design can consist of either physical or digital properties, or in the case of BWV technology, a combination of both. Physical properties of the material design influence the way in which users, subjects, and bystanders interact with and perceive the technology. This is the purview of the discipline known as 'design engineering', where the way in which the components are brought together has an impact in how the technology is used and perceived. Orlikowski (1992) sees an artefact as a social object (technology as artefact) in that it emerges from within a social context. In this sense, there are social conditions behind the design considerations which ultimately produce an artefact in its intended form. Questions which researchers might ask given the discussions in the previous chapter are whether the physical design is likely to impact on compliance with use policy (e.g. Boivin et al., 2022) and the impact on the safety of officers and members of the public (e.g. Assaraf et al., 2024) .

Digital properties take the form of user interfaces and/or digital products of physical devices, such as body-worn video footage. Examples worth examining for police researchers could be the length of time and effort it takes officers to redact footage and how this affects their workload. This would likely impact the degree to which they comply with the relevant laws and policy. However, digital aspects of material design can overlap with technical functionality such as whether the feed (what is being captured/produced) is interoperable with other systems or allows for algorithmic integration. A further blurring of functionality and digital design would be whether an evidence management system allows for supervisors to examine the history of a user's use of the device or whether someone can tune into a livestream. While livestreaming is a functionality, the ability for superiors or controllers to 'tune into' the feed would be more of a design feature.

Technical functionality

In brief, technical functionality can be examined as the full range of *intended* and *inherent* capabilities that a technological artefact (such as a BWV device) or technical system (BWV technology more broadly) is given by those who construct it (designers/vendors).

Function or functionality in the social sciences is an underdeveloped topic as, using the dual view of technology, it is conceptualised as part of the 'technology as a process' (interactional process between humans and technology), not 'technology as a product'. However, this is not the case in design engineering, and it is possible to reconcile these differences and to raise technical functionality as a key concept in both technology as a product and technology as a process.

A review of philosophy of technology scholars reveals that there is at times a refrain from discussing artefact function and a contestation of the idea that functionality can exist independent of intentionality (Franssen et al., 2024). In other words, some argue that it is only through human agency (action and/or interpretation) that materiality gains its function. A textbook entitled 'Readings in the Philosophy of Technology' (of which Latour was one of the contributors) edited by Kaplan (2009) provided a crucial missing detail. Specifically, Kroes (2009: 130) argues for the dual nature of technical artefacts, stating that "on the one hand they are *physical objects* (man-made constructions) that may be used to perform a certain function, on the other hand they are *intentional objects* since it is the *function* of a technical artefact that distinguished it from physical (natural) objects and this *function has meaning* only within a context of intentional human action" (emphasis added).

The need for human action is an intuitively attractive notion as one would be mistaken if they collected a random stone, while walking in nature, and stated that it had a function. It could be argued to some degree that the particular stone by virtue of existing in an interconnected ecosystem might have been part of a larger process that caused it to have arrived at its current form and position, but to state that every stone has an inherent function or functional purpose would be an error in inductive reasoning – specifically deriving intentionality from a natural causal process. A stone can merely exist in nature without having any inherent function, but authors are correct that human intentionality can give the stone a function. For example, if someone collects that same stone and decides to combine it with a slingshot and commits a specific action, it functions as a dangerous weapon by

causing impact damage. According to this example, intentionality is needed for function to exist, and in this instance the intention is derived from the user.

This intentionality requirement hurdle can be effectively bypassed by arguing that the intentionality of technical functionality, *as a product* separate from a user's action or perception, stems from that of the designers (as constructors of the artefact). To continue the analogy, if someone collects a chunk of rock that contains certain properties, fashions it into a flat slab of stone, and pours water over it, it can be used to sharpen metal objects – this would be called a whetstone. Accordingly, the function to sharpen metal objects is assigned by the designer, not the user and arises from the point at which it is designed and constructed. Franssen et al. (2024) aptly identifies that the issue of an existing function prior to use is highlighted by the existence of the notion of malfunctioning, which they describe as a "mismatch between actual behaviour and intended behaviour." Continuing the analogy, if users of the whetstone could not sharpen metal objects effectively due to the stone not having the necessary properties (too course for example) or being constructed poorly, one might say that it is not able to serve its function. This is congruent with critical realism's assertation that objects have causal properties independent of humans (Bhaskar, 2008). While the stone is given a function by humans, the nature of its composition grants it powers independent of human action.

Leonardi grapples with this topic, but, arguably, unnecessarily makes the error of deriving the intentionality from that of the user. It is on this topic of function or functionality that this conceptual toolkit differs from Leonardi's (2012) considerable conceptualisation efforts. Leonardi (2012: 37; their emphasis) states that "what the technology *is* does not change across space and time, but what it *does* can and often changes. Function – or material agency – is a construction that depends, in part, on materiality but also depends on one's perceptions of whether materiality affords her the ability to achieve her goals or places a constraint upon her." Leonardi's (2012) view is that the function of materiality is influenced by materiality, but that it does not exist independent of human intentionality, particularly that of the user. Hultin (2019) arrives at a similar conclusion by describing function as the impact of the material i.e. how it is used. It is possible that Leonardi's and Hultin's conflation stems from their relational ontological (co-construction) approach towards humans and technology, specifically by solely focusing their analysis on the interaction between humans and technology.

This conceptual toolkit argues that functionality is part of what the technological artefact or technical system *is*, not simply what it *does*, following Leonardi's (2012) emphasis. The critical realism embedded in the dual nature of technology approach allows one to distinguish between the artefact (product) and the interaction (process) as separate entities. Accordingly, one can differentiate between the function (as a potential capacity which exists independent of users) from use (function in action). In other words, its technical function is independent of user action/interpretation. Hence, this conceptual toolkit offers the term *technical* functionality to show that it relates to the technology, as a product, irrespective of immediate use.

To complete the analogy, a whetstone does not lose its technical functionality of potentially being able to sharpen metal objects simply because someone might use it as a doorstop, for instance. Similarly, a screwdriver no less has the functional purpose of being used to insert or remove screws simply because someone chooses to use it as a weapon. This can be expanded to police research, whereby one cannot discuss the issue of unintended uses of technology without acknowledging that the technology was selected and adopted on a basis that its technical functionality and material design would afford particular rationales.

For example, designers construct a BWV device with component parts such as the lens, motherboard, battery, antennae, and SIM-card slot which allows for visual and audio information to be captured into a digital format, stored, and transmitted via LTE/4G. This functionality exists as a potential capability independent of use. This is what could be referred to as functional purpose by Hubka (1982). Accordingly, it could be argued that the designers constructed the artefact in such a way that it could be used in certain ways, irrespective of whether the users action these potential functions or not. These inherent functions are nonetheless relevant to the examination. It is also not that difficult to determine technical functionality such as livestreaming, when, as shown in detail previously, vendors market these functionalities, the use cases, technical specifications, and case studies where police have implemented their systems.

To ground the discussion within the findings, this conceptual reasoning is empirically driven given that use has been shown repeatedly to be an important site of examination, potential uses which are intentionally constructed into technology are also worth examining. For example, the livestreaming functionality of a particular BWV device is no less relevant and significant simply because a police organisation has not yet activated the function. Moreover, a researcher might be able to argue that it is undesirable for police organisations to adopt a

particular model of BWV device based on its capability to conduct facial analysis based on its on-board 'AI', such as Reveal's K-series, irrespective of whether an organisation intends to use the device in this way. This does not detract from the interrelated, yet separate issue of whether they enable the functionality. Criminological literature captures fully well the issue of function creep due to changing organisational considerations whereby simply because a technical functionality lies dormant under certain legal and social conditions, is in no way an indication that it will not be used in the future. This may seem intuitive, but the fact that there is no such conceptualisation of technical functionality, within criminology, outside of immediate use reveals a conceptual gap which is worth addressing in this toolkit.

The functionality of the technology overlaps with the physical material design in areas such as the lens, light sensors, and other components which determine what the BWV device can record. However, technical functionality can also include digital design features that allows for interfacing with other technical systems and thus, scaling up their technical functionality. For example, interoperability and livestreaming, which are enabled by material components effecting mobile connectivity (4G/LTE) produce a digital stream which can incorporate other systems such as algorithmic analysis. While the device itself need not have on-board FRT functionality (such as Reveal's 'AI'), the fact that it can stream its footage means that FRT algorithms can be inserted into the technology. While this theoretically opens the door to hyperbolically conceptualise any recording device with an internet connection to be seen as having FRT functionality, this functionality is not tangential to BWV technology but rather a primary offering provided by the vendor as part of their service. Linder (2019: 77) refers to this arrangement as 'the surveillant assemblage-as-a-service', which forms part of the cloud-based 'platform policing'.

Technical functionality then, can be examined as the full range of *intended* and *inherent* capabilities which a technological artefact (such as a BWV device) or technical system (BWV technology as a whole) is given by those who construct it (designers; vendors). This could be conceptualised as the sum or combination of the material design and technical functions.

7.3.3 Situatedness and control

These two constituent components of technology are not entirely physical or digital properties like material design and technical functionality, but they are nonetheless design

intentions. They relate to the intended use (operational) environment(s) and users of the technology.

Situatedness conceptualises the environment in which the technology is embedded and where and how it is situated within that environment. Seeing as BWV devices are a wearable technology, the situatedness of this toolkit would examine how it is worn. In this way it encapsulates *placement,* which is associated with material design, Placement includes the device which depicts a first-person perspective, creating perspective bias. Further examples of situated include the development of algorithmic integration (video analytics and facial-recognition) and livestreaming which are situated on cloud-based digital evidence management systems outside of public purview. Miranda's (2019) work on BWV devices too reveals a crucial component of situatedness, specifically that devices are mobile and can access private and sensitive spaces such as private homes.

Control is similar in this respect given that the technology (i.e. who operates, governs, and accesses a technology's system and outputs) is designed for certain situatedness but based on the region it is only police who have access to this technology and functionality. This was explored in Chapter Five whereby police organisations control (are central to) the technology which they are supposed to be subject to. In the case of BWV technology, it remains firmly under the control of the organisation and its users, until such time as further action is taken to release aspects of the technology to the public i.e. footage or sharing of information and systems is required by independent investigative bodies (as part of the regional governance framework). These overlap with the social science concepts of visibility and access. The importance of situatedness and control to police adoption of BWV technology is a crucial finding which only becomes visible when examining the materiality of technical system.

Empirically, the placement of the BWV device on an officer's uniform (situatedness) means that it presents an officer's (first-person) perspective, which as aforementioned has specific sociolegal consequences as it creates bias in those who assess the footage which is produced from this perspective. This situatedness of the device acts in tandem with control to allow the user to capture what and when they want. While Suss et al. (2018) have looked at this from an applied ergonomics perspective, Sandhu and Simmons (2022) sociologically examined the situatedness of the design/use of BWV devices and the digital evidence management system manifests by allowing the officer (users) to operate as a filmmaker.

Access has been a substantial topic within police research and control relates to this. However, situatedness is not simply about control and access, but also relates to visibility. The previous section problematized the development of additional functionalities (function creep) primarily because these developments, involving interoperability and algorithmic integration, were happening outside of the public purview. The component of visibility matters given that these specific technological developments (increasing functionalities) are occurring, for the most part, outside of the public purview. Additionally, the indicator lights of the BWV device are known only to users (with the public only being able to estimate) and certain devices such as the Motorola Solutions' V300 and V500 models which have an upward-facing LCD display for officers to see the status of the device, including whether it has mobile connectivity, whether it is pre-recording, recording, or livestreaming, and whether GPS is activated or the microphone is muted (Motorola Solutions, 2022a). Thus, the design and wearing of the device is orientated around informing the user. It follows then that the device is geared towards the users knowing what is happening with less design consideration spent on informing the public about when and how they are being surveilled, for example.

FIGURE 18 IMAGE DISPLAYING MS' V500 UPWARD-FACING SCREEN (MOTOROLA SOLUTIONS, 2023E).

When members of the public view an officer wearing a BWV device, they currently have no accurate way of discerning whether the device has livestreaming, algorithmic integration, and/or FRT enabled and functioning at any given moment. These developments (and the organisational changes which enable them) and their operations are happening outside of their line-of-sight.

While visibility is a topic of social science, it is not possible to derive useful content on the visibility of technology. Brighenti (2007) introduced the power dynamics of visibility in

terms of recognition and control, while Yesberg et al. (2023) discussed police visibility, Sandhu and Haggerty (2017) covered visibility of policing, and Erickson and Haggerty's (2006) edited book problematizes increasing social visibility i.e. people increasingly being made visible by surveillance technologies. However, an extensive search (using Google Scholar, university portals, search engines, and connectedpapers.com) did not yield useful sociological or criminological results regarding the visibility of technology. Flight's (2019b) conference paper is the exception, examining the visibility of BWV devices and comparing how different model blended in with officer uniforms. He theorised that the less visible a device is, the weaker the deterrent effect would be during interactions, a contribution which might partly explain mixed results across BWV impact studies. Design and applied cognition fields have examined the visibility of technology and its representations. For example, Arnall's (2014) architecture and design dissertation entitled 'Making Visible' focuses on the ways in which invisible systems are made visible, specifically focusing on RFID technology and how it is represented.

These three sections have identified various conceptual and practical gaps in criminological inquiry concerning police adoption of technical systems. It has offered novel, and extended existing, concepts to address this. These conceptual components are tabulated below.

7.3.4 Visualising and operationalising the toolkit

The table outlines each component and provides illustrations from the findings.

Component	Conceptual meaning	Illustrative example (from findings)
Agency	The capacity of technology and its components to shape outcomes independent of human intention.	The deterrent effect of the BWV device; front-facing screen potentially shaping behaviour (Section 6.2).
Materiality	The composition and design of technology, encompassing physical and digital properties.	See *material design* and *technical functionality*.
Material design	The physical or digital construction of a technology's components; their form, arrangement, and visual, auditory or tactile properties.	The HD lens and low-light sensors of devices, altering visual perception and evidential interpretation of footage. (Section 7.2)

Technical functionality	The intended capabilities or capacities embedded by designers that define what the technology can do, irrespective of activation or use.	Livestreaming or facial-recognition readiness designed into BWV systems even when not enabled by the police. (Section 6.3)
Situatedness	The environment and context in which a technology is deployed, including the physical and organisational arrangements surrounding its use.	1. How the BWV device is worn; device placement on the officer's chest producing first-person perspective bias. (Section 7.2) 2. Development of algorithmic integration with cloud-based evidence management systems occurring outside of public purview. (Section 7.3.3)
Control	Who operates, governs, and accesses the technology and its outputs.	Police maintaining control over footage disclosure and system access, limiting external oversight. (Section 5.3)

7.4 Technology and meaning: (Mis)alignments as an area of interest

The previous sections have demonstrated that social arrangements and technical systems have the capacity to mutually shape one another, without having to adopt a relational ontology (agential realism). It uses a product study as evidence of this and then offers a conceptual toolkit for examining the ways in which the impact and shaping process can be analysed. This section aims to identify a point of interest for researchers which is central to many of the issues raised with police use of BWV technology in the region, specifically relating to misalignments relating to how BWV technology is understood, used, and what it is capable of.

While the previous section focuses on technology as a product and the various components which result in its intended construction, this section examines the issues which arise when, to use Orlikowski's (1992) distinction, technology as an artefact becomes technology-in-practice. It is the point at which the technology is interpreted (by the organisation and its members as well as the public) and used (by the organisation and its members) that potential issues arise between the mismatch of the technological artefact as it was designed and its use and interpretation.

7.4.1 Theoretical underpinning

As aforementioned, the socio-technical approach used in this research, grounded in critical realism, does not consider social arrangements or technical systems, a priori, to deterministically shape one another. Instead, the manner and degree to which they shape another is considered an empirical question to be examined. This mutual-shaping has been demonstrated in the previous two findings chapters. It is worth noting that the socio-technical system approach has been used as a design principle in organisational management as opposed to a research approach which explores how organizations operate in practice. It is nonetheless useful in outlining a theoretical approach for the examination of organisational adoption of technology. A historical principle finding by Trist and Bamforth (1951) was that technical systems are interpreted differently according to the social arrangements (within the organisation and the environment it operates in) and that 'joint optimization' between them should be achieved to ensure the best outcome(s) - an instrumentalist view. Consequently, there is historical precedent to examine the degree to which social arrangements and the technical system align.

Orlikowski (1992) uses the term *meaning* to introduce a vital component which needs to be examined. Building upon Giddens (1979) work, she claims that it is through human interaction that meaning is created and communicated. This is congruent with the soft determinism of Barley's (1988) *material interpretivism*, that there is a social constructionism taking place when the technology is used in an organisation, but that this constructionism is limited by the material (physical and digital) form of the technology. Accordingly, the misalignments are between material design and functionality and how the technology is used and perceived. While not wanting to depart from Orlikowski's (1992) earlier work for the practice lens in her subsequent work, given that it 'tilts' too heavily towards social constructionism, Orlikowski (2000: 424) noted the potential alignment (compatibility) between the social practices of users, the designer's intentions, and the properties of the technical system. This is worth expanding upon as a point of interest for researchers.

Expanding on this, this section argues that the materiality of technology is designed and constructed to better serve certain interpretations and uses over others. The sticking point for criminology is that this line of reasoning tilts towards 'soft' determinism, "wherein the technology itself is given some causal priority in the explanation of usage patterns" (Leonardi, 2013: 65). 'Soft' determinism, potentially described not only as the assertion that technology can shape social arrangements but that it also *tends to* shape in particular ways

based on its design and functionality, is a stance which this research adopts. Building on Pickering's (1995) work, Leonardi and Barley (2010: 34) argue that technology does 'resist' users, but that those users are not "at the mercy of the technology". However, the case study of BWV footage reveals that the degree to which BWV technology can shape humans is more significant than social constructionists such as Leonardi and Barley (2010) might be willing to concede. Specifically, that the design of the device and its resultant footage creates bias within the humans that assess it and that this process is subconscious and assessors are largely unaware of it (blind spot).

It is outside of the purview of this dissertation to solve a debate on the nature of mind and matter which remains contested after centuries. Instead, this section aims to expand criminological inquiry on police technology adoption by expanding the examination of materiality of technology and its ability to shape, grounded in critical realism. This is particularly pertinent given the pace and degree to which the technology is developing.

7.4.2 Meaning and materiality

The physical and digital properties of BWV's design act as material boundaries which places limits on the meanings that can be assigned to the technology are perceived and used.

Material design

A concrete example from the findings is the example of the audiovisual evidence which a BWV device produces. There is a misalignment between what the device produces and the meaning assigned to the product. Between what is recorded and from what perspective, and this biases assessments in a manner contradictory to how police intend it to be used – as independent and objective or depicting user perspective. This is a crucial misalignment between the materiality of the technology and how it is perceived as either arbitrating the truth or depicting perspective. Footage may be less subjective than memory recall and is more difficult to tamper with than a written statement, but it is not objective and irrefutable, nor is it external or independent to the officer. Conversely, the assumption that BWV footage depict user perspective is also problematic they humans and BWV devices have different sensors.

Technical functionality

Issues relating to misalignment between meaning and functionality lie at the heart of much criminological research. BWV as a device has a range of functionalities and the ways in which they are used varies according to the role of the user within the organisation. For example, senior members of an organisation expressed that it is a tool for transparency and accountability. Managers are more likely to use BWV technology as a tool for ensuring that officers remain compliant and operate within organisational policy. Detectives use footage for investigatory and evidentiary purposes, while frontline officers prioritise the deterrent effect of BWV devices or for recording the interaction should the deterrence fail.

Evidently, BWV technology affords different rationales stemming from its inherent technical functionalities. This demonstrates the material flexibility of the technology, but it would be problematic to conclude that it can fulfil any role or rationale. Case studies have been provided to, amongst others, reveal misalignments between what the device can does and what the police think it does. Accordingly, certain meanings are more aligned with the material reality of the technology than others. Moreover, certain configurations and design intentions conflict with rationales. For instance, a device might be designed and configured to serve the rationale of enhancing transparency and accountability by prioritising best evidence but in so doing, potential prejudices officers by capturing more visual information than they reasonably might have been able to perceive.

This space of contested meanings, with some being more aligned than others with materiality, is a further issue worth exploring. It reveals the multitude of interests within a police organisation, and the design intentions of vendors who produce the technology. In turn, the selection of specific technologies speaks to the interests of the police organisation or, in the case of policing in England and Wales, the priorities of the governance framework.

Distilling (mis)alignments between technology and meaning

There can evidently be two issues relating to materiality and meaning.

a) Multiple meanings (uses and interpretations) which are given to the same material. At times these can be contradictory. This stems from the flexibility of the technology, built into the system by the designers, to take on multiple meanings. Issues are likely to arise when the meanings contradict with one another. The social context in which they are used and interpreted are contested spaces. The materiality is more aligned

with certain meanings over others. For example, footage depicting the truth and what the officer saw. These are contradictory meanings assigned to the same technological artefact.

b) Meaning assigned to the materiality contradicts the design, functionality, and affordances of the technology. If, for example, the theoretical deterrent effect of a BWV device inadvertently produces the opposite outcome by increasing violence against officers. This is a misalignment between the intended effects by design and what the artefact affords in practice. These represent the digital and physical boundaries of the artefact and its impact which resist taking on all meaning. It, however, also excludes technological determinism, as it is the social arrangements (context) which condition the effects of the causal properties. Issues worth exploring will probably arise there is wide misalignment between the design intentions and actual outcomes.

Conclusion

This chapter aimed to contribute theoretically by advancing an approach to examining technology as a product and offered a conceptual toolkit to achieve this. It highlighted points of interests that are worth examining based on both technology as a product and as a process, whereby the meaning given to technology through its use and interpretation might present alignment issues with how the technology is designed and its functionality.

Assaraf et al.'s (2024) work on the yellow sticker (explored in Chapter Six), is a perfect example of a misalignment between the device wanting to ensure that there are less acts of violence by and against the police but its inclusion, to notify the public that the device records audio and video, might be having the opposite effect. These misalignments also reveal tensions between users and between the police and the public and reveal that decisions regarding functionality and design reflect a decision regarding whose interests and needs take priority. In the case of policing in England and Wales, the Crown Prosecution Services have decided that 'best evidence' (the most information in the highest fidelity) takes priority over depicting what the officer might have seen and cognitively processed. Accordingly, examining the design and functionality of devices is a useful endeavour to be able to discern the likely social components (interests, decision-making, hierarchies) behind certain designs and functionalities, and their selection over others.

Accordingly, there is value in examining the material properties of technology and the design intentions of vendors in combination with organisational and officer technology use. While analyses reveal misalignments, they also reveal how selection and use of specific designs and functionalities steer technological development (demonstrated in the previous chapter). Examining the materiality of BWV technology and its impact on policing in England and Wales reveals that BWV is controlled by police organisations - by design and in practice. This police-centred design logic constrains proposed benefits of BWV technology for the public.

Chapter Eight: Conclusion

Introduction

This research combined multiple data sources and interdisciplinary insight to examine the empirical impacts of body-worn video (BWV) technology on policing in England and Wales to explore how police and BWV technology shape one another. It encountered several challenges, particularly access constraints during data collection. Consequently, it did not contribute to the empirical literature in the same quantitative manner as large-scale randomised control trials or perception survey. Nevertheless, qualitative research on police BWV technology adoption in the United Kingdom was necessary to uncover deeper organisational and regional impacts on policing. This research is distinctive in its approach, the range of disciplines it engages with, and the methodological ingenuity applied in sourcing data to map the evolving relationship between BWV technology and policing in England and Wales. Resultantly, it produced novel findings, addressed gaps in criminological knowledge on BWV technology, and extended qualitative inquiry into the materiality of police technology adoption.

This conclusion chapter draws these threads together by articulating the empirical and theoretical contributions, furthering criminological debates on police technology. The first section explains how the findings respond to the research question by summarising the empirical insights on BWV technology adoption in England and Wales. The second section presents three overarching lessons for criminological research concerning methodological approaches, the bodies of knowledge commonly engaged with, and participation in research on police technology adoption.

8.1 Core findings: Empirical and theoretical contributions

The contribution of this research may be split into the empirical contribution: identifying and analysing the change to policing in England and Wales which was enabled, and continues to be shaped, by BWV technology implementation; and the theoretical contribution: analysis and critical examination of existing literature and its gaps; and a framework and conceptual toolkit for examining the process of change i.e. how police and BWV technology shape one another. The first findings chapter examined BWV technology adoption impacted policing, while the second findings chapter showed how police

considerations influenced the technology's development through its selection and use. The third findings chapter bridged the theoretical framework together with the empirical findings, using BWV footage as a product study to identify points of interest for researchers. This section sought to converge the findings by summarising and categorising them in a manner which depicts how they reinforce and justify the adopted theoretical framework.

8.1.1 Technology matters: BWV technology's capacity to shape policing

The empirical findings demonstrate that BWV technology shapes policing, not only at an organisational level but also in the behaviours and beliefs of police officers. This is the material *agency* of the technology, stemming from its design and functionality. In Latour's terms, technology acts as an *actant* (Law, 2009), and within new materialist perspectives, it has the *capacity to affect*. This emerged entirely because the research did not assume a deterministic relationship between BWV technology and police but instead examined how change took place.

The first findings chapter showed how BWV technology enables transparency and accountability mechanisms aimed at improving public trust and confidence in police organisations in England and Wales. According to police documents, early deployment prioritised operational and evidential benefits. However, this shifted in 2013 when the Equality and Human Rights Commission identified disproportionate policing of Black and Minority Ethnic groups and proposed systematic micro-monitoring of officer conduct (EHRC, 2013). This further intensified in 2014, during the Ferguson unrest in the United States, when policing faced a moment of crisis that arguably affected global public confidence. Public sentiment may be shaped by local context but it can be shaped by international events. Police calls to enhance transparency and accountability stems from this need to micro-monitor officers and is enabled by BWV technology. Unsurprisingly, police management faced resistance from officers, with low activation compliance rates. This improved as BWV technology aligned with officers' need for increased protection, by providing deterrence or evidence should the effect fail.

Since 2018, multiple data sources indicate a significant increase in the use of BWV footage to assess officer conduct. Internally, this includes increased supervision, with policies tasking supervisors to dip-sample footage as an early intervention control. Device and footage use is also tracked through audit logs and transaction histories produced by digital

evidence management systems (DEMS). Externally, Community Scrutiny Panels have arisen (some informal and others required by the College of Policing's Authorised Professional Practices (APPs) on 'stop and search' and 'use of force') enabling communities to review BWV footage. These organisational changes (increased supervision, external scrutiny, and regular assessment) are only possible because BWV technology produces audiovisual information.

Community Scrutiny Panels have the greatest room for growth. While currently reliant on BWV footage and limited to a 'bad apple' approach, they have the potential to widen their scope beyond BWV footage alone to shape local policing policy and practice.

In the findings chapters, BWV technology is shown to deter violence (in theory), to produce evidentiary footage when deterrence fails, and through DEMS enable monitoring of officers' recording history. BWV technology therefore shapes policing and is in turn shaped by organisational and governance arrangements in the region. Growing reliance on BWV technology and the embeddedness of footage into supervision, scrutiny, and public accountability shows that these developments are fundamentally technology-driven - albeit conditioned by social arrangements.

8.1.2 Materiality matters: How components influence the shaping process

This research adopted a socio-technical approach, which derives from Trist and Bamforth's (1951) 'sociotechnical system'. As a method for analysing organisations, it "emphasizes the *interrelatedness* of the functioning of the *social and technological* subsystems of the organization and the relation of the organisation as a whole to *the environment in which it operates*" (Pasmore et al., 1982: 1182; emphasis added). Accordingly, the research examines the relationship between the policing structures (the social arrangements) and BWV technology (the technical system). The research has emphasized the materiality of BWV, which is the composition and design of the technology, encompassing its physical and digital components. The previous chapter revealed the value of assessing the design and functionality of the technology in isolation of its immediate use.

While this research reinforces criminological literature that gives equal consideration to technology, it moves beyond viewing it as a material whole. It contributes instead to a smaller body of work examining the materiality - the composition and system design

(Packmohr, 2021) - of technology in the mutual shaping process between artefact and the police. The analysis became deeply technical when exploring the material design and technical functionality of BWV technology, drawing from applied psychology and design engineering. To emphasize the importance of constituent components and artefacts within the broader conceptual whole, the term 'technology' was explicitly incorporated, and a categorical typology introduced in the Case and Background chapter (Chapter Four, Section 4.1).

The findings reveal that material components of BWV technology are themselves variables in the shaping process between police and the technology. The research avoided treating the technology as a monolithic whole, instead examining both its individual components and their collective function. It showed, for example, how device's design (such as the angle and quality of the lens) can create bias by capturing different sensory information than the user. The camera may record far more visual detail than an officer could perceive, especially in low-light conditions, yet it cannot capture smells or other sensory cues. Drawing from neuroscience and applied psychology, the findings chapter argue that presenting such footage as equivalent to the officer's perspective is a misalignment between materiality and meaning. The chapter also drew on prior research to show how the field-of-view or capture point (first- or third-person) can bias perceptions of those recorded when footage is presented as being objective. Accordingly, the device's design and functionality actively shape how footage is interpreted, challenging claims by police and vendors that it provides an independent record.

The research also explained how an overlooked component, such as indicator lights, in addition to front-facing screens could influence police officer's physical safety. It then showed how functionalities that are intended to enhance operational capabilities and officer safety are developed by vendors and selected by police organisations, including livestreaming, remote activation, and facial recognition.

These findings reveal that it is essential to treat technology as more than a neutral and monolithic entity, rather it is an artefact with constituent parts that have the agency to shape policing. The findings reinforce research which explores the materiality of police technologies. Dymond's work on Tasers showed that the Conducted Energy Devices (CEDs), as an artefact with agency, reshaped policing by reducing bodily confrontations and shifting incapacitations towards Taser use. Her analysis of the device's material design showed that its physical shape resembling a firearm contributed to incidents where officers

mistakenly (allegedly) discharged their weapon, critically injuring members of the public. In terms of technical functionality, she also observed that the device's automatic discharge cutoff after a set time had reduced fatalities. Assaraf et al.'s (2024) research on police use of force revealed that yellow notification stickers placed on BWV devices impacted public-police engagements by increasing levels of violence. Finally, Miranda's (2022) article emphasized the implications of BWV devices' mobile nature. Chapter Six (Section 6.3) analyses how developments in mobile connectivity have enabled additional functionalities such as livestreaming and remote activation, building on Miranda's work to reveal that these functionalities require further analytic scrutiny to determine the consequences of their implementation.

The mistake often made by those calling for an examination of materiality is to emphasize its importance without analysing the actual composition of the technology itself (Orlikowski and Iacono, 2001). For instance, Campeau and Keesman (2023) highlight how 'material things' mediate interactions between police and the public, drawing on Latour and Miller. Yet, after stressing the role of material objects and their embodiment by police, they do not examine the material design and technical functionalities of BWV technology that empirically shape this embodiment process. While embodiment is a valuable concept, without engaging with the technology's material composition, such analyses remain conceptual. This is unfortunate as BWV technology includes components and features - such as triggers that enable auto-activation – that could strengthen the embodiment argument. In addition, organisational practices such as assigning individual devices which officers then mark with personal identifiers (the design of aftermarket modifications), further reinforce this process.

A central frustration driving this criminological research was the field's fixation on meaning (social constructions of technology) at the expense of materiality, despite progress in other disciplines. This dissertation aims to address that imbalance by foregrounding material design and technical functionality while examining the impact of police technology adoption. Such approaches are commonplace in other disciplines, and this work calls for criminology to bring them from the periphery to the discipline's core.

8.1.3 Meaning matters: The multiplicity and (mis)alignment of interpretations

The findings reinforce what many organisational and policing scholars have long argued: technologies fulfil multiple rationales (Green and Hurley, 2005) or intentions (Orlikowski, 2000), with emergent and unforeseen uses depending on the social context in which they are embedded. This research furthers this by showing that police organisations, like technologies, are not monolithic entities with singular motivations. Instead, they consist of competing interests and priorities, often depending on police hierarchical lines, with the practical concerns of frontline users taking precedence. Consequently, technical developments and organisational use cases tend to reflect operational needs more than broader institutional aims. Specifically, cameras producing the best quality evidence are selected despite their ability to bias those assessing footage by capturing different sensory information than the user. This is understandable given the centrality of the user in deciding how a BWV device is used and the footage it produces.

The findings demonstrate how police organisational levels have distinct yet overlapping considerations: senior leaders aim to improve trust and legitimacy; supervisors ensure operational efficiency and oversight; detectives value evidential quality and perspective (multiple capture points); ICT departments prioritise reliability within infrastructure and budgetary constraints; and frontline officers seek protection, deterrence, and audiovisual evidence if the first two fail. Technology thus contains multiple, sometimes competing, rationales (Green and Hurley, 2005) across these groups, with selection and use reflecting the culmination of organisational considerations (what they want to do) and affordances (what technology allows them to do when used), and technical functionality (the intrinsic capabilities of the technology). Chapter Six illustrated how officer protection and increased operational capabilities are driving technical development of BWV technology.

These findings contribute to criminological understandings of meaning-making in technology adoption without lapsing into technological or social determinism. They reveal multiple meanings within police organisations, shaped by hierarchy and function, and highlight how meanings can conflict, such as footage being interpreted both as truth and as perspective. Beyond reaffirming the importance of meaning, this research demonstrates that technology's materiality places limits on how humans can interpret it: certain meanings align more closely with its design and functionality than others.

The final findings chapter, which examines mutual shaping misalignments, shows that technology resists total social construction. The material reality of design, functionality, and placement (which determines field of view) impacts how footage is produced and interpreted, while interpretation remains a subjective process influenced by cognitive and cultural biases. Footage marketed as objective or independent is, in practice, shaped by both the technical components of the system and the social context within which the interpretation occurs.

Overall, the research advances a more complex understanding of the mutual shaping of police and technology. By integrating diverse data sources and theoretical perspectives, it highlights the need for criminology to embrace interdisciplinary approaches to better understand how technology adoption transforms policing in the UK.

8.2 Criminological inquiry

This section concludes the dissertation by outlining key for criminological research and offering specific recommendations for future research on BWV technology and police technology adoption more broadly.

8.2.1 Approach: A call for more socio-technical research examining materiality

Multiple scholars (e.g. Dymond, 2020; and Goldsmith et al., 2022) have called for socio-technical and sociomaterial research to pay greater attention to the *materiality* of technology. This dissertation reinforces those calls and provides empirical justification for an approach that gives equal consideration to both social and technical components, rather than treating technology as neutral (O'Neill et al., 2024) or as an amorphous artefact capable of taking on any meaning.

A further lesson concerns the need to focus on impact and change over time. Sociomaterial research often become preoccupied with theoretical framing and the process of technology use, sometimes at the loss of the phenomenon itself (how technologies shape practices, policies, and mechanisms once implemented). This research addressed that gap by analysing both process and outcome, demonstrating that the material design and technical functionality of BWV technology shape police transparency, accountability, and officer protection in concrete ways.

Importantly, the design and functionality of police technologies can be meaningfully assessed even prior to or outside of their use. Grounded in critical realism, the research argues that the material composition, configuration, and affordances of BWV devices already embody specific possibilities and constraints that shape user behaviour, interpretation, and organisational adoption. Recognising this enables criminological inquiry to move beyond the analysis of use alone and to examine how design can exert potential influence on future practice - while still avoiding technological determinism by acknowledging that social arrangements condition the activation of these causal properties.

This research further argues BWV technology should not be regarded as a monolithic system which is uniform across police organisations, but as a set of rapidly developing material and functional components with distinct impacts. Specifically, the material design and technical functionality of BWV technology shape police transparency, accountability, and officer protection. The findings on officer protection (Chapter Six, Section 6.3) revealed that protective functions matter deeply to officers and explored how design features support these operational needs, drawing on literature from design studies and officer safety research.

As research on notification stickers has shown, devices that theoretically deter violence may, through bright yellow recording indicators, may inadvertently reduce the deterrent effect and even increase violence. The findings here suggest that officers perceive the front-facing screen displaying the capture point as a deterrent, despite no supporting evidence and one study reporting the opposite effect. Moreover, the lens quality, angle, and point of view can prejudice both officers (as users) and the public (as subjects). Finally, Digital Evidence Management Systems enable review of device use histories, enhancing supervisory oversight and detection of potentially concerning behaviour.

8.2.2 Knowledge: A call to embrace interdisciplinary insights

Criminology, strongly influenced by sociology, has rightfully developed a critical lens through which to interrogate key concepts of police and policing. This perspective allows for a rigorous examination of how police technologies are selected, developed, and used – questioning dominant narratives, marketing discourses, and the potential implications for the public and for policing as a public good. This research adopted such a criminological lens, drawing on extensive policing literature to examine transparency and accountability while continuing the discipline's tradition of critical socio-legal analysis.

Although criminology has historically engaged with interdisciplinary knowledge, it has tended to do so within the boundaries of the social sciences, aligning with shared paradigmatic assumptions. In contrast, the more technical sciences, with their focus on empiricism and material design, have not been as readily incorporated into criminology's core in the 21st century. This research contributes by maintaining a critical criminological stance while integrating knowledge from fields not traditionally aligned with social sciences - such as ergonomics, design engineering, and applied psychology. Criminology holds deep knowledge of police organisations and the lived realities of frontline officers; combining this with technical and natural science perspectives on the design and functionality of BWV technologies allows space for richer, more empirically grounded, and conceptually innovative findings. The conceptual toolkit, drawn from design engineering, and its application in this research demonstrate this.

8.2.3 Participation and data: A call for greater access

In gathering and triangulating data from multiple sources to understand how BWV technology adoption is shaping policing in England and Wales, this research faced a central obstacle: access to relevant organisational data. Police organisations themselves are the most direct and valuable source of information, yet securing access has been a longstanding challenge, well-documented over the past four decades. Beyond participation through interviews, field observation, or surveys, police organisations also possess critical datasets that reveal how technologies are selected, used, governed, and embedded into the organisation. This research showed the value of gathering procurement records, system configuration information, and organisational policies governing BWV technology use.

Procurement records allow researchers to map the vendor landscape and trace how technology spreads across forces. They reveal the influence and market share of vendors, helping to ground concerns about the relationship between vendors and police. Procurement details illustrate the potential influence of vendors. The former Biometric and Surveillance Camera Commissioner highlighted this in 2020 when requesting vendor information on police surveillance systems, yet only two forces responded to the BWV query in full – an indication of resistance to transparency. Compounding this, procurement portals meant to provide public access are becoming increasingly opaque.

Systems information - covering devices, peripherals, and configured functionalities - allows researchers to understand the material and functional variables shaping policing practice.

However, the lack of response to the Commissioner's request for details on BWV technology brands and configurations illustrates how reluctant police organisations are to disclose technical information.

Access to organisational policies is also crucial for monitoring change. Policies outline how BWV footage must be used, managed, and supervised, and variation across police organisations in the region signals the emergence of new practices and responsibilities. This research identified policy shifts that increased supervisory burdens, yet without access to policies across all 43 forces, it is impossible to determine whether these developments are isolated or widespread.

Missing data on failed implementation

Survivorship bias, a type of selection bias first identified in World War II engineering, emerges when decisions are based on visible successes while missing data of failures. beat first, engineers reinforced the areas of returning aircrafts that showed bullet damage. Abraham Wald proposed that aircraft should be reinforced in the undamaged areas as planes hit there never returned (Wallis, 1980)(as cited in Casselman, 2016). The missing data revealed the true vulnerabilities.
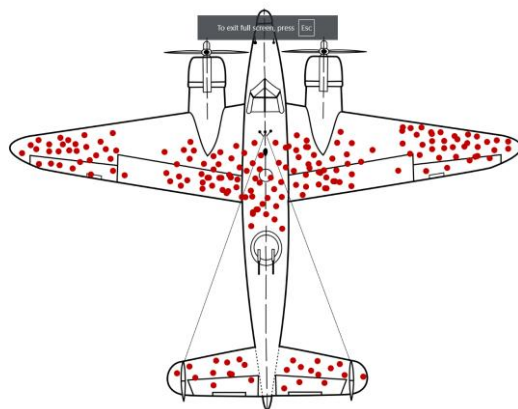
FIGURE 19 MOCK FIGURE USED TO ILLUSTRATE SURVIVORSHIP BIAS, WITH RED DOTS INDICATING REPORTED SHOT PATTERN OF SURVIVING PLANES.[1]

Similarly, research on police technology adoption disproportionately includes organisations where overall 'success' (relatively speaking) with their implementation is perceived as successful. These organisations more willing to grant access to researchers, while

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[1] Created by Martin Grandjean (2021) under Creative Commons 4.0.

organisations experiencing difficulties withdraw or avoid participation. Criminological knowledge is therefore built on cases where implementation *survived*, obscuring the conditions under which adoption fails.

This research encountered this bias directly. One police organisation formally granted access but then ceased communication for more than a year. Only later did a senior contact unofficially reveal that their transition to a new BWV system had difficulties, and participation was withdrawn to prevent exposing any failures. Another police organisation, with a known history of failed technology adoption, initially agreed but later reversed the decision, with a senior contact this time unofficially citing political sensitivity almost two years later. What is lost in these missing cases are precisely the insights that others could learn from: how organisations diagnose failure, redesigning implementation frameworks, or change leadership and expertise to course-correct.

Survivorship bias creates two problems for criminological research. First, it weakens generalisability as findings are skewed towards organisations with effective leadership, sufficient resources, and strong organisational controls. Accordingly, research risks over-representing positive outcomes while masking the prevalence and causes of failed implementation. Second, it fosters creates a strategic dilemma whereby organisations see participation as risky. Even when researchers emphasise that understanding failure can improve future practice and reduce organisational harm, the reputational risk will often outweigh the perceived benefit of sharing data.

Unlike the WWII analogy, where missing data can be logically inferred, the number of factors causing failed BWV technology implementation are complex. The same technology may succeed in one environment and fail in another due to intricate interactions: poor leadership, organisational culture, user resistance, system configuration choices, or a lack of staff consultation.

Two lessons can be drawn: Researcher must recognise and explicitly acknowledge survivorship bias. First, BWV technology research should avoid overstating the generalisability of its findings and be transparent about the likelihood that failed implementations remain hidden. Second, criminology may need to strategically shift its approach. A purely critical stance can discourage participation. A more constructive approach which differentiates learning from blame might improve acquiring access to

sensitive organisational data and minimise the likelihood of organisations repeating mistakes and thus preventing harm.

This research does not prescribe a specific stance but rather shows that access is shaped by pragmatic considerations as much as principle.   If criminology is to fully understand technology adoption, and not just technology use, it must discover ways to include failed implementations.

A call to examine police-vendor relations

Importantly, the design and functionality of police technologies can be meaningfully examined prior to or outside of their use. This research, grounded in critical realism, argues that the material composition, configuration, functionality, and affordances of BWV technology contain specific possibilities and constraints that shape user behaviour, interpretation, and organisational adoption. Recognising this enables criminological research beyond the study of use alone (to examine the potential influence of design on future practice) while avoiding technological determinism by acknowledging that it is social arrangements which condition causal properties. The conceptual toolkit, borne from design engineering and the inter-paradigmatic nature of Human Computer Interaction, and its analyses demonstrate this.

Extending this logic raises a critical question: If design precedes technology use, who designs the technology? To date, there is no criminological research on BWV vendors or their relationships with police organisations., despite the considerable power these companies have hold over technological possibility (Hadjimatheou, 2021). The significance of this gap is highlighted by the dominance of a few companies in the BWV technology market and the vast financial resources they possess. For example, Motorola Solutions has acquired major competitors in BWV technology and video analytics, totalling more than US $2 billion in acquisitions. As a result, it is the only known vendor presently offering a first-party video data analytics suite that integrates self-learning algorithms across both fixed and body-worn video feeds – hosted on the same platform which manages their BWV footage.

This research extends earlier findings that police technology is not neutral by conceptualising material agency, design, and functionality and demonstrating how these shape policing. The same logic applies to vendors. They are not neutral suppliers, but rather are co-producers of policing, who shape the capabilities of police through both the design

and use process. What is identified in this dissertation raises concerns. First, vendor marketing narratives - particularly around 'objectivity', 'truth', and 'transparency' in addition to BWV devices acting as 'independent witnesses' and capturing 'officer perspective' – are misaligned with findings from cognitive psychology and behavioural sciences. Second, procurement processes are becoming less transparent to the public, despite involving public funds and impacting public rights. Instances of police resistance to release vendor information when legally required is particularly alarming.

Third, vendors shape expectations of BWV technology should be used but face no accountability for any resultant socio-legal implications of those design decisions. If releasing police footage in the hope of improving public trust and confidence instead worsens public perception of police in the region, then both the technology which shaped that footage and the vendors who shaped that belief ought to be interrogated. This concern aligns with Wood et al.'s (2023: 8) examination of 'technology-mediated harm', which examines "the role design decisions might play in co-producing harm" (as cited in Adams and Thompson, 2025: 309). Precisely because design choices can structure future harms, analysing design and functionality in isolation before implementation becomes a harm-prevention strategy. This preventative orientation is only possible when technology is understood as having causal properties independently of human interpretation or action. Within a purely relational ontology, where nothing exists outside of interaction, this pre-emptive analysis is ontologically impossible.

From an analytic position, the absence of vendor-focused research is problematic for several reasons. First, *design precedes use*. Prior to police ever turning on the camera, vendors have determined what is possible and what is not. Technical functionalities are inherent capabilities of the system independent of immediate use, while affordances are possibilities for action perceived and enacted by police – with constraints limiting possibilities. Vendors achieve this through physical and interface design, feature availability, data access, cloud storage hosting and locations, pricing models notably technology-as-a-service, and algorithmic co-development (machine-learning video analytics) and integration. Second, *power stems from dependency*. When police organisations rely on vendor-controlled platforms (e.g. Digital Evidence Management Systems which are part of larger analytics ecosystems), the vendor arguably becomes a long-term organisational partner. Switching vendors can become costly, massive amounts of footage requires migration, officers become familiar with their platforms, functions, and devices, and as this research encountered implementing a new system runs the risk of failure. This creates structural dependency.

Third, *procurement shapes policy*. When procurement processes lack transparency or oversight, vendors can indirectly influence policing priorities through product bundling. Axon (formerly Taser) illustrates this: its dominance in the BWV technology market is due in part to bundling and the integration of BWV devices with the Taser through auto-activation triggers.

To understand BWV technology, the vendor landscape must be examined; to understand police technology adoption, police-vendor relations must be analysed. In the absence of this, analyses risk assuming that technology develops solely from police priorities, when the development trajectory is actually co-shaped by private commercial interests.

Conclusion

This chapter began by synthesising the empirical and theoretical contributions of the research. It summarised the changes in policing in England and Wales that followed BWV technology adoption (identified across multiple data sources) and explained how these changes inform the mutual-shaping between police and BWV technology. In so doing, it clarified how social arrangements and technical systems interact with and exert influence on one another.

The chapter then presented hard-learnt methodological lessons and suggested ways in which criminological research could be strengthened when examining police technology adoption. It reflected on research approaches, the academic fields typically drawn from, and the kinds of data and organisational participation required to address gaps in the literature. It also highlighted the need to interrogate the vendors and their relationships with police organisations, given their central role in determining the design and functionality of BWV technology.

While empirical access constraints limited the volume of data gathered, this dissertation's primary contribution is its analytical stance. Specifically, treating the technical components of technology as equal to the social and drawing from disciplines criminology typically avoids. The contributions emerged entirely because this research acted beyond traditional criminological boundaries. It embraced knowledge from historically unaligned fields and refused to treat technology as a neutral and passive object. The central insight is patent, addressing gaps in police technology research requires a willingness to step outside established assumptions and approaches.

Appendices

Appendix A: Letter of ethical approval

University
of Glasgow

College of Social
Sciences

29 June 2022

Dear Jean-Pierre Roux

College of Social Sciences Research Ethics Committee

Project Title: Technology-mediated policing: A socio-technical analysis of change

Application No: 400210253

The College Research Ethics Committee has reviewed your application and has agreed that there is no objection on ethical grounds to the proposed study. It is happy therefore to approve the project, subject to the following conditions:

- Start date of ethical approval: 01/07/2022
- Project end date: 30/09/2024
- Any outstanding permissions needed from third parties in order to recruit research participants or to access facilities or venues for research purposes must be obtained in writing and submitted to the CoSS Research Ethics Administrator before research commences: socsci-ethics@glasgow.ac.uk
- 'Avenues for Support' should be added to the Participant Information Sheet or provided to participants in a separate document at the point of recruitment.
- The research should be carried out only on the sites, and/or with the groups and using the methods defined in the application.
- The data should be held securely for a period of ten years after the completion of the research project, or for longer if specified by the research funder or sponsor, in accordance with the University's Code of Good Practice in Research: (https://www.gla.ac.uk/media/media_490311_en.pdf)
- Any proposed changes in the protocol should be submitted for reassessment as an amendment to the original application. The **Request for Amendments to an Approved Application** form should be used: https://www.gla.ac.uk/colleges/socialsciences/students/ethics/forms/staffandpostgraduateresearchstudents/

Yours sincerely,

Dr Susan A. Batchelor
College Ethics Lead

Susan A. Batchelor, Senior Lecturer
College of Social Sciences Ethics Lead
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Ivy Lodge, 63 Gibson Street, Glasgow G12 8LR.
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Appendix B: Consent form for in-person interviews

University
of Glasgow

College of Social
Sciences

Consent Form: Interview

Title of Project: Technology-mediated policing: A socio-technical analysis of change
Name of Researcher: Jean-Pierre Roux

I confirm that I have read and understood the Participant Information Sheet for the above study and have had the opportunity to ask questions.

I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason.

I acknowledge that participants will be anonymized.

- I agree to have the interview be voice recorded
- All names and other material likely to identify individuals, especially the transcripts of voice recordings, will be anonymised.
- The anonymised material will be treated as confidential and kept in secure storage at all times.
- The anonymised material will be retained in secure storage for use in future academic research
- The anonymised material may be used in future publications, both print and online.
- I agree to waive my copyright to any data collected as part of this project.
- I understand that other authenticated researchers will have access to this data only if they agree to preserve the confidentiality of the information as requested in this form.
- I understand that other authenticated researchers may use my words in publications, reports, web pages, and other research outputs, only if they agree to preserve the confidentiality of the information as requested in this form
- I understand that confidentiality will be respected unless there are compelling and legitimate reasons for this to be breached, given that the researcher has a duty of care to report to the relevant authorities any possible harm/danger to participant or others (if this was the case we would inform you of any decisions that might limit your confidentiality).

I acknowledge the provision of a Privacy Notice in relation to this research project.

I agree / do not agree (circle choice) to take part in the above study.

I consent / do not consent (circle choice) to interviews being audio-recorded.

Name of Participant:…………………………………. Signature …………………………Date …………………………………

Name of Researcher: Jean-Pierre Roux   Signature   ……………………………Date ……………………………………

Appendix C: Consent form for online interviews

College of Social Sciences

Consent Form: Online Interview

Title of Project: Technology-mediated policing: A socio-technical analysis of change
Name of Researcher: Jean-Pierre Roux

I confirm that I have read and understood the Participant Information Sheet for the above study and have had the opportunity to ask questions.

I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason.

I acknowledge that participants will be anonymized.

♦ I agree to have the interview be video and voice recorded. Both Zoom and MSTeams don't allow for audio-only recording. Zoom however does split the audio and video files. As such, the video file will be deleted immediately and the audio file retained in cloud storage until it has been transcribed.

♦ All names and other material likely to identify individuals, especially the transcripts of voice recordings, will be anonymised.

♦ The anonymised material will be treated as confidential and kept in secure storage at all times.

♦ The anonymised material will be retained in secure storage for use in future academic research

♦ The anonymised material may be used in future publications, both print and online.

♦ I agree to waive my copyright to any data collected as part of this project.

♦ I understand that other authenticated researchers will have access to this data only if they agree to preserve the confidentiality of the information as requested in this form.

♦ I understand that other authenticated researchers may use my words in publications, reports, web pages, and other research outputs, only if they agree to preserve the confidentiality of the information as requested in this form

♦ I understand that confidentiality will be respected unless there are compelling and legitimate reasons for this to be breached, given that the researcher has a duty of care to report to the relevant authorities any possible harm/danger to participant or others (if this was the case we would inform you of any decisions that might limit your confidentiality).

I acknowledge the provision of a Privacy Notice in relation to this research project.

I agree / do not agree (circle choice) to take part in the above study.

I consent / do not consent (circle choice) to interviews being audio-recorded.

Name of Participant:…………………………………. Signature …………………………Date …………………………………

Name of Researcher: Jean-Pierre Roux   Signature   ……………………………Date ………………………………………

Appendix D: Consent form for participant observation

College of Social
Sciences

Consent Form: Field Observation

Title of Project: Technology-mediated policing: A socio-technical analysis of change
Name of Researcher: Jean-Pierre Roux

I confirm that I have read and understood the Participant Information Sheet for the above study and have had the opportunity to ask questions.

I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason.

I acknowledge that participants will be anonymized.

- All names and other material likely to identify individuals will be anonymised.
- No photographs will be taken of participants. Photographs taken of body-worn video devices will not contain personally identifiable features of participants, their gear, or uniform.
- The anonymised material will be treated as confidential and kept in secure storage at all times.
- The anonymised material will be retained in secure storage for use in future academic research
- The anonymised material may be used in future publications, both print and online.
- I agree to waive my copyright to any data collected as part of this project.
- I understand that other authenticated researchers will have access to this data only if they agree to preserve the confidentiality of the information as requested in this form.
- I understand that other authenticated researchers may use my words in publications, reports, web pages, and other research outputs, only if they agree to preserve the confidentiality of the information as requested in this form
- I understand that confidentiality will be respected unless there are compelling and legitimate reasons for this to be breached, given that the researcher has a duty of care to report to the relevant authorities any possible harm/danger to participant or others (if this was the case we would inform you of any decisions that might limit your confidentiality).

I acknowledge the provision of a Privacy Notice in relation to this research project.

I agree / do not agree (circle choice) to take part in the above study.

Name of Participant: .... Signature ....Date ....

Name of Researcher: Jean-Pierre Roux   Signature   ....Date ....

Appendix E: Interview themes

Decision-makers & managerial staff

- The reasoning for the particular selection of model for the BWV.

Question examples

- Which technical elements are most important to achieving organizational goals?
- Was the market competitive for pricing?
- Were the respective models equal or would you have preferred another feature present in the other model?
- How do you intend to monitor to life cycle of the device?
- What are your intentions for the device once it reaches the end of its life cycle?

- Reasons for specific policy and procedure choices.

Question examples

- Did any of the technical features have to be adapted to fit with your procedures?
- Did any technical elements affect the process of creating policies?
- What sort of issues have you found and would like to amend with policy?
- What policy changes are you considering and why?
- Do you find that the operators are able to be compliant with the policies?
- What sort of compliance issues are you seeing?
- Is training sufficient for the policies and technology?
- How are operators updated on policy changes?

- The specific technological features affecting considerations relating to procedures/codes of conduct.

- Relationship with the manufacturers and the design process.

Question examples

- How did you find out about the manufacturers?
- What input did you have with the design?
- Have they asked for feedback and input for future models?
- Are the manufacturers happy to assist with implementation?
- What considerations are they aware of which impact design choices and technical options?
- Are their products in line with what senior staff's needs?

- Were there design issues which you had to negotiate with the manufacturers?

- Are they open to input?

- Is the product sufficiently flexible for your needs?

- How does one approach them and begin the negotiation process?

- Public engagement when adopting new technologies.

- Consultation with the frontline officers when adopting new technologies, especially BWVs.

Frontline officers

What are the ways in which technology affects them, their work, public engagement, their organisation, their policing culture, and how policing looks to outsiders?

- Usage practices. What habits are emerging? What behaviours are changing or being contested?

- The environmental factors behind their decision-making/usage practices.

- What guides their discretion to turn on/off the camera? What are the benefits to recording and do they want to record?

- The ways in which BWV impact their privacy.

- Their thoughts on surveillance and being surveilled.

- Discussion on the features/specifications of the device which are useful and desirable to them.

- Technological issues/limitations that arise.

- Impact the BWV, in general, has made on their interactions with the public.

- The design features/technical aspects of BWVs which affect your duties the most. Why/in what ways do they impact?

- Benefits and issues they have experienced with the BWVs.

- Improvements to BWV technology and the policies/procedures that they would like to see.

- Have they addressed any concerns or offered feedback on the technology and procedures?

- Environmental factors impacting interactions with the public.

- How do people react to being recorded? Is it a barrier to engagement or can it be used to increase engagement?

- Do people ask not to be recorded or recorded and how do they navigate their requests?

- Can technology solve some of the issues they regularly face?
- Which technology (model of BWV) did they prefer and why?
- How confident are they in their technological tools and their tech skills during their interactions?
- Is technology enabling them to do better policing?
- Do they enjoy having technology?
- What changes in their behaviour have taken place as a result of technology adoption?
- What are their training needs and are they feeling sufficiently trained?
- How do BWVs affect your interactions with your colleagues?
- How do BWVs affect your interactions with the public?
- How has their safety been impacted by BWVs? Do they feel more or less safe?
- What does BWV mean to them in terms of trust and accountability?
- How regularly do they watch their BWV footage? Do they feel it reflects their story/an accurate approximation?
- Their favourite features of the BWV model and why. Are they familiar with all of the features? Which features do they use the most regularly?

Detectives

- Their varied role and usages of BWV footage
  - Do you show footage to suspects?
    - Their responses?
  - Do you use it during public interactions?
    - The effect it has had?
  - Do you use it to record statements?
  - More perspective or for evidentiary purposes?
- Any significant experiences they've had using footage – any cases breakers or closers?
- Positive and/or negative impacts of BWV
  - Where do you see the technology heading?
  - Are their problems with the way officers are using it?
- Reliance on technology/BWV
  - Is it deskilling policing?

    o   Is it causing changes to types of people who become officers?

- Any challenges presented by BWV?

- Issues they might have with the technology?

- What could be improved – features or device hardware improvements?

- Accessing and using footage?

Trainers/Professional Development Unit

- Usage trends and training emphasis and issues.

Question examples

- What role does technology play in policing?

- What is important for officers to learn?

- Is the training more challenging in terms of technical aspects or procedures and behaviour?

- How free are you to determine the training material?

- What can you identify from viewing footage?

- What are some of the things you look for?

- Is that taught? Is there a manual on what to look for? Has that changed over time?

- What are some of the biggest differences between new officers and experienced officers?

- What usage trends are emerging with regards to usage and implementation?

- How representative is footage to being in the field?

- What would you like to see included in the training?

- What behavioural changes would you like to see?

- What policy changes would you like to see?

- Are officers coming back for retraining?

- How much of a burden is the training for officers?

- Are officers struggling to become sufficiently trained?

- Is the training sufficient for the task?

- What are some of the limitations of the BWVs that you've found so far?

- What are some of the concerns about the BWVs that you've heard from officers and managers?

- What are some of the barriers you've noticed for implementing the BWVs according to the way prescribed by senior officials/staff?

- Are there particular features that you think can be used better?

- Are there particular features that you think should be deactivated?

- Are there any features that you would like to see in future models?

- Environmental factors.

- What training are the trainers receiving?

- Cost of training, including officers' time.

  - Is sufficient funding spent on training?

- Upskilling, deskilling (reliance on technology), and changes to required skillsets and the effect of this on types of officers.

- What cooperation is there with the manufacturers for training purposes?

IT/technical support

- Implementation gaps, successes, and challenges.

- Feedback from frontline officers and management.

- Tech features they would like to see deployed in the future and why.

- Role of technology in policing.

Question examples

- What role does technology play in policing?

- In what ways are changes in policing occurring as a result of technology adoption?

- Which organizational and environmental factors are affecting technology adoption?

- Has BWV been the most successful technology adoption?

- What role does technology play in change?

- Are there specific BWV features you see being useful or necessary in the future?

- How important is the software and backend system to the BWV platform?

- What is it about technology that makes it useful for policing?

- What are some of the negative and positive features of the old and new BWVs?

- Implementation gaps.

  - What implementation challenges have you seen over the years?

  - Are you seeing issues with technology not being used as intended?

- Interoperability of technology.

  - How well does the technology fit into your existing systems?

- Support and training.

  - Are you receiving enough support from senior staff and operators?

  - What sort of training do you receive?

- Technical capabilities and requirements.

  - Are these systems and models sufficient to meet the needs of command staff?

  - What changes would you like to see?

- Particular features that can be used better/more regularly.

- Particular features that should be deactivated.

- Particular features that should be included in future models.

Appendix F: Observation proforma

OBSERVATION PROFORMA

Department observing:	(e.g. frontline officer, trainer)	Duty	(e.g. patrol, training, technical assistance)
Site/Location	(e.g. station, HQ, silo offices)	Shift:	(e.g. night/day, weekend/week, special event)
Date:	Time:		

Primary focus of the observation: (e.g. training of officers to operate bodycams, frontline officer day patrol of station – standard duties, tech support resolving bodycam system issues)

What happened:	Issues/themes:
	(e.g. impact of BWV, nature of public engagement, interesting usage, environmental factors affecting discretion, specific technical features making an impact)
Important notes to consider:	**Notes regarding potential impact of researcher:** (e.g. officers seemed less inclined to initiate public engagement in my presence)

Appendix G: Vendor landscape information spreadsheet

#	Constabulary	Vendor	Comments	Net spend Contract	Net spend FOI	Contract duration	Renewal	Data date	Tender ID	FOI reference
2	Avon and Somerset Police	Reveal	Most likely Reveal as part of 5 force colloboration	£ 1,933,390.00	£ 277,380.00	3.5 years	Late-2023	18/11/2022	SPS0864	FOI #905109
3	Bedfordshire Police	Reveal	Most likely Reveal as part of 5 force colloboration	£ 744,469.01		2017-2022	30/04/2023	15/11/2022		FOI2022/05865
4	Cambridgeshire Constabulary	Not on Blue Lights (BL), no website, no F	Most likely Reveal as part of 5 force colloboration							
5	Cheshire Constabulary	Reveal	Bluelight	531,566.00		2018-2021-2023	31/03/2023	Current	CPA/SPU/807	
6	City of London Police	No BL								
7	Cleveland Police	MS	Withheld	£ 23,593.50		4 years	03/10/2025	01/11/2022		14287-22
8	Cumbria Constabulary	Axon		£ 1,579,342.00			01/07/2025	23/11/2022		FOI750/22
9	Derbyshire Constabulary	Reveal	Bluelight	1,441,526.20		4 years	31/07/2024	Current	DP0534	
10	Devon and Cornwall Police	No FOI, BL, or website	2019 article indicating Reveal							
11	Dorset Police	No BL	No FOI, BL, or website							
12	Durham Constabulary	Axon	Through Computacenter	£ 1,087,035.60	Not provided	3 years	01/11/2024	01/11/2022	50966	DC/FOI 1013-22
13	Dyfed-Powys Police	Axon	Deficit between FOI and BL tender	£ 1,054,478.00	£ 891,352.20	3 years		16/12/2022	DPP/19/14	764/2022
14	Essex Police	Axon	From police website							
15	Gloucestershire Constabulary	Reveal	From news website		£1.2million	4 years				
16	Greater Manchester Police	Axon	https://uk.eu-supply.com/ctm/Suppl	£ 4,700,000.00		4 years	31/03/2027	21/10/2022	A0816/A0985	GSA 4162 22
17	Gwent Police	Reveal	In tandem with South Wales							
18	Hampshire and Isle of Wight Con...	No info								
19	Hertfordshire Constabulary	No info	Most likely Reveal as part of 5 force colloboration							
20	Humberside Police	Reveal	Bluelight	£713,905.00		2017-2020-2024-20	01/05/2025	Current 26/10/2022	1596-2017 and HP807 and HP1056	
21	Kent Police	AxonUK			20m as part of DAMS		16/07/1905	07/11/2022		FOI/01186/22/HR
22	Lancashire Constabulary	(MS most likely) Refused under S21	Refers to blpd (42755/42746); blue 2,081,783.47	£299,413	Annual licencing an	01/04/2023	07/11/2022	42755	
23	Leicestershire Police	Reveal	Based on Self-assessment tool (p. 14)							
24	Lincolnshire Police	Axon			Approx. £163k annually		01/05/2024	01/08/2022		003909/22
25	Merseyside Police	Reveal	BWV policy from Dec 2021					07/12/2022		00390922

#	Constabulary	Vendor	Comments	Net spend Contract	Net spend FOI	Contract duration	Renewal	Data date	Tender ID	FOI reference
26	Metropolitan Police Service	Axon			11million		01/11/2023	08/11/2022		01/FOI/22/026722
27	Norfolk Constabulary	No BL	Most likely Reveal as part of 5 force colloboration							
28	North Wales Police	No BL	Reveal in 2017							
29	Northamptonshire Police	MS	Nice Investigate integration	£1,001,197.24 (incl. hardware refresh)		01/12/2025	03/11/2022		FOI 5574 22
30	Northumbria Police	Edesix (MS)	Motorola Bodyworn Video Manager	Circa £200k p.a.			30/06/2023	01/10/2022		
31	North Yorkshire Police	Reveal	Bluelight	191,669.88		2018-2021-2023	31/03/2023		1720-2018	
32	Nottinghamshire Police	No info	Part of EMSCU							
33	South Wales Police	Reveal	Bluelight - 0 Pounds indicated	0		18 months	05/03/2024	Current	JCPS0091	
34	South Yorkshire Police	Reveal	Bluelight	55,797.55		2018-2021-2023-20	01/05/2025	Current	1668 - 2017 and SYP857 and SYP...	
35	Staffordshire Police	Axon		£ 1,066,108.26	No info		14/11/2022	14857		
36	Suffolk Constabulary	No info	Most likely Reveal as part of 5 force colloboration							
37	Surrey Police	MS	Nice	£ 1,170,317.00		01/02/2025	01/12/2022		004188/22	
38	Sussex Police	Motorola	Bluelight; BWV and DEAMS listed as 0.00; Part of Kent's FOI still outstanding			14/04/2027	JPS499	3189/22		
39	Thames Valley Police	Axon	Bluelight (nothing on 2022)	5,808,500.00		3 years	01/03/2023	01/11/2022	TVP00714	
40	Warwickshire Police	Axon		£168,583.50 FY22/23			31/03/2023	01/10/2022		FOI-735-2022
41	West Mercia Police	Axon	Refused spend via S21				31/03/2023			203284
42	West Midlands Police	Axon		c£3.4m			31/05/2027	01/10/2022		1366A/22
43	West Yorkshire Police	Unknown - MS most likely	'Pronto spend' airwave, compucenter, and insight direct. Bluelight ID - 41953 - cannot find; FOI states 2mil spend		3900000 (pronto)	5 years	14/10/2027	01/11/2022	2529-2021/2265	1373221/22
44	Wiltshire Police	Reveal	Bluelight	£16,371.00		4 years	19/12/2022		316	

Reference list

Murray v. The United Kingdom, European Court of Human Rights, Application No. 18731/91 [1995].

R (on the application of Wood) v Commissioner of Police for the Metropolis, England and Wales Court of Appeal (Civilian Division) 414 [2009].

#WECOPS. 2024. *Body worn video* [Online]. Available: https://www.wecops.uk/events/2024/08/body-worn-video [Accessed 15 February 2025].

#WECOPS. no date. *Leanne Moorhouse* [Online]. Available: https://www.wecops.uk/user/leanne-moorhouse [Accessed 13 February 2025].

ADAMS, C. & THOMPSON, T. L. 2025. Interviews with digital objects. *In:* MAREILE, K. & HEIDI MORK, L. (eds.) *De Gruyter Handbook of Digital Criminology.* Berlin and Boston: De Gruyter.

ADAMS, I. & MASTRACCI, S. 2017. Visibility is a trap: The ethics of police body-worn cameras and control. *Administrative Theory & Praxis,* 39**,** 313-328.

ADAMS, I. & MASTRACCI, S. 2019. Police body-worn cameras: Effects on officers' burnout and perceived organizational support. *Police Quarterly,* 22**,** 5-30.

ARCHER, M. S. 1995. *Realist social theory: the morphogenetic approach,* Cambridge, Cambridge University Press.

ARCHER, M. S. 2010. Morphogenesis versus structuration: on combining structure and action. *The British Journal of Sociology,* 61**,** 225-252.

ARGYRIS, C. & SCHÖN, D. A. 1978. *Organizational learning: A theory of action perspective,* Reading, Addison-Wesley Publishing.

ARGYROUS, G. 2012. Evidence based policy: Principles of transparency and accountability. *Australian Journal of Public Administration,* 71**,** 457-468.

ARIEL, B. 2018. "Not all evidence is created equal": On the importance of matching research questions with research methods in evidence based policing. *In:* MITCHELL, R. J. & HUEY, L. (eds.) *Evidence based policing: An introduction.* Bristol: Policy Press.

ARIEL, B., FARRAR, W. A. & SUTHERLAND, A. 2015. The effect of police body-worn cameras on use of force and citizens' complaints against the police: A randomized controlled trial. *Journal of Quantitative Criminology,* 31**,** 509-535.

ARIEL, B., SUTHERLAND, A., HENSTOCK, D., YOUNG, J., DROVER, P., SYKES, J., MEGICKS, S. & HENDERSON, R. 2016. Wearing body cameras increases assaults against officers and does not reduce police use of force: Results from a global multi-site experiment. *European Journal of Criminology,* 13**,** 744-755.

ARIEL, B., SUTHERLAND, A., HENSTOCK, D., YOUNG, J., DROVER, P., SYKES, J., MEGICKS, S. & HENDERSON, R. 2017a. "Contagious accountability": A global multisite randomized controlled trial on the effect of police body-worn cameras on citizens' complaints against the police. *Criminal Justice and Behavior,* 44**,** 293-316.

ARIEL, B., SUTHERLAND, A., HENSTOCK, D., YOUNG, J. & SOSINSKI, G. 2017b. The deterrence spectrum: Explaining why police body-worn cameras 'work' or 'backfire' in aggressive police–public encounters. *Policing,* 12**,** 6-26.

ARIEL, B., SUTHERLAND, A. & SHERMAN, L. W. 2019. Preventing treatment spillover contamination in criminological field experiments: The case of body-worn police cameras. *Journal of Experimental Criminology,* 15**,** 569-591.

ARNALL, T. D. 2014. *Making visible: Mediating the material of emerging technology.* The Oslo School of Architecture and Design.

ASSARAF, N., MOURO, A., PAPY, D. M., CASTILLO, N. & ARIEL, B. 2024. Behind the yellow sticker: Paradoxical effects of a visual warning of body-worn cameras on the use of police force. *Journal of Experimental Criminology*.

ATMANSPACHER, H. 1997. Cartesian cut, Heisenberg cut, and the concept of complexity. *World Futures: Journal of General Evolution,* 49**,** 333-355.

AUDAX. 2023. *Audax launches new Holster Aware sensor, designed to support and enhance security and emergency services operations in the field* [Online]. Available: https://audaxsecurity.co.uk/article/audax-launches-new-holster-aware-sensor-designed-to-support-and-enhance-security-and-emergency-services-operations-in-the-field/ [Accessed 5 April 2024].

AVIGILON. no date. *AI-powered video analytics software* [Online]. Available: https://www.avigilon.com/analytics [Accessed 20 October 2025].

AXON. 2019. *Dyfed-Powys Police is first UK force to roll out Axon Fleet 2 in-car video system* [Online]. Available: https://investor.axon.com/2019-06-04-Dyfed-Powys-Police-Is-First-UK-Force-to-Roll-Out-Axon-Fleet-2-In-Car-Video-System [Accessed 5 April 2024].

AXON. 2020. *Axon Flex 2* [Online]. Available: https://web.archive.org/web/20201010001350/https://www.axon.com/products/axon-flex-2 [Accessed 31 July 2024].

AXON. 2023a. *Evolution of the Axon body camera* [Online]. Available: https://www.axon.com/news/technology/evolution-of-axon-body-camera [Accessed 23 October 2025].

AXON. 2023b. *Flex POV module* [Online]. Available: https://a.storyblok.com/f/133181/x/9b02860e6c/flex-pov-product-card.PDF [Accessed 17 February 2025].

AXON. 2023c. *How Axon's ecosystem helps West Midlands Police do more with less* [Online]. Available: https://web.archive.org/web/20240915174917/https://www.axon.com/resources/articles-source/how-axon-s-ecosystem-helps-west-midlands-police-do-more-with-less [Accessed 31 July 2024].

AXON. 2023d. *Recording an event* [Online]. Available: https://my.axon.com/s/article/Recording-an-Event [Accessed 31 July 2024].

AXON. 2023e. *Turning on or off camera lights, sounds, and vibrations (Stealth Mode)* [Online]. Available: https://my.axon.com/s/article/Turning-On-or-Off-Camera-Lights--Sounds--and-Vibrations-Stealth-Mode?language=en_US [Accessed 31 July 2024].

AXON. 2024a. *Axon Performance* [Online]. Available: https://www.axon.com/products/axon-performance [Accessed 17 February 2025].

AXON. 2024b. *Axon Respond* [Online]. Available: https://www.axon.com/uk/products/axon-respond [Accessed 29 September 2024].

AXON. 2024c. *Axon Signal* [Online]. Available: https://www.axon.com/products/axon-signal [Accessed 31 July 2024].

AXON. 2024d. *Digital evidence management* [Online]. Available: https://www.axon.com/resources/digital-evidence-management-guide#investigate [Accessed 17 February 2025].

AXON. 2024e. *How Axon Body 4 cameras with Watch Me technology improved safety* [Online]. Available: https://www.axon.com/resources/how-axon-body-4-cameras-with-watch-me-technology-improved-safety [Accessed 29 September 2024].

AXON. no date-a. *Axon Body 3* [Online]. Available: https://www.axon.com/products/axon-body-3 [Accessed 31 July 2024].

AXON. no date-b. *Axon Body 4* [Online]. Available: https://www.axon.com/products/axon-body-4 [Accessed 31 July 2024].

AXON. no date-c. *Axon Ecosystem* [Online]. Available: https://www.axon.com/ecosystem [Accessed 13 February 2025].

AXON. no date-d. *Seeing through the lens* [Online]. Available: https://www.axon.com/resources/how-axon-body-cameras-bridge-the-gap [Accessed 30 May 2025].

BARAD, K. 2007. *Meeting the universe halfway: Quantum physics and the entanglement of matter and meaning,* Durham, Duke University Press.

BARDZELL, S. & BARDZELL, J. Towards a feminist HCI methodology: Social science, feminism, and HCI. Proceedings of the SIGCHI conference on human factors in computing systems, 2011. 675-684.

BARLEY, S. R. 1988. Technology, power, and the social organization of work: Towards a pragmatic theory of skilling and deskilling. *Research in the Sociology of Organizations,* 6**,** 33-80.

BARLEY, S. R. 1998. What can we learn from the history of technology? *Journal of Engineering and Technology Management,* 15**,** 237-255.

BBC NEWS. 2011. *Grampian Police hail body-worn camera success* [Online]. Available: https://www.bbc.com/news/uk-scotland-north-east-orkney-shetland-13974578 [Accessed 9 May 2024].

BBC NEWS. 2017. *Issues with police body-worn camera system revealed* [Online]. Available: https://www.bbc.com/news/uk-scotland-39730665 [Accessed 9 May 2024].

BBC NEWS. 2018. *Police body cameras 'reduce the need to fire Taser'* [Online]. Available: https://www.bbc.com/news/uk-england-leeds-43541479 [Accessed 9 May 2024].

BBC NEWS. 2020a. *Facial recognition use by South Wales Police ruled unlawful* [Online]. Available: https://www.bbc.com/news/uk-wales-53734716 [Accessed 29 September 2024].

BBC NEWS. 2020b. *Sir Steve House warns against releasing more police body-worn footage* [Online]. Available: https://www.bbc.com/news/uk-england-london-54071949 [Accessed 31 May 2024].

BBC NEWS. 2021. *Police body cams could see 'spike in guilty pleas'* [Online]. Available: https://www.bbc.com/news/uk-scotland-57309639 [Accessed 9 May 2024].

BBC NEWS. 2022a. *MPs call for UK ban on two Chinese CCTV firms* [Online]. Available: https://www.bbc.com/news/technology-62003253 [Accessed 9 May 2024].

BBC NEWS. 2022b. *West Midlands Police to live-stream body cam footage* [Online]. Available: https://www.bbc.com/news/uk-england-birmingham-62186212 [Accessed 9 May 2024].

BBC NEWS. 2023a. *Bodycam cops uncovered* [Online]. Available: https://www.bbc.co.uk/programmes/p0ggqrkx [Accessed 9 May 2024].

BBC NEWS. 2023b. *Facial recognition tech: Liberty 'police racism' claim* [Online]. Available: https://www.bbc.com/news/uk-wales-65214494 [Accessed 29 September 2024].

BBC NEWS. 2023c. *Police officers widely misusing body-worn cameras* [Online]. Available: https://www.bbc.com/news/uk-66809642 [Accessed 9 May 2024].

BBC NEWS. 2024. *Southampton trials facial recognition cameras in pubs and clubs* [Online]. Available: https://www.bbc.com/news/uk-england-hampshire-68071705 [Accessed 29 September 2025].

BBC NEWS. 2025. *Council traffic wardens to wear body-worn cameras* [Online]. Available: https://www.bbc.com/news/articles/c9vml8ml7djo [Accessed 17 February 2025].

BERRY, C. R. 2021. Under surveillance: An actor network theory ethnography of users' experiences of electronic monitoring. *European Journal of Criminology,* 18**,** 817-835.

BHASKAR, R. 1975. Forms of realism. *Philosophica,* 15**,** 99-127.

BHASKAR, R. 2008. *A Realist Theory of Science* London and New York, Routledge.

BIOMETRICS AND SURVEILLANCE CAMERA COMMISSIONER 2023a. Commissioner for the Retention and Use of Biometric Material annual report January 2021 – March 2022 and Surveillance Camera Commissioner annual report March 2021 – March 2022 Office of the Biometrics and Surveillance Camera Commissioner.,.

BIOMETRICS AND SURVEILLANCE CAMERA COMMISSIONER 2023b. UK policing 'shot through' with Chinese surveillance technology.

BIOMETRICS AND SURVEILLANCE CAMERA COMMISSIONER 2023c. The use of overt surveillance camera systems in public places by police forces in England and Wales: An assessment of compliance with the Protection of Freedoms Act 2012 and the Surveillance Camera Code of Practice.

BLUELIGHT COMMERCIAL. 2022. *National e-procurement system contract awarded* [Online]. Available: https://bluelightcommercial.police.uk/news/eprocurement-system/ [Accessed 5 April 2024].

BLUELIGHT COMMERCIAL. no date. *Procurement Act 2023 and blue light suppliers* [Online]. Available: https://bluelightcommercial.police.uk/suppliers/procurement-act-2023/ [Accessed 13 February 2025].

BOBLOV. no date. *BOBLOV M7* [Online]. Available: https://boblov.com/products/m7-128gb-gps-body-worn-camera [Accessed 17 February 2025].

BOCZKOWSKI, P. J. 1999. Mutual shaping of users and technologies in a national virtual community. *Journal of Communication,* 49**,** 86-108.

BOCZKOWSKI, P. J. 2004. The mutual shaping of technology and society in videotex newspapers: Beyond the diffusion and social shaping perspectives. *The Information Society,* 20**,** 255-267.

BØDKER, S. 2015. Third-wave HCI, 10 years later---Participation and sharing. *Interactions,* 22**,** 24-31.

BOIVIN, R., BERNIER, D., OSTIGUY, R., GAGNON, C. & GENDRON, A. 2023. Content and container: Exploring possible perspective and audio biases in videos of police interventions. *Journal of Police and Criminal Psychology,* 38**,** 413-425.

BOIVIN, R., FAUBERT, C., GENDRON, A. & POULIN, B. 2020. Explaining the body-worn camera perspective bias. *Journal of Qualitative Criminal Justice & Criminology,* 9.

BOIVIN, R., GENDRON, A., FAUBERT, C. & POULIN, B. 2017. The body-worn camera perspective bias. *Journal of Experimental Criminology,* 13**,** 125-142.

BOIVIN, R., POIRIER, B. & D'ELIA, M. 2022. Activate compliance: A multilevel study of factors associated with activation of body-worn cameras. *Criminal Justice Review,* 47**,** 103-118.

BOVENS, M., SCHILLEMANS, T. & GOODIN, R. 2014. Public accountability. *In:* BOVENS, M., GOODIN, R. & SCHILLEMANS, T. (eds.) *The Oxford handbook of public accountability.* Oxford: Oxford University Press.

BOWLING, B. & IYER, S. 2019. Automated policing: The case of body-worn video. *International Journal of Law in Context,* 15**,** 140-161.

BOWS, H. 2019. Methodological approaches to criminological research. *In:* DAVIES, P. & FRANCIS, P. (eds.) *Doing criminological research.* 3rd ed. London: SAGE Publications.

BRIGHENTI, A. 2007. Visibility: A category for the social sciences. *Current Sociology,* 55**,** 323-342.

BROWN, J. 1996. Police research: Some critical issues. *In:* LEISHMAN, F., LOVEDAY, B. & SAVAGE, S. P. (eds.) *Core issues in policing.* London and New York: Longman.

BROWNE, D. G. 1956. *The rise of Scotland Yard: A history of the Metropolitan Police,* London, George G. Harrap and Co.

BRYMAN, A. 1984. The debate about quantitative and qualitative research: A question of method or epistemology? *British Journal of Sociology***,** 75-92.

BRYNJOLFSSON, E. 1993. The productivity paradox of information technology. *Communications of the ACM,* 36**,** 67-77.

BRYNJOLFSSON, E. & HITT, L. M. 2003. Beyond computation: Information technology, organizational transformation, and business performance. *In:* MALONE, T. W., LAUBACHER, R. & MORTON, M. S. S. (eds.) *Inventing the Organizations of the 21st Century.* Cambridge and Massachusetts: MIT Press.

BULLOUGH, J. D., BOYCE, P. R., BIERMAN, A., CONWAY, K. M., HUANG, M. K., O'ROURKE, C. P., HUNTER, C. M. & NAKATA, A. 1999. Luminous intensity for traffic signals: A scientific basis for performance specifications. Lighting Research Center.

BUREAU OF JUSTICE ASSISTANCE. 2019. *Funding awards* [Online]. Available: https://bja.ojp.gov/funding/awards/2019-bc-bx-k001. [Accessed 5 April 2024].

BURNETT, S. 2011. Perceptual worlds and sensory ecology. *Nature Education Knowledge,* 3**,** 75.

BURTON, F. & CARLEN, P. 2013. *Official discourse: On discourse analysis, government publications, ideology and the state,* Oxon, Routledge Revivals Series.

CAMPEAU, H. & KEESMAN, L. D. 2023. 'Robocops' in the making: Reframing police–citizen interactions through the lens of body-worn cameras. *The British Journal of Criminology,* 64**,** 744-760.

CASEY, R. 2021. *Left to their own devices: A technosocial ethnography of penal electronic monitoring in Scotland.* Doctor of Philosophy, University of Glasgow.

CASSELMAN, B. 2016. *The legend of Abraham Wald* [Online]. American Mathematical Society. Available: https://www.ams.org/publicoutreach/feature-column/fc-2016-06 [Accessed 25 March 2025].

CENTRE FOR APPLIED SCIENCE AND TECHNOLOGY 2014. Body-worn video technical guidance. Home Office.

CHARMAN, S. & BENNETT, S. 2022. Voluntary resignations from the police service: the impact of organisational and occupational stressors on organisational commitment. *Policing and Society,* 32**,** 159-178.

CNN. 2018. *Watch both perspectives of this arrest* [Online]. Available: https://edition.cnn.com/videos/us/2018/11/15/keilon-hill-west-des-moines-police-arrest-orig-js.cnn [Accessed 9 May 2024].

COLLEGE OF POLICING. 2013. *National decision model* [Online]. Available: https://production.copweb.aws.college.police.uk/print/pdf/node/2567 [Accessed 12 May 2024].

COLLEGE OF POLICING 2014a. Body-worn video.

COLLEGE OF POLICING. 2014b. *Management of police information (Authorise Professional Practice)* [Online]. Available: https://www.college.police.uk/app/information-management/management-police-information [Accessed 20 June 2024].

COLLEGE OF POLICING. 2016. *Stop and search (Authorise Professional Practice)* [Online]. Available: https://www.college.police.uk/app/stop-and-search [Accessed 23 June 2024].

COLLEGE OF POLICING 2020. Policing in England and Wales: Future operating environment 2040.

COLLEGE OF POLICING 2024a. Data-driven technologies: Authorised professional practice: Consultation.

COLLEGE OF POLICING 2024b. Data ethics: Authorised professional practice: Consultation.

COLLEGE OF POLICING. 2024c. *Ethical use of data and technologies guidance* [Online]. Available: https://www.college.police.uk/article/ethical-use-data-and-technologies-guidance-have-your-say [Accessed 17 February 2025].

COMMISSION ON RACE AND ETHNIC DISPARITIES 2021. The report of the Commission on Race and Ethnic Disparities.

CORNISH, D. B. & CLARKE, R. V. 1987. Understanding crime displacement: An application of rational choice theory. *Criminology,* 25**,** 933–948.

COUNCIL OF EUROPE 1950. Convention for the Protection of Human Rights and Fundamental Freedoms (European Convention on Human Rights). *Council of Europe Treaty Series 005.*

CRITICAL INCIDENT REVIEW. 2024. *Comparison: Body-worn camera v. The human eye* [Online]. Available: https://criticalincidentreview.com/comparison-body-worn-camera-v-the-human-eye/ [Accessed 30 May 2025].

DAILYMAIL. 2022. *Shocking moment Ohio cop shoots dead unarmed man, 20, in his bed after mistaking his VAPE for a gun* [Online]. Available: https://www.dailymail.co.uk/news/article-11166689/Bodycam-footage-shows-shocking-moment-cops-kill-unarmed-man-BED-mistaking-vape-pen-gun.html [Accessed 9 August 2024].

DANGLES, O., IRSCHICK, D., CHITTKA, L. & CASAS, J. 2009. Variability in sensory ecology: Expanding the bridge between physiology and evolutionary biology. *The Quarterly Review of Biology,* 84**,** 51-74.

DAVIES, M. 2016. To what extent can we trust police research? - Examining trends in research 'on', 'with', 'by' and 'for' the police. *Nordisk politiforskning,* 3**,** 154-164.

DAVIES, P. 2019. Doing qualitative data analysis in criminological research. *In:* DAVIES, P. & FRANCIS, P. (eds.) *Doing criminological research.* 3rd ed. London: SAGE Publications.

DAVIS, G. B. 2006. Information systems as an academic discipline: Looking back, looking forward, and ensuring the future. *In:* AVISON, D., ELLIOT, S., KROGSTIE, J. & PRIES-HEJE, J. (eds.) *The past and future of information systems: 1976–2006 and beyond.* Boston: Springer.

DE MOURA, E. O. & BISPO, M. D. S. 2020. Sociomateriality: Theories, methodology, and practice. *Canadian Journal of Administrative Sciences,* 37**,** 350-365.

DEMARÉE, C., VERWEE, I. & ENHUS, E. 2013. Observing the observers. participant observation in police settings. *In:* BEYENS, K., CHRISTIAENS, J., CLAES, B., DE RIDDER, S., TOURNEL, H. & TUBEX, H. (eds.) *The pains of doing criminological research.* VUBPRESS.

DEMIR, M. 2023. Effect of awareness and notification of body-worn cameras on procedural justice, police legitimacy, cooperation, and compliance: Findings from a randomized controlled trial. *Journal of Experimental Criminology,* 19**,** 1-31.

DENZIN, N. K. 2009. The elephant in the living room: Or extending the conversation about the politics of evidence. *Qualitative Research,* 9**,** 139-160.

DEPARTMENT FOR DIGITAL CULTURE MEDIA AND SPORT, CENTRE FOR DATA ETHICS AND INNOVATION, THE RETIRED HONOURABLE OLIVER DOWDEN CBE MP & CMG, T. R. H. L. F. 2021. UK launches data reform to boost innovation, economic growth and protect the public.

DES MOINES REGISTER. 2019. *'Treated like a criminal for absolutely no reason'* [Online]. Available: https://www.desmoinesregister.com/story/news/crime-and-courts/2019/04/30/keilon-hill-black-campaign-worker-iowa-david-young-acquitted-harassment-public-official-wdm-police/3621793002/ [Accessed 9 May 2024].

DEVARAJ, S. & KOHLI, R. 2000. Information technology payoff in the health-care industry: A longitudinal study. *Journal of Management Information Systems,* 16**,** 41-67.

DEVON AND CORNWALL COMMUNITY SCRUTINY PANEL. 2024a. *March 2024 report (3-5pm)* [Online]. Available: https://www.dccspanel.org.uk/news-media/report-march2024-3to5 [Accessed 23 June 2024].

DEVON AND CORNWALL COMMUNITY SCRUTINY PANEL. 2024b. *March 2024 report (7-9pm)* [Online]. Available: https://www.dccspanel.org.uk/news-media/march-2024-report-7-9pm [Accessed 23 June 2024].

DEVON AND CORNWALL COMMUNITY SCRUTINY PANEL. no date. *About the Devon and Cornwall community scrutiny panel* [Online]. Available: https://www.dccspanel.org.uk/scrutiny-panel [Accessed 23 June 2024].

DEVONLIVE. 2020. *Release body worn video to protect officers, says Police Federation of England and Wales* [Online]. Available: https://www.devonlive.com/news/devon-news/release-born-worn-video-protect-4438181 [Accessed 31 May 2024].

DEVONLIVE. 2021. *'Frustrating' police forces still not releasing body worn video* [Online]. Available: https://www.devonlive.com/news/devon-news/frustrating-police-forces-still-not-5645438 [Accessed 31 May 2024].

DIGITAL ALLY. no date. *FirstVu II* [Online]. Available: https://www.digitalallyinc.com/law-enforcement-products/firstvu-ii/ [Accessed 17 February 2025].

DROVER, P. & ARIEL, B. 2015. Leading an experiment in police body-worn video cameras. *International Criminal Justice Review,* 25**,** 80-97.

DUVAL, S. & WICKLUND, R. A. 1972. *A theory of objective self awareness,* Oxford, Academic Press.

DYMOND, A. 2014. Taser: From object to actant? How actor-network theory can advance the literature on taser. *International Journal of Criminology and Sociological Theory,* 7**,** 1-12.

DYMOND, A. 2016. *Police use of Taser in England and Wales, 2004 – 2014.* PhD, University of Exeter.

DYMOND, A. 2020. Towards a socio-technical understanding of discretion: A case study of Taser and police use of force. *Policing and Society,* 30**,** 998-1012.

EAST MIDLANDS STRATEGIC COMMERCIAL UNIT. 2018. *Tender notice* [Online]. Available: https://bidstats.uk/tenders/2018/W46/690946064 [Accessed 14 February 2024].

EDMONTON POLICE SERVICE 2015. Body worn video: Considering the evidence.

EDWARDS, J. 2012. *Ethical decision-making: A treatise into the role of ethics in 21st century policing.* Professional Doctorate, London Metropolitan University.

EEYELOG. no date. *Homepage* [Online]. Available: https://www.eeyelog.com/ [Accessed 17 February 2025].

ELDER-VASS, D. 2012. Towards a realist social constructionism. *Sociologia, problemas e práticas***,** 9-24.

ELKINS-BROWN, N., JAMES, S. & JAMES, L. 2023. Validating a novel tool for coding body worn camera footage of police-community member interactions. *Criminology & Public Policy,* 22**,** 347-384.

EMSLEY, C. 2013. Peel's principles, police principles. *In:* BROWN, J. M. (ed.) *The future of policing.* London and New York: Routledge.

EQUALITY AND HUMAN RIGHTS COMMISSION 2013. Stop and think again: Towards race equality in police PACE stop and search.

ERICSON, R. V. 1995. The news media and account ability in criminal justice. *In:* STENNING, P. C. (ed.) *Accountability for criminal justice.* Toronto: University of Toronto Press.

ESPENANT, M., MURWANASHYAKA, J. N., DE GAGNÉ, M. & WOLLBAUM, A. 2015. Scoping, technical, and operational evaluation of body worn video. Defence Research and Development Canada - Centre for Security Science.

ESSEX POLICE. 2020. *Essex Police body worn video contract* [Online]. Available: https://www.essex.police.uk/foi-ai/essex-police/other-information/previous-foi-requests/essex-police-body-worn-video-bwv-contract/ [Accessed 5 April 2024].

ESSEX POLICE. no date. *a0901 Procedure* [Online]. Available: https://www.essex.police.uk/foi-ai/essex-police/our-policies-and-procedures/a/a0901-procedure---body-worn-video---operational-use-recording-and-the-evidential-process/ [Accessed 27 May 2024].

EUROPEAN PARLIAMENT 2016. Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data (United Kingdom General Data Protection Regulation).

FAN, M. D. 2017. Missing police body camera videos: Remedies, evidentiary fairness, and automatic activation. *Georgia Law Review,* 52**,** 57-108.

FAN, M. D. 2018a. Body cameras, big data, and police accountability. *Law & Social Inquiry,* 43**,** 1236–1256.

FAN, M. D. 2018b. Democratizing proof: Pooling public and police body-camera videos. *North Carolina Law Review,* 96**,** 1640-1680.

FAN, M. D. 2020. Privacy, public disclosure, and police-worn body camera footage. *In:* NEWELL, B. C. (ed.) *Police on camera: Surveillance, privacy, and accountability.* London: Routledge.

FENTON-O'CREEVY, M., MILLER, N., SELBY-FELL, H. & BOWLES, B. 2022. Policing uncertainty, decisions and actions in a national emergency: A report on a study of policing leadership and decision-making in the UK during the Covid-19 pandemic. Open University: Centre for Policing Research and Learning.

FLAMMER, I. 2016. Genteel wearables: Bystander-centered design. *IEEE Security & Privacy,* 14**,** 73-79.

FLEETWOOD, S. 2005. Ontology in organization and management studies: A critical realist perspective. *Organization,* 12**,** 197-222.

FLIGHT, S. 2019a. *Focus: Evaluatie pilot bodycams Politie Eenheid Amsterdam 2017-2018,* Den Haag and Amsterdam, Politie & Wetenschap and Sander Flight Onderzoek & Advies.

FLIGHT, S. 2019b. Opening up the black box: Understanding the impact of bodycams on policing. *European Law Enforcement Research Bulletin***,** 47-59.

FLIGHT, S. 2020. Taking off the blinders: A general framework to understand how bodycams work. *In:* NEWELL, B. C. (ed.) *Police on camera: Surveillance, privacy, and accountability.* London: Routledge.

FOX, J. C. & LUNDMAN, R. J. 1974. Problems and strategies in gaining research access in police organizations. *Criminology,* 12**,** 52-69.

FOX, N. J. & ALLDRED, P. 2014. The research-assemblage: a new materialist approach to social inquiry.

FOX, N. J. & ALLDRED, P. 2016. *Sociology and the new materialism: Theory, research, action*, Sage.

FOX, N. J. & ALLDRED, P. 2023. Applied research, diffractive methodology, and the research-assemblage: Challenges and opportunities. *Sociological Research Online,* 28**,** 93-109.

FRANSSEN, M., LOKHORST, G.-J. & VAN DE POEL, I. 2024. Philosophy of Technology (Fall 2024 Edition). *In:* ZALTA, E. N. & NODELMAN, U. (eds.) *The Stanford Encyclopedia of Philosophy*

GAUB, J. E., CHOATE, D. E., TODAK, N., KATZ, C. M. & WHITE, M. D. 2016. Officer perceptions of body-worn cameras before and after deployment: A study of three departments. *Police Quarterly,* 19**,** 275-302.

GIBSON, J. J. 2015. *The ecological approach to visual perception,* New York and London, Psychology Press.

GIDDENS, A. 1976. Classical social theory and the origins of modern sociology. *American Journal of Sociology,* 81**,** 703-729.

GIDDENS, A. 1979. *Central problems in social theory: Action, structure and contradiction in social analysis,* Berkeley, University of California Press.

GIDDENS, A. 1984. *The constitution of society: Outline of the theory of structuration,* Berkeley and Los Angeles, University of California Press.

GILLING, D. 2014. Reforming police governance in England and Wales: Managerialisation and the politics of organisational regime change. *Policing and Society,* 24**,** 81-101.

GOLDSMITH, A., HALSEY, M. & BRIGHT, D. 2022. Taking crime guns seriously: A socio-material perspective. *Criminology & Criminal Justice,* 22**,** 462-479.

GRANOT, Y., BALCETIS, E., FEIGENSON, N. & TYLER, T. 2018. In the eyes of the law: Perception versus reality in appraisals of video evidence. *Psychology, Public Policy, and Law,* 24**,** 93.

GREEN, C. W. & HURLEY, T. A. Technology use rationale and assimilation in the implementation of electronic data interchange. AMCIS 2005 Proceedings, 2005 Omaha. 1230-1239.

GROFF, E. R., HABERMAN, C. & WOOD, J. D. 2020. The effects of body-worn cameras on police-citizen encounters and police activity: Evaluation of a pilot implementation in Philadelphia, PA. *Journal of Experimental Criminology,* 16**,** 463-480.

GUZIK, K. 2020. Can we count on the police? Definitional issues in considering the promise of body-worn cameras to increase police accountability. *In:* NEWELL, B. C. (ed.) *Police on camera: Surveillance, privacy, and accountability.* London: Routledge.

GUZIK, K., SESAY, A., OH, O., RAMIREZ, R. & TONG, T. 2021. Making the material routine: A sociomaterial study of the relationship between police body worn cameras (BWCs) and organisational routines. *Policing and Society,* 31**,** 100-115.

HADJIMATHEOU, K. 2021. *Relationship between big tech and policing is shielded behind commercial confidentiality* [Online]. Available: https://theconversation.com/relationship-between-big-tech-and-policing-is-shielded-behind-commercial-confidentiality-its-a-problem-163958 [Accessed 6 June 2025].

HAGGERTY, K. D. & ERICSON, R. V. 2006. *The new politics of surveillance and visibility,* Toronto and London, University of Toronto Press.

HANSEN LÖFSTRAND, C. & BACKMAN, C. 2021. Control or protection? Work environment implications of police body-worn cameras. *New Technology, Work and Employment,* 36**,** 327-347.

HANSETH, O., AANESTAD, M. & BERG, M. 2004. Guest editors' introduction: Actor-network theory and information systems. What's so special? *Information Technology & People,* 17**,** 116-123.

HARAWAY, D. 1988. Situated knowledges: The science question in feminism and the privilege of partial perspective. *Feminist Studies,* 3**,** 575-599.

HARRIS, D. A. 2010. Picture this: Body-worn video devices (heads cams) as tools for ensuring fourth amendment compliance by police. *Texas Tech Law Review,* 43**,** 357-371.

HARRISON, S., TATAR, D. & SENGERS, P. The three paradigms of HCI. Alt. Chi. Session at the SIGCHI Conference on human factors in computing systems, 2007 San Jose. 1-18.

HENNE, K., SHORE, K. & HARB, J. I. 2022. Body-worn cameras, police violence and the politics of evidence: A case of ontological gerrymandering. *Critical Social Policy,* 42**,** 388-407.

HIKVISION. 2024. *Linux 4G Front-Facing Screen Body Camera* [Online]. Available: https://www.hikvision.com/mena-en/products/portable-products/portable-products/body-worn-camera-series/ds-mcw40b/ [Accessed 17 February 2025].

HIKVISION. no date. *Body-worn cameras* [Online]. Available: https://www.hikvision.com/en/products/portable-products/portable-products/body-worn-camera-series/ [Accessed 17 February 2025].

HIS MAJESTY'S INSPECTORATE OF CONSTABULARY AND FIRE & RESCUE SERVICES 2019. Inspection of the performance of Home Office police forces: HMICFRS's approach to inspection, including monitoring, force insight, inspection design and fieldwork.

HIS MAJESTY'S INSPECTORATE OF CONSTABULARY AND FIRE & RESCUE SERVICES 2021. Disproportionate use of police powers: A spotlight on stop and search and the use of force.

HIS MAJESTY'S INSPECTORATE OF CONSTABULARY AND FIRE & RESCUE SERVICES 2023a. Police performance: Getting a grip.

HIS MAJESTY'S INSPECTORATE OF CONSTABULARY AND FIRE & RESCUE SERVICES 2023b. State of policing: The annual assessment of policing in England and Wales 2022.

HIS MAJESTY'S INSPECTORATE OF CONSTABULARY AND FIRE & RESCUE SERVICES. no date-a. *Homepage* [Online]. Available: https://hmicfrs.justiceinspectorates.gov.uk/ [Accessed 23 June 2024].

HIS MAJESTY'S INSPECTORATE OF CONSTABULARY AND FIRE & RESCUE SERVICES. no date-b. *PEEL Assessments 2023–25* [Online]. Available: https://hmicfrs.justiceinspectorates.gov.uk/peel-reports-year/2023-25/ [Accessed 23 June 2024].

HOLDAWAY, S. 1980. The police station. *Urban Life,* 9**,** 79-100.

HOLZ, E. B. 2021. Sociomateriality and organizational analysis: From rhetoric to relevance. *Organizações & Sociedade,* 28**,** 241-264.

HOME OFFICE 2012. Definition of policing by consent: FOI release.

HOME OFFICE 2013. Surveillance camera code of practice.

HOME OFFICE. 2017. *Body worn video icons* [Online]. Available: https://www.gov.uk/government/publications/body-worn-video-bwv-icons [Accessed 20 June 2024].

HOME OFFICE 2021. Surveillance camera code of practice (Amended).

HOME OFFICE 2023. Draft community scrutiny framework: National guidance for community scrutiny panels.

HOME OFFICE & CLEVERLY, J. 2024. *Reforms to boost confidence in police accountability system* [Online]. Available: https://www.gov.uk/government/news/reforms-to-boost-confidence-in-police-accountability-system [Accessed 19 June 2024].

HOME OFFICE & INDEPENDENT POLICE COMPLAINTS COMMISSION. 2018. *Independent Office for Police Conduct launches* [Online]. Available: https://www.gov.uk/government/news/independent-office-for-police-conduct-launches-today [Accessed 5 April 2024].

HOUSE OF COMMONS 2008. Policing in the 21st century. *Seventh Report of Session 2007–08.* Home Affairs Committee.

HOUSE OF COMMONS 2021. Never again: The UK's responsibility to act on atrocities in Xinjiang and beyond. *Second Report of Session 2021–22.* Foreign Affairs Committee.

HUANG, K., BULLOUGH, J. D., BOYCE, P. R. & BIERMAN, A. 1999. Detection and identification of LED traffic signals by protan observers. *Transportation Research Board 82nd Annual Meeting.* Washington.

HUBKA, V. 1982. *Principles of engineering design,* London, Butterworth Scientific.

HULTIN, L. 2019. On becoming a sociomaterial researcher: Exploring epistemological practices grounded in a relational, performative ontology. *Information and Organization,* 29**,** 91-104.

HUMBERSIDE POLICE. no date. *Procurement* [Online]. Available: https://www.humberside.police.uk/police-forces/humberside-police/areas/about-us/about-us/procurement/ [Accessed 18 June 2024].

HUNG, V., BABIN, S. & COBERLY, J. 2016. A primer on body worn camera technologies. Maryland: Johns Hopkins University Applied Physics Laboratory.

IIDA, F. & NURZAMAN, S. G. 2016. Adaptation of sensor morphology: An integrative view of perception from biologically inspired robotics perspective. *Interface focus,* 6**,** 1-17.

INDEPENDENT OFFICE FOR POLICE CONDUCT. 2020a. *Investigation into police contact with a man* [Online]. Available: https://www.policeconduct.gov.uk/our-work/learning/investigation-police-contact-man-cleveland-police-december-2020 [Accessed 18 June 2024].

INDEPENDENT OFFICE FOR POLICE CONDUCT. 2020b. *Poplar incident to inform national recommendation on how police officers deal with potential medical emergencies* [Online]. Available: https://www.policeconduct.gov.uk/news/poplar-incident-inform-national-recommendation-how-police-officers-deal-potential-medical [Accessed 18 June 2024].

INDEPENDENT OFFICE FOR POLICE CONDUCT. 2021. *National recommendation* [Online]. Available: https://www.policeconduct.gov.uk/our-work/learning/national-recommendation-national-police-chiefs-council-april-2021 [Accessed 18 June 2024].

INDEPENDENT OFFICE FOR POLICE CONDUCT 2022a. National stop and search learning report.

INDEPENDENT OFFICE FOR POLICE CONDUCT. 2022b. *Stop and search, national recommendations* [Online]. Available: https://www.policeconduct.gov.uk/our-work/learning/stop-and-search-national-recommendations-april-2022 [Accessed 20 June 2024].

INDEPENDENT OFFICE FOR POLICE CONDUCT. 2023a. *Complaints raised after police contact with man* [Online]. Available: https://www.policeconduct.gov.uk/our-work/learning/complaints-raised-after-police-contact-man-greater-manchester-police-january-2022 [Accessed 18 June 2024].

INDEPENDENT OFFICE FOR POLICE CONDUCT. 2023b. *Man died after his detention and restraint by police* [Online]. Available: https://www.policeconduct.gov.uk/our-work/learning/man-died-after-his-detention-and-restraint-police-norfolk-constabulary-august [Accessed 18 June 2024].

INDEPENDENT OFFICE FOR POLICE CONDUCT. 2023c. *Police contact with man* [Online]. Available: https://www.policeconduct.gov.uk/our-work/learning/police-contact-man-staffordshire-police-service-june-2022 [Accessed 18 June 2024].

INDEPENDENT OFFICE FOR POLICE CONDUCT. no date. *Homepage* [Online]. Available: https://www.policeconduct.gov.uk/ [Accessed 18 June 2024].

INDEPENDENT POLICE COMMISSION 2013. Policing for a better Britain.

INDEPENDENT POLICE COMPLAINTS COMMISSION 2016. IPCC position statement on body worn video.

INFORMATION COMMISSIONER'S OFFICE. 2022. *Guidance on video surveillance (including CCTV)* [Online]. Available: https://webarchive.nationalarchives.gov.uk/ukgwa/20230601101156/https://ico.org.uk/for-organisations/uk-gdpr-guidance-and-resources/cctv-and-video-surveillance/guidance-on-video-surveillance-including-cctv/ [Accessed 15 February 2025].

INFORMATION COMMISSIONER'S OFFICE. 2023. *Body worn video* [Online]. Available: https://ico.org.uk/for-organisations/uk-gdpr-guidance-and-resources/cctv-and-video-surveillance/guidance-on-video-surveillance-including-cctv/additional-considerations-for-technologies-other-than-cctv/body-worn-video-bwv/#bwv [Accessed 19 June 2024].

INFORMATION COMMISSIONER'S OFFICE. no date-a. *A guide to subject access* [Online]. Available: https://ico.org.uk/for-organisations/uk-gdpr-guidance-and-resources/subject-access-requests/a-guide-to-subject-access/ [Accessed 23 June 2024].

INFORMATION COMMISSIONER'S OFFICE. no date-b. *Law enforcement* [Online]. Available: https://ico.org.uk/for-organisations/law-enforcement/ [Accessed 18 June 2024].

INSIDER. 2019. *Edesix parent company acquired by Motorola for £350m* [Online]. Available: https://www.insider.co.uk/news/edesix-vaas-international-holdings-motorola-13828895 [Accessed 5 April 2024].

INSIGHT. no date. *Policing solutions* [Online]. Available: https://uk.insight.com/en_GB/what-we-do/public-sector/police.html [Accessed 18 June 2024].

INTERNATIONAL ASSOCIATION OF CHIEFS OF POLICE 2014. Body-worn cameras: Concepts and issues paper. IACP National Law Enforcement Policy Center.

JACKSON, M. H., POOLE, M. S. & KUHN, T. 2002. The social construction of technology in studies of the workplace. *In:* LIEVROUW, L. A. & LIVINGSTONE, S. (eds.) *Handbook of new media: Social shaping and consequences of ICTs.* London: SAGE.

JONES, K. A., CROZIER, W. E. & STRANGE, D. 2018. Objectivity is a myth for you but not for me or police: A bias blind spot for viewing and remembering criminal events. *Psychology, Public Policy, and Law,* 24**,** 259–270.

JONES, K. A., TODD, T. L., STRANGE, D. & CHAUHAN, P. 2021. More than meets the eye: Officer actions and civilian behavioral health shape appraisals of police footage. *Psychology, Public Policy, and Law,* 27**,** 449-465.

JONES, R. 2020. Theorizing police body-worn cameras. *In:* NEWELL, B. C. (ed.) *Police on camera: Surveillance, privacy, and accountability.* London: Routledge.

JONES, R., HARRISON, M. & JONES, T. 2023. Policing and devolution in the UK: The 'special'case of Wales. *Policing,* 17**,** 1-13.

JONES, T. & NEWBURN, T. 2002. Learning from Uncle Sam? Exploring US influences on British crime control policy. *Governance,* 15**,** 97-119.

JUST VOICES. no date. *Keilon Hill* [Online]. Available: https://justvoicesia.org/stories/keilon-hill/ [Accessed 9 May 2024].

KAPLAN, D. M. (ed.) 2009. *Readings in the philosophy of technology,* Plymouth: Rowman & Littlefield Publishers.

KAPTELININ, V. & NARDI, B. A. 2006. *Acting with technology: Activity theory and interaction design,* Cambirdge, MIT press.

KASPERSKY. no date. *What is spear phishing?* [Online]. Available: https://www.kaspersky.co.uk/resource-center/definitions/spear-phishing [Accessed 20 June 2024].

KAUTZ, K. & JENSEN, T. B. 2013. Sociomateriality at the royal court of IS: A jester's monologue. *Information and Organization,* 23**,** 15-27.

KCCI DES MOINES. 2018. *Racial profiling or justified arrest? See video for yourself* [Online]. Available: https://www.kcci.com/article/see-full-video-of-alleged-wdm-racial-profiling-incident/25106271 [Accessed 9 May 2024].

KENT POLICE. no date. *Body worn video policy* [Online]. Available: https://www.kent.police.uk/foi-ai/kent-police/Policy/operational-partnerships/body-worn-video-policy-o47/ [Accessed 27 May 2024].

KERSTING, S., NAPLAVA, T., REUTEMANN, M., HEIL, M. & SCHEER-VESPER, C. 2019. Die deeskalierende Wirkung von Bodycams im Wachdienst der Polizei Nordrhein-Westfalen: Abschlussbericht. Gelsenkirchen: Institut für Polizei-und Kriminalwissenschaft der Fachhochschule für öffentliche Verwaltung NRW.

KOELLE, M., WOLF, K. & BOLL, S. Beyond LED status lights - Design requirements of privacy notices for body-worn cameras. Proceedings of the Twelfth International Conference on Tangible, Embedded, and Embodied Interaction, 2018 Stockholm. 177-187.

KOEN, M. C. 2016. *On-set with body-worn cameras in a police organization: Structures, practices, and technological frames.* Doctor of Philosophy, George Mason University.

KOEN, M. C. & WILLIS, J. J. 2020. Making sense of body-worn cameras in a police organization: A technological frames analysis. *Police Practice and Research,* 21**,** 351-367.

KOPER, C. S., LUM, C. & WILLIS, J. J. 2014. Optimizing the use of technology in policing: Results and implications from a multi-site study of the social, organizational, and behavioural aspects of implementing police technologies. *Policing,* 8**,** 212-221.

KORVA, N., BENNELL, C., LALUMIÈRE, M. L. & KARIMULLAH, M. 2022. What do you see? Understanding perceptions of police use of force videos as a function of the camera perspective. *Behavioral Sciences & the Law,* 40**,** 480-503.

KRASMANN, S. 2025. Agency. *In:* MAREILE, K. & HEIDI MORK, L. (eds.) *De Gruyter Handbook of Digital Criminology.* Berlin and Boston: De Gruyter.

KROES, P. 2009. Design methodology and the nature of technical artifacts. *In:* KAPLAN, D. M. (ed.) *Readings in the philosophy of technology.* Plymouth: Rowman & Littlefield Publishers.

KRUSE, U., KAUFMANN, J. M., SEIDEL, F. & SCHWEINBERGER, S. R. 2023. The de-escalating potential of body-worn cameras: Results from six German police departments. *Journal of Criminal Justice,* 88.

KYBA, C., MOHAR, A. & POSCH, T. 2017. How bright is moonlight? *Astronomy and Geophysics,* 58**,** 1.31-1.32.

LASSITER, G. D., DIAMOND, S. S., SCHMIDT, H. C. & ELEK, J. K. 2007. Evaluating videotaped confessions: Expertise provides no defense against the camera-perspective effect. *Psychological Science,* 18**,** 224-226.

LASSITER, G. D., GEERS, A. L., MUNHALL, P. J., PLOUTZ-SNYDER, R. J. & BREITENBECHER, D. L. 2002. Illusory causation: Why it occurs. *Psychological Science,* 13**,** 299-305.

LASSITER, G. D. & IRVINE, A. A. 1986. Videotaped confessions: The impact of camera point of view on judgments of coercion. *Journal of Applied Social Psychology,* 16**,** 268-276.

LASSITER, G. D., WARE, L. J., RATCLIFF, J. J. & IRVIN, C. R. 2009. Evidence of the camera perspective bias in authentic videotaped interrogations: Implications for emerging reform in the criminal justice system. *Legal and Criminological Psychology,* 14**,** 157-170.

LATOUR, B. 1990. Technology is society made durable. *The Sociological Review,* 38**,** 103-131.

LATOUR, B. 2005. *Reassembling the social: An introduction to actor-network-theory,* Oxford, Oxford University Press.

LAW, J. 2009. Actor network theory and material semiotics. *In:* TURNER, B. S. (ed.) *The new Blackwell Companion to social theory.* Chichester: Blackwell Publishing.

LAWRENCE, D. S., MCCLURE, D., MALM, A., LYNCH, M. & LA VIGNE, N. 2019. Activation of body-worn cameras: Variation by officer, over time, and by policing activity. *Criminal Justice Review,* 44**,** 339-355.

LEE, S. & KIM, S. H. 2006. A lag effect of it investment on firm performance. *Information Resources Management Journal,* 19**,** 43-69.

LENTZ, S. A. & CHAIRES, R. H. 2007. The invention of Peel's principles: A study of policing 'textbook' history. *Journal of Criminal Justice,* 35**,** 69-79.

LEONARDI, P. M. 2012. Materiality, sociomateriality, and socio-technical systems: What do these terms mean? How are they different? Do we need them? *In:* LEONARDI, P. M., NARDI, B. A. & KALLINIKOS, J. (eds.) *Materiality and organizing: Social interaction in a technological world.* Oxford: Oxford University Press.

LEONARDI, P. M. 2013. Theoretical foundations for the study of sociomateriality. *Information and Organization,* 23**,** 59-76.

LEONARDI, P. M., NARDI, B. A. & KALLINIKOS, J. (eds.) 2012. *Materiality and organizing: Social interaction in a technological world,* Oxford: Oxford University Press.

LEY, D. 1992. Qualitative methods: reshaping a tradition. *Journal of Geography in Higher Education,* 16**,** 167-170.

LIBERMAN-PINCU, E. & BITAN, Y. 2021. FULE—Functionality, usability, look-and-feel and evaluation novel user-centered product design methodology—Illustrated in the case of an autonomous medical device. *Applied Sciences,* 11**,** 985.

LINDER, T. 2019. Surveillance capitalism and platform policing: The surveillant assemblage-as-a-service. *Surveillance & Society,* 17**,** 76-82.

LOSCHKY, L. C., NUTHMANN, A., FORTENBAUGH, F. C. & LEVI, D. M. 2017. Scene perception from central to peripheral vision. *Journal of Vision,* 17**,** 6-10.

LOVEDAY, B. 2018. Police and Crime Commissioners: Developing and sustaining a new model of police governance in England and Wales. *International Journal of Police Science & Management,* 20**,** 28-37.

LUM, C., KOPER, C. S., MEROLA, L., SCHERER, A. & REIOUX, A. 2015. Existing and ongoing body worn camera research: Knowledge gaps and opportunities. Fairfax: Center for Evidence-Based Crime Policy, George Mason University.

LUM, C., KOPER, C. S., WILSON, D. B., STOLTZ, M., GOODIER, M., EGGINS, E., HIGGINSON, A. & MAZEROLLE, L. 2020. Body-worn cameras' effects on police officers and citizen behavior: A systematic review. *Campbell Systematic Review,* 16.

LUM, C., STOLTZ, M., KOPER, C. S. & SCHERER, J. A. 2019. Research on body-worn cameras. *Criminology & Public Policy,* 18**,** 93-118.

LUNDMAN, R. J. & FOX, J. C. 1978. Problems and strategies in gaining research access in police organisations. *Criminology,* 12**,** 52-69.

MAC GIOLLABHUÍ, S., GOOLD, B. & LOFTUS, B. 2016. Watching the watchers: Conducting ethnographic research on covert police investigation in the United Kingdom. *Qualitative Research,* 16**,** 630-645.

MACLENNAN-BROWN, K. & COHEN, N. 2020. Digital imaging and multimedia procedure (v3.0). *In:* LABORATORY, D. S. A. T. (ed.). National Police Chiefs' Council.

MAISTRELLO, G., TOOLE, H., ADAMS, A., WHITMORE, M., HOCKING, L., PHILLIPS, W. & LING, T. 2024. Evaluation of the use and impact of body-worn cameras in the NHS England ambulance sector: Final report. RAND Europe.

MALM, A. E. & WHITE, M. D. 2020. *Cops, cameras, and crisis: The potential and the perils of police body-worn cameras,* New York, New York University Press.

MANNING, P. K. 1992. Information technologies and the police. *Crime and Justice,* 15**,** 349-398.

MANNING, P. K. 2008. *The technology of policing: Crime mapping, information technology, and the rationality of crime control,* New York and London, New York University Press.

MARDONES-BRAVO, D. 2022. Online methods in qualitative criminology. *In:* FARIA, R. & DODGE, M. (eds.) *Qualitative research in criminology: Cutting-edge methods.* Cham: Springer.

MAREILE, K. & HEIDI MORK, L. (eds.) 2025. *De Gruyter Handbook of Digital Criminology,* Berlin and Boston: De Gruyter.

MASS TRANSIT. 2011. *Reveal Media launches RS3-SX* [Online]. Available: https://www.masstransitmag.com/safety-security/press-release/10362984/reveal-media-reveal-media-launches-rs3-sx-next-generation-body-worn-camera-system [Accessed 17 February 2025].

MCCLUSKEY, J. D. & UCHIDA, C. D. 2023. Video data analysis and police body-worn camera footage. *Sociological Methods & Research,* 52**,** 1120-1154.

MELVILLE LEE, W. L. 1901. *A history of police in England,* London, Methuen and Co.

METROPOLITAN POLICE. 2024. *Information on Axon body worn cameras* [Online]. Available: https://www.met.police.uk/foi-ai/metropolitan-police/disclosure-2024/april-2024/information-axon-body-worn-cameras/ [Accessed 18 June 2024].

METROPOLITAN POLICE. no date-a. *Facial recognition technology* [Online]. Available: https://www.met.police.uk/police-forces/metropolitan-police/areas/about-us/about-the-met/facial-recognition-technology/ [Accessed 29 September 2024].

METROPOLITAN POLICE. no date-b. *Police encounter panels* [Online]. Available: https://www.met.police.uk/police-forces/metropolitan-police/areas/about-us/about-the-met/pep/police-encounter-panels/ [Accessed 27 May 2024].

MILLER, L., TOLIVER, J. & POLICE EXECUTIVE RESEARCH FORUM. 2014. Implementing a body-worn camera program: Recommendations and lessons learned. Washington, DC: Office of Community Oriented Policing Services.

MILOVANOVIC, D. 2022. Ontological shift in classical criminology: Engagement with the new sciences. *Critical Criminology,* 30**,** 621-663.

MINISTRY OF HOUSING COMMUNITIES AND LOCAL GOVERNMENT, SCOTLAND OFFICE, NORTHERN IRELAND OFFICE, WALES OFFICE, CABINET OFFICE, OFFICE OF THE SECRETARY OF STATE FOR SCOTLAND, OFFICE OF THE SECRETARY OF STATE FOR WALES & DEPARTMENT FOR LEVELLING UP HOUSING AND COMMUNITIES 2013a. Devolution of powers to Scotland, Wales and Northern Ireland.

MINISTRY OF HOUSING COMMUNITIES AND LOCAL GOVERNMENT, SCOTLAND OFFICE, NORTHERN IRELAND OFFICE, WALES OFFICE, CABINET OFFICE, OFFICE OF THE SECRETARY OF STATE FOR SCOTLAND, OFFICE OF THE SECRETARY OF STATE FOR WALES & DEPARTMENT FOR LEVELLING UP HOUSING AND COMMUNITIES 2013b. Devolution: Factsheet.

MIRANDA, D. 2022. Body-worn cameras 'on the move': Exploring the contextual, technical and ethical challenges in policing practice. *Policing and Society,* 32**,** 18-34.

MOTOROLA SOLUTIONS. 2018a. *Motorola Solutions to acquire Avigilon, leader in advanced video surveillance and analytics* [Online]. Available: https://www.motorolasolutions.com/newsroom/press-releases/motorola-solutions-to-acquire-avigilon-leader-in-advanced-video-surveillanc.html [Accessed 5 April 2024].

MOTOROLA SOLUTIONS. 2018b. *Si500 video speaker microphone* [Online]. Available: https://www.motorolasolutions.com/content/dam/msi/docs/products/police-cameras/si500/si500-specifications-english-global.pdf [Accessed 5 April 2024].

MOTOROLA SOLUTIONS. 2019. *Motorola Solutions expands video security portfolio to support South African crime-fighting* [Online]. Available: https://www.motorolasolutions.com/newsroom/press-releases/motorola-solutions-expands-video-security-portfolio-to-support-south-africa.html [Accessed 5 April 2024].

MOTOROLA SOLUTIONS. 2021a. *Motorola Solutions reports third-quarter 2021 financial results* [Online]. Available: https://www.motorolasolutions.com/content/dam/msi/investors/doc_financials/2021/q3/msi-q3-2021-earnings-press-release-and-financial-tables--1-.pdf [Accessed 20 October 2025].

MOTOROLA SOLUTIONS. 2021b. *V300 body-worn camera user guide* [Online]. Available: https://usermanual.wiki/m/2305b5d5e0e70aeac11c0f24956d0c05689ea11ae21fbfad724ddca89d5c7f21_optim.pdf [Accessed 23 October 2025].

MOTOROLA SOLUTIONS. 2022a. *V300 user interface guide* [Online]. Available: https://www.motorolasolutions.com/content/dam/msi/docs/products/body-worn-cameras/v300_how-to-guide.pdf [Accessed 23 October 2025].

MOTOROLA SOLUTIONS. 2022b. *VB400 body camera* [Online]. Available: https://web.archive.org/web/20230608063802/https://www.motorolasolutions.com/content/dam/msi/docs/products/body-worn-cameras/vb400-brochure_law-enforcement_nam.pdf [Accessed 31 July 2024].

MOTOROLA SOLUTIONS. 2023a. *Holster Aware* [Online]. Available: https://www.motorolasolutions.com/content/dam/msi/docs/products/body-worn-cameras/v300-holster-aware-brochure.pdf [Accessed 5 April 2024].

MOTOROLA SOLUTIONS. 2023b. *Livestream body-worn video* [Online]. Available: https://www.motorolasolutions.com/content/dam/msi/docs/products/body-worn-cameras/aware_for_streaming_v700_datasheet.pdf [Accessed 5 April 2024].

MOTOROLA SOLUTIONS. 2023c. *Motorola Solutions unveils new Avigilon security suite, introduces Avigilon Alta cloud and Avigilon Unity on-premise* [Online]. Available: https://www.motorolasolutions.com/newsroom/press-releases/avigilon-security-suite.html [Accessed 31 July 2024].

MOTOROLA SOLUTIONS. 2023d. *V300* [Online]. Available: https://www.motorolasolutions.com/content/dam/msi/docs/products/body-worn-cameras/v300-brochure.pdf [Accessed 26 November 2024].

MOTOROLA SOLUTIONS. 2023e. *V500 body camera* [Online]. Available: https://www.motorolasolutions.com/content/dam/msi/docs/products/body-worn-cameras/v500/v500-brochure_eng.pdf [Accessed 5 April 2024].

MOTOROLA SOLUTIONS. 2025a. *CommandCentral Aware* [Online]. Available: https://www.motorolasolutions.com/content/dam/msi/docs/global-software/commandcentral-aware/cc_aware_brochure_web.pdf [Accessed 23 October 2025].

MOTOROLA SOLUTIONS. 2025b. *VB400 body camera quick start guide* [Online]. Available: https://www.motorolasolutions.com/content/dam/msi/docs/EA_Collaterals/ENGLISH/bwc/vb400/anz/ED-006-021-AB_enus_VB400_Body_Camera_Quick_Start_Guide.pdf [Accessed 23 October 2025].

MOTOROLA SOLUTIONS. no date-a. *Body cameras for police and security* [Online]. Available: https://www.motorolasolutions.com/en_xu/video-security-access-control/body-worn-cameras.html [Accessed 31 July 2024].

MOTOROLA SOLUTIONS. no date-b. *BWC evaluation* [Online]. Available: https://namrinfo.motorolasolutions.com/bwc-evaluation [Accessed 31 July 2024].

MOTOROLA SOLUTIONS. no date-c. *Police body cameras* [Online]. Available: https://www.motorolasolutions.com/en_us/video-security-access-control/body-worn-cameras/police.html [Accessed 31 July 2024].

MOTOROLA SOLUTIONS. no date-d. *Video analytics* [Online]. Available: https://www.motorolasolutions.com/en_us/solutions/ai-video-analytics.html [Accessed 5 April 2024].

MOTOROLA SOLUTIONS. no date-e. *Video analytics and artificial intelligence* [Online]. Available: https://www.motorolasolutions.com/en_xl/video-security-access-control/video-analysis-artificial-intelligence.html [Accessed 14 February 2025].

MURPHY, P., ECKERSLEY, P. & FERRY, L. 2017. Accountability and transparency: Police forces in England and Wales. *Public Policy and Administration,* 32**,** 197-213.

MURRIA, S. R. 2023. *In pursuit of a 'good' stop and search in the era of body-worn videos.* Doctor of Philosophy, University of Warwick.

MUTCH, A. 2010. Technology, organization, and structure—A morphogenetic approach. *Organization Science,* 21**,** 507-520.

MUTCH, A. 2013. Sociomateriality — Taking the wrong turning? *Information and Organization,* 23**,** 28-40.

NATIONAL POLICE CHIEFS' COUNCIL 2020. Advice to assist decision making on the public release of Body Worn Video (BWV) footage.

NATIONAL POLICE CHIEFS' COUNCIL 2021. National digital and physical evidence retention guidance.

NATIONAL POLICE CHIEFS' COUNCIL 2022. Body-worn video.

NATIONAL POLICE CHIEFS' COUNCIL 2023. Body worn video (v2.0).

NATIONAL POLICE CHIEFS' COUNCIL 2024a. Body-worn video guidance.

NATIONAL POLICE CHIEFS' COUNCIL 2024b. Strategic Plan 2021 - 2025.

NATIONAL POLICE CHIEFS' COUNCIL no date. Policing vision 2025.

NATIONAL POLICE CHIEFS' COUNCIL & COLLEGE OF POLICING 2022. Police Race Action Plan: Improving policing for Black people.

NATIONAL POLICING IMPROVEMENT AGENCY. 2007. Practice advice on police use of digital images. Association of Chief Police Officers.

NBC NEWS. 2007. *Britain straps video cameras to police helmets* [Online]. Available: https://www.nbcnews.com/id/wbna19750278# [Accessed 14 January 2025].

NBC NEWS. 2017. *Bodycam footage shows police officer shooting photographer after mistaking his camera for a gun* [Online]. Available: https://www.nbcnews.com/video/ohio-police-officer-shoots-photographer-after-mistaking-camera-for-gun-1041721411606 [Accessed 9 August 2024].

NEWELL, B. C. (ed.) 2020. *Police on camera: Surveillance, privacy, and accountability,* London: Routledge.

NEWELL, B. C. 2021. *Police visibility: Privacy, surveillance, and the false promise of body-worn cameras*, University of California Press.

NHS ENGLAND. 2021. *NHS roll out of body cams in boost to ambulance crews safety* [Online]. Available: https://www.england.nhs.uk/2021/06/nhs-roll-out-of-body-cams-in-boost-to-ambulance-crews-safety/ [Accessed 24 September 2024].

NHS ENGLAND. no date. *Violence prevention and reduction* [Online]. Available: https://www.england.nhs.uk/supporting-our-nhs-people/health-and-wellbeing-programmes/violence-prevention-and-safety/ [Accessed 19 June 2024].

NOAKS, L. & WINCUP, E. 2004. *Criminological Research,* London, SAGE Publications.

NORTCLIFFE, T. 2018a. Safeguarding body worn video data (v2.0). Home Office.

NORTCLIFFE, T. 2018b. Technical guidance for body worn video devices (v2.0). Home Office.

NOTTINGHAMSHIRE POLICE. 2025. *Body worn video policy* [Online]. Available: https://www.nottinghamshire.police.uk/foi-ai/nottinghamshire-police/publication/our-policies-and-procedures/human-resources/body-worn-video-policy-ps-306/ [Accessed 17 February 2025].

NOTTINGHAMSHIRE POLICE AND CRIME COMMISSIONER. 2023. *Notice of decision* [Online]. Available: https://www.nottinghamshire.pcc.police.uk/Document-Library/Public-Information/Decisions/2023/2023.050-REDACTED-Decision-Record-Body-Worn-Video-Replacement.pdf [Accessed 14 February 2025].

O'BRIEN, E. & WILSON, M. 2014. Clinton, Bush, and Obama: Changing policy and rhetoric in the United States Annual Trafficking in Persons Report. *In:* DRAGIEWICZ, M. (ed.) *Global human trafficking: Critical issues and contexts.* London: Routledge.

O'NEILL, M., CLAYTON, E., ANDREWS, W., ASTON, L., WELLS, H. & BRADFORD, B. 2024. Body-worn video and interactions with the public: Who does it benefit and how is it used? *INTERACT.*

OFFICE OF PROFESSIONAL STANDARDS 2024. Final investigative report : IA 2023 - 031

OFFICER. 2024. *What's the smell of stupid?* [Online]. Available: https://web.archive.org/web/20241227003920/https://www.officer.com/on-the-street/body-cameras/video/55249993/whats-the-smell-of-stupid-wanted-mans-cologne-tips-off-atlanta-police [Accessed 17 February 2025].

ORLIKOWSKI, W. J. 1992. The duality of technology: Rethinking the concept of technology in organizations. *Organization Science,* 3**,** 398-427.

ORLIKOWSKI, W. J. 2000. Using technology and constituting structures: A practice lens for studying technology in organizations. *Organization science,* 11**,** 404-428.

ORLIKOWSKI, W. J. & GASH, D. C. 1994. Technological frames: Making sense of information technology in organizations. *ACM Transactions on Information Systems,* 12**,** 174–207.

ORLIKOWSKI, W. J. & IACONO, C. S. 2001. Research commentary: Desperately seeking the "IT" in IT research—A call to theorizing the IT artifact. *Information Systems Research,* 12**,** 121-134.

ORLIKOWSKI, W. J. & SCOTT, S. V. 2008. Sociomateriality: Challenging the Separation of Technology, Work and Organization. *Academy of Management Annals,* 2**,** 433-474.

PACKMOHR, S. 2021. A call for more sociomateriality and its usage in research on digital transformation. *14th IADIS International Conference Information Systems.*

PARKHURST, J. 2016. *The politics of evidence: From evidence-based policy to the good governance of evidence,* London, Routledge.

PARLIAMENT OF THE UNITED KINGDOM 1984. Police and Criminal Evidence Act.

PARLIAMENT OF THE UNITED KINGDOM 1998. Scotland Act.

PARLIAMENT OF THE UNITED KINGDOM 2000. Freedom of Information Act.

PARLIAMENT OF THE UNITED KINGDOM 2012. Protection of Freedoms Act.

PARLIAMENT OF THE UNITED KINGDOM 2018. Data Protection Act.

PASMORE, W. A., FRANCIS, C., HALDEMAN, J. & SHANI, A. 1982. Sociotechnical systems: A North American reflection on empirical studies of the seventies. *Human Relations,* 35**,** 1179-1204.

PAULHUS, D. L. 1984. Two-component models of socially desirable responding. *Journal of Personality and Social Psychology,* 46**,** 598-609.

PEZDEK, K., SHAPLAND, T. & BARRAGAN, J. 2022. Memory outcomes of police officers viewing their body-worn camera video. *Journal of Applied Research in Memory and Cognition,* 11**,** 392-404.

PICKERING, A. 1995. *The mangle of practice: Time, agency, and science,* Chicago and London, University of Chicago Press.

PLYMOUTHLIVE. 2020. *How Devon and Cornwall Police body worn video is making life safer for everyone* [Online]. Available: https://www.plymouthherald.co.uk/news/plymouth-news/police-bodyworn-video-camera-bwv-4437226 [Accessed 31 May 2024].

POIRIER, B., COLLIN-SANTERRE, J. & BOIVIN, R. 2022. Body-worn camera footage in the news: An experimental study of the impact of perspective and framing on viewer perception. *Canadian Journal of Criminology and Criminal Justice,* 64**,** 82-98.

POLICE1. 2017. *Reveal's new D5 body camera provides advanced functionality* [Online]. Available: https://www.police1.com/police-products/body-cameras/articles/reveals-new-d5-body-camera-provides-advanced-functionality-CfcwJEIk4iqxBK5Y/ [Accessed 12 October 2025].

POLICE1. 2021. *How your body-worn camera system can improve situational awareness and enhance officer safety* [Online]. Available: https://www.police1.com/police-products/body-cameras/articles/how-your-body-worn-camera-system-can-improve-situational-awareness-and-enhance-officer-safety-PSAxUdH01qxpveyB/ [Accessed 20 June 2024].

POLICE1. 2024a. *How AI analysis of police bodycam video can identify best policing practices* [Online]. Available: https://www.police1.com/police-products/firearms/accessories/ammunition/how-ai-analysis-of-police-bodycam-video-can-identify-best-policing-practices [Accessed 5 April 2024].

POLICE1. 2024b. *Uncovering the hidden distortions in body-worn camera footage* [Online].
Available: https://www.police1.com/officer-safety/uncovering-the-hidden-distortions-in-body-worn-camera-footage [Accessed 30 May 2025].

POLICE AND CRIME STANDARDS DIRECTORATE 2007. Guidance for the police use of body-worn video devices. Home Office.

POLICE DIGITAL SERVICE 2020. National policing digital strategy 2020-2030.

POLICE FEDERATION. 2024. *Challenges faced by police demand urgent attention and reform* [Online]. Available: https://www.polfed.org/news/latest-news/2024/challenges-faced-by-police-demand-urgent-attention-and-reform/ [Accessed 19 February 2025].

POLICE OMBUDSMAN FOR NORTHERN IRELAND. 2024. *Management action taken against 74 police officers* [Online]. Available: https://www.policeombudsman.org/news/police-ombudsman-investigation-results-in-management-action-against-74-police-officers-who-inappropr [Accessed 14 February 2025].

POLICE PROFESSIONAL. 2022. *West Midlands Police first force to live-stream body-worn camera footage* [Online]. Available: https://policeprofessional.com/news/west-midlands-police-first-force-to-live-stream-body-worn-camera-footage/ [Accessed 9 May 2024].

POLICE PROFESSIONAL. 2023. *West Midlands Police trials next-generation BWV camera* [Online]. Available: https://policeprofessional.com/news/west-midlands-police-trials-next-generation-bwv-camera/ [Accessed 9 May 2024].

POLIS SOLUTIONS. 2024. *TrustStat* [Online]. Available: https://www.polis-solutions.ai/services/truststat [Accessed 17 February 2025].

POLIT, D. F. & BECK, C. T. 2010. Generalization in quantitative and qualitative research: Myths and strategies. *International Journal of Nursing Studies,* 47**,** 1451-1458.

POLLOCK, T. G. & BONO, J. E. 2013. Being Scheherazade: The importance of storytelling in academic writing. 56**,** 629-634.

PRODUCTIVITY COMMISSION 2010. Inquiry report: Gambling.

RADIO COMMZ. no date. *Critical View* [Online]. Available: https://radiocommz.co.uk/critical-view/ [Accessed 31 July 2024].

RANKIN, L. 2013. End of program evaluation and recommendations: On-officer body camera system. Mesa Police Department.

RAPLEY, T. 2014. Sampling strategies in qualitative research. *In:* FLICK, U. (ed.) *The SAGE handbook of qualitative data analysis.*

REITH, C. 1956. *A new study of police history,* London, Oliver and Boyd.

REUTERS. 2023. *UK's House of Commons backs blocking Chinese cameras from government sites* [Online]. Available: https://www.reuters.com/world/uk/uks-house-commons-backs-blocking-chinese-cameras-govt-sites-2023-09-13/ [Accessed 9 May 2024].

REVEAL. 2021a. *AI* [Online]. Available: https://web.archive.org/web/20240806232648/https://www.revealmedia.co.uk/ai [Accessed 5 April 2024].

REVEAL 2021b. D-series K-series DEMS360.

REVEAL. 2021c. *On-premises considerations & pre-requisites* [Online]. Available: https://revealmedia.ams3.digitaloceanspaces.com/RVL1083-DEMS-360-V6-ON-PREMISES-Considerations-Pre-Reqs-v1.5-4.pdf [Accessed 17 February 2025].

REVEAL. 2025. *D-Series* [Online]. Available: https://www.revealmedia.co.uk/products/d-series [Accessed 23 October 2025].

REVEAL. no date-a. *The benefits of body cameras with front-facing screens* [Online]. Available: https://www.revealmedia.com/articles/body-cameras-with-front-facing-screens [Accessed 23 October 2025].

REVEAL. no date-b. *Body worn video* [Online]. Available: https://www.revealmedia.co.uk/about-us/body-worn-video [Accessed 31 July 2024].

REVEAL. no date-c. *D5 Body camera live streaming* [Online]. Available: https://www.revealmedia.co.uk/d5-body-camera-live-streaming [Accessed 5 April 2024].

REVEAL. no date-d. *D-Series operation* [Online]. Available: https://www.revealmedia.com/product-documentation [Accessed 23 October 2025].

REVEAL. no date-e. *Devon and Cornwall Police deploy Reveal body cameras to officers* [Online]. Available: https://www.revealmedia.co.uk/articles/devon-and-cornwall-police-deploy-reveal-body-cameras-to-officers [Accessed 5 April 2024].

REVEAL. no date-f. *The evolution of Police use of body-worn cameras* [Online]. Available: https://www.revealmedia.co.uk/articles/the-evolution-of-police-use-of-body-worn-cameras-from-evidence-capture-to-live-support [Accessed 12 October 2025].

REVEAL. no date-g. *High-performance police body cameras* [Online]. Available: https://www.revealmedia.co.uk/industries/police-body-cameras [Accessed 23 October 2025].

REVEAL. no date-h. *K-Series operation* [Online]. Available: https://www.revealmedia.com/product-documentation [Accessed 23 October 2025].

REVEAL. no date-i. *Live facial recognition trial launched with GO! Southampton* [Online]. Available: https://www.revealmedia.com/aus/articles/facial-recognition-body-camera-trial-southampton [Accessed 17 February 2025].

REVEAL. no date-j. *Performance body cameras for security* [Online]. Available: https://www.revealmedia.co.uk/industries/body-cameras-in-security [Accessed 5 April 2024].

ROBERT, D. & DUFRESNE, M. 2016. *Actor-network theory and crime studies: Explorations in science and technology,* London and New York, Routledge.

ROBERTS, K. H. & GRABOWSKI, M. 1999. Organizations, technology and structuring. *In:* CLEGG, S. R., HARDY, C. & NORD, W. R. (eds.) *Managing organizations: Current issues.* London: SAGE Publications.

ROCHESTER INSTITUTE OF TECHNOLOGY. 2023. *RIT scientists developing machine-learning techniques to analyze body-worn camera footage* [Online]. Available: https://www.rit.edu/news/rit-scientists-developing-machine-learning-techniques-analyze-body-worn-camera-footage [Accessed 5 April 2024].

ROGERS, E. M. 2003. *Diffusion of innovations,* New York, Free Press.

ROJEK, J., MARTIN, P. & ALPERT, G. P. 2014. *Developing and maintaining police-researcher partnerships to facilitate research use: A comparative analysis,* New York, Springer.

ROSENHOLTZ, R. 2016. Capabilities and limitations of peripheral vision. *Annual Review of Vision Science,* 2**,** 437-457.

ROULSTON, K. 2014. Analysing interviews. *In:* FLICK, U. (ed.) *The SAGE handbook of qualitative data analysis.*

SAMPSON, F. 2012. Hail to the chief?—How far does the introduction of elected Police Commissioners herald a US-style politicization of policing for the UK? *Policing: A Journal of Policy and Practice,* 6**,** 4-15.

SANDHU, A. & HAGGERTY, K. D. 2017. Policing on camera. *Theoretical Criminology,* 21**,** 78-95.

SANDHU, A. & SIMMONS, J. S. 2022. Police officers as filmmakers: The cinematography of body worn cameras. *Policing and Society,* 33**,** 593-603.

SCHREUDER, D. A. 1981. Standardization of light signals for road traffic control. *Transportation research record,* 811**,** 14-15.

SCOTT, K. B. 2013. A single police force for Scotland: The legislative framework (1). *Policing,* 7**,** 135-141.

SCOTT, S. V. & ORLIKOWSKI, W. J. 2013. Sociomateriality — taking the wrong turning? A response to Mutch. *Information and Organization,* 23**,** 77-80.

SCOTTISH PARLIAMENT 2012. Police and Fire Reform (Scotland) Act

SEGRAVE, M. & MILIVOJEVIC, S. 2019. Using in-depth interviewing and documentary analysis in criminological research. *In:* DAVIES, P. & FRANCIS, P. (eds.) *Doing criminological research.* 3rd ed. London: SAGE Publications.

SESAY, A., RAMIREZ, R. & OH, O.-O. 2017. Digital transformation in police work: A sociomaterial perspective on police body worn cameras (BWC). *Proceedings of the 50th Hawaii International Conference on System Sciences.*

SOUSA, W. H., COLDREN, J. R., RODRIGUEZ, D. & BRAGA, A. A. 2016. Research on body worn cameras: Meeting the challenges of police operations, program implementation, and randomized controlled trial designs. *Police Quarterly,* 19**,** 363-384.

SOUTH WALES POLICE. 2022. *Is there a legitimate role for facial recognition in policing and law enforcement?* [Online]. Available: https://www.south-wales.police.uk/news/south-wales/news/2022/meh-jun/facial-recognition-technology-testimony/ [Accessed 29 September 2024].

ST. PIERRE, E. A. 2011. Post qualitative research: The critique and the coming after. *In:* DENZIN, N. K. & LINCOLN, Y. S. (eds.) *The Sage Handbook of Qualitative Research.* 4th ed. Thousand Oaks: SAGE Publications.

STENNING, P. C. 1995. Introduction. *In:* STENNING, P. C. (ed.) *Accountability for criminal justice.* Toronto: University of Toronto Press.

STOUGHTON, S. W. 2018. Police body-worn cameras. *North Carolina Law Review,* 96**,** 1363-1423.

SUBLETTE, C. 2019. *Section 4.0 Engineering and Design of Nuclear Weapons* [Online]. Nuclear Weapon Archive. Available: https://nuclearweaponarchive.org/Nwfaq/Nfaq4.html [Accessed].

SUOZZO, M., BORG, N., FRERING, D., LUCAS, M. & VRABEL, P. 2000. LED traffic lights: Signaling a global transformation. *Proceedings American Council for an Energy Efficient Economy Summer Study on Energy Efficiency in Buildings* American Council for an Energy-Efficient Economy.

SURVEILLANCE CAMERA COMMISSIONER 2014. Body worn video: Perspectives from the Surveillance Camera Commissioner. Surveillance Camera Commissioner's Office.,.

SURVEILLANCE CAMERA COMMISSIONER 2016. National surveillance camera strategy.

SUSS, J. & PETUSHEK, E. 2021. Head, shoulders, chest: Does mounting location affect visibility of key information in police bodyworn-camera footage? *Criminologie,* 54**,** 97-133.

SUSS, J., RAUSHEL, A., ARMIJO, A. & WHITE, B. 2018. Design Considerations in the Proliferation of Police Body-Worn Cameras. *Ergonomics in Design,* 26**,** 17-22.

SUTHERLAND, A., ARIEL, B., FARRAR, W. & DE ANDA, R. 2017. Post-experimental follow-ups— Fade-out versus persistence effects: The Rialto police body-worn camera experiment four years on. *Journal of Criminal Justice,* 53**,** 110-116.

TAYLOR, E. & LEE, M. 2019. Off the record? Arrestee concerns about the manipulation, modification, and misrepresentation of police body-worn camera footage. *Surveillance and Society,* 17**,** 473-483.

TERPSTRA, B., WHITE, M. D., MALM, A., GAUB, J. E. & UCHIDA, C. 2022. An examination of body-worn camera digital evidence management (DEM) strategies. Justice & Security Strategies and Arizona State University.

THE GUARDIAN. 2020. *This is not a gun* [Online]. Available: https://www.theguardian.com/artanddesign/2020/dec/07/this-is-not-a-gun-cara-levine-interview-objects-police-mistook-for-weapons [Accessed 9 August 2024].

THE I PAPER. 2024. *UK police using Chinese-made body-cameras to surveil the British public* [Online]. Available: https://inews.co.uk/news/world/uk-police-chinese-made-body-cameras-spying-3044235 [Accessed 20 June 2024].

THE INDEPENDENT. 2021. *Bodycam footage shows Virginia police shot man multiple times after mistaking phone for a gun* [Online]. Available: https://www.independent.co.uk/news/world/americas/virginia-police-shooting-phone-gun-b1836993.html [Accessed 9 August 2024].

THE INDEPENDENT. 2025. *Warnings that police £1.2bn funding shortfall will continue to grow* [Online]. Available: https://www.independent.co.uk/news/uk/home-news/chancellor-government-england-wales-police-b2768108.html [Accessed 23 October 2025].

THE NEW YORK TIMES MAGAZINE. 2023. *Police body cameras* [Online]. Available: https://www.nytimes.com/2023/12/13/magazine/police-body-cameras-miguel-richards.html [Accessed 31 May 2024].

TIME. 2014. *Obama requests funds for police body cameras to address 'simmering distrust' after Ferguson* [Online]. Available: https://time.com/3613058/obama-ferguson-police-body-cameras-funding/ [Accessed 20 June 2024].

TRIST, E. L. & BAMFORTH, K. W. 1951. Some social and psychological consequences of the longwall method of coal-getting: An examination of the psychological situation and

defences of a work group in relation to the social structure and technological content of the work system. *Human Relations,* 4**,** 3-38.

TRULEO. 2025. *AI analyst for command* [Online]. Available: https://truleo.co/for-command [Accessed 19 October 2025].

TUNÇALP, D. 2016. Questioning the ontology of sociomateriality: a critical realist perspective. *Management Decision,* 54**,** 1073-1087.

U.S. DEPARTMENT OF HOMELAND SECURITY 2015. Body-worn video cameras for law enforcement market survey report. Science and Technology Directorate.

UCHIDA, C., MCCLUSKEY, J., KRINGEN, J., KRINGEN, A., KATO, S., MELENDEZ, H. & SCHMITZ, J. 2022. Police accounts of critical incidents: A descriptive and empirical assessment. *Journal of Crime and Justice,* 47**,** 95-111.

UCHIDA, C., MCCLUSKEY, J., KRINGEN, J., KRINGEN, A., KATO, S., MELENDEZ, H. & SCHMITZ, J. 2024. Police accounts of critical incidents: A descriptive and empirical assessment. *Journal of Crime and Justice,* 47**,** 95-111.

UHR, J. Accountability, scrutiny and oversight. Common Wealth Secretariat, Canberra Meeting, 2001 Canberra, Australia.

USA TODAY. 2021. *Bodycams haven't lived up to promises of exposing police misconduct* [Online]. Available: https://www.usatoday.com/story/news/nation/2021/05/16/police-body-cameras-have-mixed-legacy-criminal-justice-reform/5064170001/?gnt-cfr=1&gca-cat=p [Accessed 31 May 2024].

VREDEVELDT, A., KESTELOO, L. & HILDEBRANDT, A. 2021. To watch or not to watch: When reviewing body-worn camera footage improves police reports. *Law and Human Behavior,* 45**,** 427-439.

WALLACE, D., WHITE, M. D., GAUB, J. E. & TODAK, N. 2018. Body-worn cameras as a potential source of depolicing: Testing for camera-induced passivity. *Criminology,* 56**,** 481-509.

WALLIS, W. A. 1980. The Statistical Research Group, 1942-1945. *Journal of the American Statistical Association,* 75**,** 320-330.

WALSH, D. P. J. & CONWAY, V. 2011. Police governance and accountability: overview of current issues. *Crime, Law and Social Change,* 55**,** 61-86.

WEBSTER, W., MIRANDA, D. & LELEUX, C. 2022. Rapid research project: Evidence review into public experience and confidence of body worn video in a policing context. University of Stirling.

WEST MIDLANDS POLICE. 2022. *Live body-worn cameras* [Online]. Available: https://foi.west-midlands.police.uk/live-body-worn-cameras-935a-22/ [Accessed 18 June 2024].

WEST MIDLANDS POLICE. no date. *Police Race Action Plan* [Online]. Available: https://www.westmidlands.police.uk/police-forces/west-midlands-police/areas/about-us/about-us-police-race-action-plan/ [Accessed 5 April 2024].

WEST YORKSHIRE COMBINED AUTHORITY. 2023. *Body worn video solution framework* [Online]. Available: https://www.find-tender.service.gov.uk/Notice/034342-2023 [Accessed 14 February 2024].

WEST YORKSHIRE POLICE. 2020. *Freedom of Information: 4703/20* [Online]. Available: https://www.whatdotheyknow.com/request/body_worn_videos_4/response/1639825/attach/4/Annabel%20FOI%204703%2020.pdf [Accessed 14 February 2024].

WEST YORKSHIRE POLICE. 2022. *Freedom of Information: 1373221/22* [Online]. Available: https://www.whatdotheyknow.com/request/body_worn_video_query_23/response/2157770/attach/html/4/FOI%201373221%2022.pdf.html [Accessed 14 February 2024].

WEST YORKSHIRE POLICE. no date-a. *Body worn video: Force policy* [Online]. Available: https://www.westyorkshire.police.uk/about-us/policies-and-procedures/policies/operational-policing/body-worn-video [Accessed 5 April 2024].

WEST YORKSHIRE POLICE. no date-b. *Body worn video: Force policy* [Online]. Available: https://www.westyorkshire.police.uk/about-us/policies-and-procedures/policies/operational-policing/body-worn-video [Accessed 13 February 2025].

WESTMARLAND, L. 2008. Police cultures. *In:* NEWBURN, T. (ed.) *Handbook of policing.* 2nd ed. London: Routledge.

WESTMARLAND, L. 2015. Outsiders inside: Ethnography and police culture. *In:* BRUNGER, M., MARTIN, D. & TONG, S. (eds.) *Introduction to policing research: Taking lessons from practice.* London: Routledge.

WHITE, M. D. & MALM, A. 2020. *Cops, cameras, and crisis: The potential and the perils of police body-worn cameras,* New York, New York University Press.

WILLIS, J. J. 2022. "Culture eats strategy for breakfast": An in-depth examination of police officer perceptions of body-worn camera implementation and their relationship to policy, supervision, and training. *Criminology & Public Policy,* 21**,** 713-737.

WINCHESTER, N. 2020a. Policing in the UK: Governance, oversight and complaints.

WINCHESTER, N. 2020b. Policing in the UK: Serious and organised crime.

WJHG. 2024. *Deputy reportedly mistakes acorn drop for gunshot* [Online]. Available: https://www.wjhg.com/2024/02/15/deputy-reportedly-mistakes-acorn-drop-gunshot-full-internal-investigation-report-body-cam-released/ [Accessed 9 August 2024].

WOOD, M. A. & ARPKE-WALES, W. 2025. Affordances. *In:* MAREILE, K. & HEIDI MORK, L. (eds.) *De Gruyter Handbook of Digital Criminology.* Berlin and Boston: De Gruyter.

WOOD, M. A., MITCHELL, M., PERVAN, F., ANDERSON, B., O'NEILL, T., WOOD, J. & ARPKE-WALES, W. 2023. Inviting, affording and translating harm: Understanding the role of technological mediation in technology-facilitated violence. *The British Journal of Criminology,* 63**,** 1384-1404.

WOODCOCK, M. G. L. 2025. Optics and vision. *In:* GRADWELL, D. & WILKINSON, E. (eds.) *Ernsting's aviation and space medicine.* 6th ed.: CRC Press.

WRIGHT, J. P. & BOISVERT, D. 2009. What biosocial criminology offers criminology. *Criminal Justice and Behavior,* 36**,** 1228-1240.

WU, H., WANG, Q., XIONG, J. & ZUNIGA, M. 2019. SmartVLC: Co-designing smart lighting and communication for visible light networks. *IEEE Transactions on Mobile Computing,* 19**,** 1956-1970.

YESBERG, J., BRUNTON-SMITH, I. & BRADFORD, B. 2023. Police visibility, trust in police fairness, and collective efficacy: A multilevel Structural Equation Model. *European Journal of Criminology,* 20**,** 712-737.

YOUNG, J. T. N. & READY, J. T. 2016. A longitudinal analysis of the relationship between administrative policy, technological preferences, and body-worn camera activation among police officers. *Policing,* 12**,** 27-42.