Digital Transformation in Police Work: A Sociomaterial Perspective on Police Body Worn Cameras (BWC)

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Abstract

The need to augment human capabilities through computer-based technologies, and a belief in the "objectivity" of data has contributed to the popularity of wearables. Such is the case with BWCs and their proliferation in police organizations. Unfortunately, BWCs have not been studied from an IS perspective, using specific or complementary theories applied in IS. We address this gap with a case study of a mid-sized police department, using a sociomaterial lens. We find that BWCs have triggered significant unanticipated changes in police practice. The impacts of these changes are not uniformly distributed. Rank-and-file patrol officers carry the burden upfront, while evidence technicians are burdened on the backend. We contribute by providing an actual account of the changes and impacts of BWCs in policing; providing initial evidence of how BWCs meet policing goals; and demonstrating the applicability of sociomateriality in explicating wearable technologies in general, and BWCs in particular.

1. Introduction

Since the 1992 riots in Los Angeles, sparked in part by video evidence of the beating of Rodney King by Los Angeles police officers, the power of digital evidence has loomed large in the public perception of violent encounters between law enforcement officers and community members. Most recently, in 2014, law enforcement encounters leading up to the death of Michael Brown in Ferguson, Missouri, and Eric Garner, in Long Island, New York, have amplified calls [31] for the use of Body Worn Cameras (BWC) by law enforcement officers, in order to document with audio and video, police interactions with community members. These calls became more strident with nation-wide demonstrations after police killings of Philander Castillo in Minnesota and Alton Sterling in Louisiana in 2016. None of these killings were captured on police BWC, although the Long Island and Minnesota killings were captured on personal cell phones by civilian witnesses. The calls for widespread use of police BWCs are laden with the expectation that video recordings would expose officer misconduct when it happens and eliminate ambiguity when there are discrepancies between an officer's and a civilian's account of an interaction [10]. Body-worn cameras are small video cameras—typically attached to an officer's clothing, helmet, or sunglasses—that can capture, from an officer's point of view, video and audio recordings of police activities, including traffic stops, arrests, searches, interrogations, and critical incidents such as officer-involved-shootings.

The Bureau of Justice Statistics' Law Enforcement Management and Administrative Statistics (LEMAS) survey indicates that, of the more than 12,000 local law enforcement departments in the U.S., 32% were using BWCs in 2013. Following the aforementioned events in Ferguson, Missouri, and Long Island, New York, the Obama Administration announced a $75 million initiative to provide matching grants for police departments to purchase BWCs and requisite storage. The program is expected to help purchase 50,000 new BWCs [31]. This will serve to usher in an era of wearable technology in police agencies throughout the U.S. and may be a tipping point for adoption in other countries. The assumption underlying this massive investment of public funds is that BWCs are a panacea for what ails police-community relations.

In this paper, we propose a theoretical approach to explicate the impact of BWC technology in policing from an IS and organizational perspective. As a new digital technology, accessorized on its human host, BWC is unique among existing police camera systems because it creates digital audio-visual evidence from a first-person perspective. The video provides unique insights into what a police officer is experiencing at the time of a recorded police-civilian interaction. Thus, its evidentiary value is of interest not only to police departments, but to other entities throughout the criminal justice system, including prosecutors, defense attorneys, defendants, and the courts. BWC technology

has been hailed for its potential to "reveal instances of police misconduct, reform police (and civilian) behavior, and build trust between the police and the community" [10]. Proponents of BWC highlight benefits related to core elements of police operations, such as increased transparency and accountability, reduced use of force and other misconduct by police officers, efficient resolution of civilian complaints, improved officer training, and providing effective evidence documentation for trials. Skeptics of BWCs raise concerns, such as potential breach of citizen and officer privacy, "objectivity" of video evidence, encroachments of the surveillance state, locus of control and access to video footage, and program costs.

As a recent phenomenon, academic studies examining the impact of BWCs on police organizations are few [3, 4, 26, 14], and the findings from completed studies are mostly preliminary, and in some cases, contradictory. For example, a recent global multisite study on the effects of BWCs on police use-of-force found that BWCs are associated with an increase in "use-of-force" if officers have discretion to turn BWCs on and off [4]. This finding contradicts the finding from [3], which reported a decline in use-of-force complaints. Nearly all of this work is in the Criminal Justice and Criminology literature or involves limited scope studies funded by U.S. Department of Justice grants and private foundations. Furthermore, studies in these domains are generally preoccupied with the putative mediating role of BWCs in surveilling police-community encounters. To the best of our knowledge, none of the existing studies examine BWCs from an Information Systems perspective, using specific IS theories or complementary theories applied in IS research. A draft working paper by [21] has examined the relationship between police IT use and the number of police officers killed or assaulted in the line of duty. However, the technologies investigated in the study do not include BWCs, and neither was the impact of specific technologies on the police organization investigated. As such, IS research on BWCs is, as of yet, a barren field.

A Body-Worn Camera is an example of a wearable technology, donned by individual police officers, and deployed in police organizations of various sizes and organizational structures. These features offer a unique opportunity to examine the impacts of wearable technology at the individual as well as the organizational level. Thus, the proposed research is timely and critical to fill the knowledge gap on BWC research in the IS field. To contribute to this endeavor, we focus on one main research question:

How do body-worn cameras impact policing?

To answer this question, we conducted a detailed case study of a mid-sized police department in the state of Colorado that has recently implemented BWCs. According to the Chief of Police, BWCs are seen as "a valuable tool for law enforcement." An excellent way to capture evidence, and a "very powerful means to be transparent with our community." Thus, transparency and evidence documentation were the two main drivers for implementing BWCs. Our analysis reveals that BWCs have triggered unanticipated changes in work dynamics of police officers and the organization. The impacts of these changes are not uniformly distributed throughout the organization. Rather, rank-and-file patrol officers carry the most burden upfront, including changes in writing and filing reports, documenting and uploading video evidence for storage, and the awareness to use the cameras in the first place. Evidence technicians are burdened on the backend as they have to sift through evidence videos to download and make copies for court officials, and satisfy evidence discovery requests. We contribute by providing an actual account of the changes and impacts of BWCs in policing; providing initial evidence of how BWCs meet policing goals; and demonstrating the applicability of sociomateriality in explicating wearable technologies in general, and BWCs in particular.

2. Theoretical Background

The need to augment human capabilities through computer-based technologies is not new [2, 28]. In his seminal paper on "Augmenting Human Intellect", [7] employed a systems approach to develop a conceptual framework, which "can include many things—all of which appear to be but extensions of means developed and used in the past to help man apply his native sensory, mental, and motor capabilities" [7, p.1]. Wearable technologies are "the technological enhancement of products that can be worn on almost any part of the anatomy" [32]. According to Engelbart's framework [7], the quickest route to augmentation involved two paths: 1) access to a minute-by-minute computer services, and 2) methods of thinking and working to leverage the power of the computer. These two paths are embodied in current wearable technologies, which provide continuous, on-going computer services to the human wearer, and which are amenable to data analytics to derive knowledge from the use of the wearable. Citing Billinghurst and Starner (1999), [16] identified three key principles for a wearable computer: mobility, augmented reality, and context sensitivity. All these three principles are present in the current generation of BWCs (for example: Axon Body 2 by Taser International, and Vievu LE4 by

Vievu). In an IdeaWatch article in Harvard Business Review, [28] provided an infographic of the history of wearable devices, which we reproduce and update with novel innovations in tabular form below.

Table 1. History of wearables

Year	Device: Description
1965	*Telemetry Systems:* Designed to allow remote observers at NASA to assess an astronaut's respiration, blood pressure and physiological functions
1982	*Polar Heart Rate Monitor:* Wireless device brought scientific measurement out of the lab to the athletic fields
1991	*Vuman 1*: Designed for viewing blueprints for architects and contractors to work more efficiently
1994	*Forget-Me-Not:* Registers movement and interactions to help employees understand where and how they spend their time
	Wrist Computer: Allow repair technicians and other mobile workers enter and analyze data on site
2006	*Nike+:* Uses shoe-mounted accelerometer to record pace and distance (forerunner of Fitbit and Jawbone activity trackers)
2009	*Mindset EEG:* Enabled knowledge workers to identify patterns of brain waves associated with creativity
	Hitachi Business Microscope: Gauges movement so that workers can identify when they're most focused
2013	*Google Glass:* Smart phone with a head mounted glasses display
2014	*Activity Trackers:* Fitness and activity trackers
2015	*Apple Watch:* Provides texting, fitness tracking, TV control and other functionality

Context sensitivity of wearable technologies falls into two broad categories [9]. Those that can provide information about the wearer and the world around them (situationally-aware), and those that provide information relevant to the task at hand, but are not computationally aware of their surrounding (situationally-unaware) [9]. In this categorization, the current class of BWCs are situationally-unaware devices, whereas a Fitbit band, which monitors vital signs and activities of the wearer is said to be situationally-aware. A main benefit of wearables is that they can permit hands-free operation, thereby augmenting human capabilities through cognitive as well as physical means.

Despite their opposing views, both proponents and skeptics of BWCs agree that the technology will fundamentally alter the nature of police organizations and police practice [10]. We take the position that contending views on BWCs revolve around the agential capabilities of BWCs as situationally-unaware devices. For instance, skeptics point to the fact that it takes human agency to turn a BWC on and off, which brings the purported "objectivity" of BWC evidence into question. The inference we draw from this observation is that BWCs must have independent agency to be "objective." Proponents, on the other hand, appear to take the agential capabilities of BWC technology as given. That is, BWCs can't be expected to do more than what they are originally designed to do. Therefore, it is up to the human host (officer) to enact the affordances of BWC technology. The dialectic between autonomous human (officer) and non-autonomous material (BWC) agency suggests that a sociomaterial perspective can be usefully applied to negotiate the terms of the relational dynamics between human and material agencies. Thus, we propose a sociomaterial lens to explicate the individual and organizational changes triggered by the use of BWCs in police departments.

Sociomateriality

Sociomateriality entered popular discourse in IS through the writings and research of Wanda Orlikowski [18, 19, 20]. A sociomaterial approach advances the view that there is an inherent inseparability between the technical and the social, and that privileging one over the other constrains the power to explain the mutually constitutive and emergent relationship between humans and technology in organizational work. The traditional view of technology as an independent and separable object has led to research that "view[s] technology as at best a contextual variable or ancillary tool" in organizational and social research [17], resulting in the use of conceptual hyphens between entities, such as human-technology, subject-object, social-material, etc. This practice obfuscates the process of how one entity (e.g., human or technology) contributes in changing, shaping, and constituting another entity (e.g., technology or human). A sociomaterial perspective overcomes the conceptual and analytical barriers in current organizational discourses by positing that: 1) both human subject and nonhuman object (e.g., technology) have their own performative capability to affect, and (2) both human subject and nonhuman object are inseparable because one entity is essential to constitute the other. Given the ubiquity of IT throughout organizations and the increased use of new digital technologies, such as wearables (e.g., BWC), in which the human and material are intimately connected, we posit that a sociomaterial approach is needed to explain how organizations and new IT co-evolve.

The introduction of BWC technology in police departments has created what we call a "hybrid" police officer. That is, a human police officer accessorized

with a BWC, resulting in a constitutive and entangled human-material relationship. While, for the sake of convenience, we can discern a sharp separation between material and human components of a hybrid police officer, compelling and contentious questions require a sociomaterial analysis. From a police department's point of view, BWCs are a law enforcement tool (material), useful for identifying and documenting evidence that could be used for prosecution in a court of law, or adjudicate the merits of citizen complaints against police officers. This is the view held by proponents of BWCs. Skeptics, on the other hand, see BWCs as a legitimization (social expression) tool, needed as a check and balance against police authority, to ensure that police powers are not exercised at the expense of individual rights and freedoms. Hence, the true essence of BWC is not given, but emerges from its constitutive entanglement in the practice of police work. To resolve these contending views, it is necessary to focus on how agential capabilities of BWCs affect the human agency of the police officer wearing them, and vice versa. In this practice view, the dialectic between subject and object is only used for the convenience of raising questions like 'what is subject?' and 'what is object?' To achieve synthesis, the focus must be on the relational and ontological status of both 'subject' and 'object'. Thus, the focus of sociomateriality is on 'what human subject and nonhuman object can do and how they co-function.

Based on a review of 146 articles on sociomateriality, [11] identified five key notions as underlying sociomateriality. These are:

Materiality—a process of materialization of phenomena enfolding in material-discursive practices of IS development, implementation and use.

Inseparability—inextricable entanglement of the social and the material.

Relationality—form, attributes, and capabilities of entities emerge only through inter-penetration.

Performativity—the idea that certain utterances have the capacity to achieve social outcomes.

Practice—embodied, materially mediated arrays of human activity.

We will use these notions to test for and analyze instances of sociomateriality in our research case study.

3. Conceptual Framework

Technology is a major driving force in the provision of police services, and is often seen as increasing the effectiveness and efficiency of the department [30]. Historically, also, technological innovations have been catalysts for reform in crime prevention and crime control strategies [6]. For example, the introduction of the telephone allowed citizens to call the police department directly for service, instead of going to the station to request service, while the patrol car has enabled the police to service a larger geographic area.

Conceptually, police functions can be categorized into support services, service delivery or operations, and strategy [30]. Through its capabilities to gather and document evidence in real time, as well as asynchronously, BWCs cut across all three areas of police functions. We use these conceptual functional areas to examine the relationships between BWC technology and police work.

4. Research Method

Due to the lack of specific IS studies on BWCs, we employ an exploratory case study to examine the phenomenon of BWC in police organizations. Following [22], our strategy is to study one case in depth at an organization that is representative of police organizations in Colorado that have implemented BWC technology. The insights drawn from this case will then be used to inform the design of future studies of a more generalized nature. The key assumptions underlying our research are: 1) the relationship between humans and technology in organizations is emergent rather than deterministic, and (2) the material aspects of the technology and social aspects of humans mutually constitute each other [8].

The data for this case study were gathered as part of an ongoing study of the implementation of BWCs in police departments in Colorado. Because we are interested in studying the impacts of the technology on the work dynamics of police officers wearing the technology, and the police organization as a whole, we targeted departments that have implemented, or are currently piloting a BWC program. So far, we have identified eight police departments throughout the state that are in various stages of implementation. These include departments in small rural areas, college towns, suburban areas, and large urban cities. The diversity in our case study sample will help us take into account the nuances in department type, structure and local law enforcement needs. For the current case, we collected data using in-person semi-structured interviews with personnel from all major divisions in the police department involved with BWC implementation. This includes interviews with officers in senior command leadership, patrol operations, supervisors of patrol officers, professional standards/internal affairs, evidence and investigations, and IT systems. In all, eight personnel were interviewed, with interviews lasting between 30 and 45 minutes. Multiple interviews in the same organization permit us to cross-validate data gathered from each individual. All the interviews were

audio-recorded for subsequent transcription. Additionally, we reviewed policy documents, and obtained insights on recent high-profile cases involving the use of BWCs.

Research Context

This case belongs to Public PD (PPD, a pseudonym), a local police department in Colorado, whose mission is to provide public safety for all. The department has 30 – 45 sworn police officers, serving a community of less than 30,000 residents. The development of a valuable natural resource has catalyzed economic development, attracting a diverse population and putting strain on police resources. Due to the foresight of the police chief and recent complaints of biased policing by civilians, PPD decided to pilot a BWC program, and went live with full implementation in 2014. Each of PPDs sworn officers is issued a BWC. Because the city lacks a formal IT department, it opted for Cloud storage of its BWC data through a third-party vendor. Recently, PPD also issued officers with smart phones that contain a vendor-supplied app, which provides Bluetooth connectivity to the BWC. The app allows officers to view BWC footage in real time, and to tag and label videos before uploading them to the cloud.

5. Data Analysis

The data analysis of this case was focused on uncovering specific instances of police practice that are afforded by the introduction of BWCs. Since the focus is on explicating sociomateriality, we analyzed the interviews and reviewed policy documents and procedures in terms of the five common notions of sociomateriality [11]. Policing has a long and storied history in the U.S., and the introduction of BWCs does not fundamentally change the nature of police work. This is evident from the fact that police agencies have not changed or modified their mission and value statements to account for the introducing of BWCs. However, if the thesis of sociomateriality holds, we expect to reveal practices that are emergent from the mutual entanglement of the "hybrid" police officer and BWC technology. Accordingly, we examine and analyze the unfolding of these practices through the five notions of sociomateriality. As [11] observed, "research that seeks to employ the concept of sociomateriality [should] pay greater attention to the full range of notions involved."

Materiality: The introduction of BWCs in PPD means that new technology artifacts are introduced in the department. These include the BWC, docking stations for the cameras, and smart phones, which are required equipment for patrol officers. In addition to the physical artifacts, software for the BWC and smart phone apps represent the digital materiality of the new setup. Both physical and digital materiality have brought about changes to work dynamics of PPD officers. As shown in Table 2, in addition to officers reporting for work and waiting for dispatch calls, they now have to undock BWCs and mount them on their uniforms. As one officer recalls, "So you come in, the first thing on yourself is body-worn camera, you walk out the door there's a sign that says 'Camera?' just in case you forget it." Before attending to any work in the current shift, officers have to logon to the cloud-based digital evidence management system and tag and label videos from the previous shift. This routine adds/subtracts about 20 minutes to an officer's shift. One respondent shared that: "before the iPhones, you'd record everything and you could write it down and then you come and dock to a docking station and then upload your videos there, not labeled, they don't have case numbers, so you had to go video by video to see what they are." Although the new smart phones allow officers to label videos during their shift, the process is the same, only the location may be different. Besides, once a video is uploaded, it is no longer available for playback and labelling through the smart phone app.

Another change related to the materiality of the BWC is note-taking and report-writing. Officers indicated that, although not required to do so, they now instinctively consult the video of an event before filing a report. While this makes the reports more accurate, it takes additional time to complete. As a member of the command staff noted: "…officers are spending more time writing their reports now because instead of just writing reports, now they're watching their video and writing the reports…I think the officers' reports are much more detailed than they ever were before—good for court, but a lot of that detail is unnecessary."

Inseparability: By policy, patrol officers are required to wear BWCs at all time and record every interaction with civilians. With the Bluetooth wireless connectivity afforded by the smart phones, officers are now inseparably entangled with BWCs during their shift. In fact, when asked whether they could achieve departmental goals without BWCs, the overwhelming response of the officers interviewed was "no." As one officer puts it: "And so I think in society and with technology today we expect for whatever happens, wherever it happens that it would be captured and documented in a visual and auditory way." Officers no longer trust their mental faculties to remember all the facts about a particular interaction. Instead, they rely on the video recording and playback capabilities of the BWC to do so. The inseparability of the officer's

memory and the video afforded by the BWC is summarized by the following statement from one officer: "Our cases, they don't always go to court that year. So, it can be two years from now when I get summoned into court for something that I dealt with three years ago, and after so many cases. As a patrol officer, you get so many cases every day, you're probably not going to remember every single detail. So you go back and read your report and all that stuff, but you could go back and look through your video and make sure everything in the report is correct." And so, in the evidence documentation process, the human memory and BWC recording have become inseparably entangled.

Relationality: When officers said they do not think they could achieve current policing goals without BWC technology, it does not mean that BWC technology determines those goals. Indeed, for most officers interviewed, their views on policing before and after introducing BWCs have not changed much, if at all. As one interviewee puts it: "I am the same person, with or without the camera." Officers realize that the public they serve no longer takes their word for granted, which makes the BWC an integral part of police work. Commenting on the role of BWCs in the investigation of officer-involved-shootings, one officer stated pointedly that: "the investigator, without the body-worn camera [footage], could never put themselves in the officer's shoes. With the body-worn camera, basically you get frontal view of what's going on." For this officer, investigators (who are themselves police officers) can only relate to circumstances of a critical incident through BWC footage. The relationship between an officer and the BWC is one in which neither independently determines policing goals. In response to a question about how an officer feels when a civilian complaint is filed against them knowing that the incident was captured in a BWC, one respondent stated: "And it makes me feel a little better that the camera is there for a little bit more evidence because then without the camera, it would be my word against her word, and after so many complaints you'd probably start losing credibility. But with the body-worn camera, every complaint I've received has been shut down immediately." Thus, rather than just a device for recording police-civilian encounters, officers see BWCs as effectively mediating their relationship with civilians.

Performativity: There is a mantra in police work: 'ask', 'tell', 'make', and 'take.' What this means is that in any encounter with civilians, a police officer will first "ask" the civilian questions to ascertain identity, such as name, address, identification, etc. The officer expects a candid response from the civilian. If the civilian refuses to respond, or provide false information, the officer may "tell" the civilian to respond and threaten consequences, often in a more authoritative voice. If still a satisfactory response is not forthcoming from the civilian, the officer may use police tactics to "make" the civilian respond. These tactics may range from a citation to a court summons. Depending on the nature of the encounter, the officer may use police powers to "take" the civilian into custody, thereby curtailing the civilian's freedoms. The progression of this mantra represents an escalation at each successive stage, from the officer raising his or her voice to issue commands, to immobilizing the civilian with a Taser or handcuff, or use-of-force to gain compliance. The use of BWCs makes this sequence of police actions performative, by providing a new visibility on the actions of both the officer and the civilian. This visibility allows for the actions of the officer and the civilian to be monitored for adherence to policy and procedures. Disciplinary action may be taken against the officer for non-adherence, while the civilian may face additional charges for non-compliance. Thus the use of BWCs encourages officers to be more "civil" and "moderate" in their use of police powers. One officer describes this as the "system" turning them into "Robot Officers," who can't bring out their individual personality to bear on their work, or to "speak to civilians at their level." A member of the command staff narrated this exchange with a patrol officer: "I had an interesting conversation with a very, very good officer, one of my best officers, and soon after we implemented them [BWC], he came into my office and he says, '[Sir], can I still use profanity when I talk to people when I have the camera?' And, I said, 'Look, you talk to people the way you think you need to appropriately talk to them. Just remember that a jury may hear everything you say.'" Thus, the mere presence of the BWC with a blinking light to signify activation, communicates to the civilian and the officer that their actions are being monitored. This visual, rather than verbal communication elicits certain performative responses from the civilian and officer.

Practice: Obviously, the introduction of BWCs has added a new dimension to the work practices of police officers. The constant presence of a "virtual" third-party is now reality. It has raised an awareness that no matter how an officer chose to put into practice the training and standards of policing expected of him/her, the BWC memorializes a record of that practice, and affords a before and after re-enactment. BWCs have also influenced the practice of police officers at different stages of their career. Younger officers, so-called "digital natives" seem to fare better with BWC technology, because of their facility and comfort with technologies in general. An older officer with more than

a decade of policing experience summarizes this practice perspective thus: "I'm one of the older police officers, and I would much rather do everything on a piece of paper with a pen versus all the new technology… and I don't learn as quickly as maybe some of our officers that are 20 [something years old] and have grown up with cell phones and Facebook and all this new technology. It just takes me a little bit longer to learn those types of new things." During our interviews, older officers generally lament the intrusiveness of BWCs and bemoan the new task of labelling and tagging videos from the computer terminals at the police department, even though this functionality is available to them via the smart phone app. Younger officers who use the smart phone app to label and tag videos during downtime in their patrol shift show little concern about this added task to their patrol duties. As such, BWCs have added an "age" dimension to the practice of policing, by requiring the learning and comprehension of new skills with a steeper learning curve for technologically-challenged older officers.

Table 2. Changes and Impacts of BWC Program

Functional Area	Changes Reported	Impacts Reported
Operations	▪ Wearing BWC and carrying smart phones as part of standard equipment ▪ Requirement to turn BWC on and off per policy ▪ Awareness of BWC during interactions ▪ Consciousness of location of BWC on uniform and adjust policing stance during interactions ▪ Sensitivity to privacy issues in certain locations ▪ Dock BWCs after shift to upload video footage and charge battery ▪ Review each recorded incident and tag and label it separately ▪ Review video to corroborate field notes and write report	▪ Discomfort from hot battery pack and weight of equipment ▪ Put up with vibrating sound during operation ▪ More civility during interactions/Less worried about civilian complaints/Reduced likelihood of suits resulting in payouts ▪ Add/subtract 20 minutes per shift for labelling videos/Less time testifying in court due to video evidence ▪ Improved accuracy of report. Report takes longer to write
Support Services	▪ Manage and troubleshoot BWC docking stations ▪ Manage user logins and configurations ▪ Manage smart phones with BWC app ▪ Manage connectivity to the cloud ▪ Troubleshoot BWC and systems as needed ▪ Search, copy and burn footage on DVDs for other parties such as prosecutors and courts	▪ Additional personnel needed to help manage video evidence
Strategy	▪ New BWC policy ▪ Procedures for release of footage ▪ Program funding ▪ Training and professional standards ▪ Customize training and performance evaluation ▪ Virtual supervision	▪ One-time cost for cameras ▪ On-going cloud storage fees ▪ Shortened retention periods ▪ Reduced complaints and suits resulting in payouts ▪ Random review of a sample of videos to ensure officer compliance with standards

6. Findings

In order to examine the individual and organizational changes and impacts caused by implementation of the BWC program in PPD, we categorize changes reported and their impacts based on the functional area of the police organization that is impacted. This enables us to determine areas of differential impact due to the BWC program. Table 2 fills in the reported changes and impacts under each functional area. From the table, it is evident that most of the changes are experienced on the operations division, which consists mainly of patrol, followed by support services, which include investigations, evidence, and professional standards. This bears out the observation of most of the officers interviewed as well as the command staff, who emphatically stated: "Patrol definitely had to make the adjustments."

The concept of sociomateriality, which advocates a practice-based approach cannot be adequately discussed in the abstract. In order to facilitate a discussion of the results of the case study and demonstrate sociomaterial instances of police practice, we present an incident that occurred during a routine PPD patrol operation as narrated by one of the officers interviewed:

Officers were dispatched to a location where a suspect was threatening his roommate with a machete. When officers arrived at the scene, the suspect bolted for the attic with machete in hand to hide from police.

Officers tried to coax the suspect from hiding several times without success. Since they can't see where in the attic the suspect was hiding, officers decided it was too risky to send someone to chase him out of hiding. As one officer stated: "so, he was hiding in the attic and then we didn't want to play gopher with the guy and stick your head there." The officers on scene radioed back to head quarter and asked for tactical support, which is an escalation of the response. But just before the tactical team arrived, a young patrol office asked his supervisor if he could try hoisting his BWC into the attic and use it to locate the suspect with the real-time video display capabilities of his smart phone via the smart phone app. The supervisor consented. The young officer taped the BWC onto a broomstick and hoisted it through an aperture into the attic. With Bluetooth wireless connectivity on his smart phone, the officer maneuvered the broomstick with the BWC until he could locate the spot where the suspect was hiding. From then, he used the real-time video feed on the smart phone screen to make contact with the suspect. Since he could see the suspect while the suspect can't see him, he communicated to the suspect as if he was standing face to face with him. Realizing that he has been discovered, based on the officer's description of him and his hiding place, the suspect had no choice but to come out of hiding and surrender. The other officers at the scene rushed him to the ground, and took him into custody. This potentially bloody situation ended peacefully, and PPD was able to fulfil its mission of providing safety for all, including violent suspects.

This case demonstrates the power of a practice approach to analyze the use of technologies in the workplace. Clearly, hoisting the BWC into a remote location to search for a suspect in hiding was not the way a BWC was intended to operate. PPDs operating policies and procedures and rules of engagement made no mention of such a scenario. However, improvisation through human agency and wireless connectivity through affordances of the BWC and smart phone, resulted in an outcome that demonstrated the relationality and constitutive entanglement of social and material agencies in organizational work. Using the five common notions of sociomateriality [11], Table 3 provides a detailed sociomaterial analysis of this case.

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

7. Discussion and Limitations

The foregoing dissection of an actual police event into the various notions of sociomateriality, demonstrate the unfolding of sociomaterial instances in everyday police work. Obviously, we could separate out the social and material components in the above scenario. But such a separation yields only the phantom convenience of reductionism. In reality, a thorough analysis of the outcome of this case is possible only through a sociomaterial analysis in practical situations. It demonstrates how the introduction of BWCs has reconstituted the everyday practice of police work, and provides evidence of sociomateriality through the mutual entanglement and

inseparability of the work of the police officer from the work of the technology (BWC).

Limitations of the Study

Like any case study, this research is limited to the experience and practices of a single police department. Hence, the insights and findings derived herein are not generalizable to other contexts. In addition, our interviews are backward looking, asking questions about what has happened and what has been experienced. As such, we cannot claim that the reported practices will persist into the future, particularly given the novelty of BWCs and the introduction of new technologies to complement their use in police departments. For example, the introduction of smart phones, which allows officers to view and label videos in the field, appears to mitigate the impact of labeling videos after an officer's shift. Our study also did not consider the institutional context of police organizations and the impact of prevailing institutional logics on the implementation of BWCs.

Future Work

In order to address some of the limitations cited above, we have extended our study to include multiple case sites in varying institutional and political contexts. Additional questions have been added to the questionnaire to capture broader insights regarding BWC technology that emerged from our analysis of the single case study. Our goal is to use the multiple case studies to build theory about BWCs in particular, and wearables in general, in an institutional setting. Such theory can then be tested through a nation-wide survey of BWC implementation in police organizations. Thus, we envisage a multi-methods approach for a comprehensive study of BWCs in police organizations in the U.S.

8. Conclusions

The popularity of wearables in general, and the proliferation of BWCs in police organizations in particular, has provided an opportunity to examine the impacts of wearable technology on the individuals wearing it, and the organizations in which it is deployed. There is a lack of specific IS studies related to the use of BWCs in police departments. To begin to fill this knowledge gap, we have used an exploratory case study to examine and explicate the changes and impacts of BWCs on police organizations. Our analysis of the case study suggests that these changes are significant, requiring accommodations from the police officers wearing BWCs and the organization they work for. For example, having the awareness of the camera requires officers to remember to turn it on and off at the right time and for the right instances, even though that means they have additional work to do in terms of labelling, tagging, docking the cameras to upload video footage and charge camera batteries, and write detailed reports. From the organizations point of view, there is the additional cost of procuring and maintaining BWC equipment and on-going storage costs. In addition, the organization has to enact specific policies to guide the use of BWCs, and the attendant costs of monitoring compliance with that policy. Because of the affordances of BWCs, there is now the expectation that video evidence should be made available in order to clarify and adjudicate any discrepancy arising from the exercise of police functions. In instances where this is not possible, due to either faulty equipment or the discretion of the officer involved, the reputation of the organization is brought into question. This concern is highlighted by the following statement from a command officer: "My guess is officers are very aware that everything they're saying and doing is recorded. So, that changes it. But I think that the bigger change to this, the more systemic change, is how we're going to be using it for evidentiary purposes and how it's going to be utilized in court. […] The downside is, I think juries are going to expect body-worn camera video for every case, and if you don't have it, you're gonna lose the case."

We used a sociomaterial lens to uncover changes in the practice of policing that are due to the implementation of BWCs, and the organizational impact of those changes. A sociomaterial perspective aims to supplant a social constructivist view of technology in which human agency occasions structuring [15, 18, 19, 20], with a constitutive view in which structuring emerges. Our study demonstrates the use of an IS-theoretic lens to explicate the implementation of technology in an organization, and makes the following contributions: 1) Provides an actual account and evidence of the changes and impacts of BWCs in policing, 2) provides initial evidence of whether BWCs meet the goals anticipated by the police organization, and 3) demonstrates the applicability of a sociomaterial lens in explicating the phenomenon of BWCs in a police department.

Our study is preliminary and exploratory. Through additional research and analysis of more case sites, we hope to have a deeper dive into the BWC phenomenon to explore new theoretical understandings of wearable technologies in general, and BWCs in particular.

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