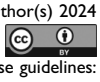
Original Research Article

International Journal of
Police Science
& Management

The persistent attractions of low-tech: Challenging the efficiency paradigm of forensic technology

International Journal of
Police Science & Management
1–10



DOI: 10.1177/14613557241231164
journals.sagepub.com/home/psm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Abstract

The promise of efficiency is a catalyst for technological development in forensic science and crime scene investigation practices. Crime scene investigators aim to locate and document every potential trace for evidence and investigate crime scenes as quickly, accurately and objectively as possible. This narrative suggests that performance leads the police to adopt new efficient technologies. But to what extent is this narrative reflective of actual practices? Through examining how crime scene investigators use existing technologies in practice, i.e. traditional or 'low-tech' methods and tools such as DNA detection dogs and manual documentation tools, this article shows that the use of low-tech persists even under the pressure to perform and achieve. The study finds that low-tech remains attractive as a less-restraining alternative to digital and high-tech solutions. It is also contrast to, integrated with or necessary in co-existence with high-tech for crime scene investigations practices to function. The study draws on fieldwork conducted at police stations in Norway, including interviews and participatory observation of investigations in practice, to discuss the persistent attractions of low-tech and what the implications are for research into policing and technology.

Keywords

Crime scene investigations, low-tech, efficiency, forensics, knowledge production

Submitted 28 Jul 2023, Revise received 27 Oct 2023, accepted 23 Jan 2024

Introduction

On a Saturday morning in 2019, a man was found deceased in a parking lot in Bergen, Norway.[1] The police approached the scene expecting to investigate an accidental death (Hagen and Røssland, 2022). Hypothermia is not a very rare cause of death in Norway (Filseth, 2012: 14–16, 23), especially in combination with alcohol consumption (Nordrum et al., 1998). Therefore, no evidence from the scene was collected and only a few photographs were taken. Later, details from the autopsy pointed to a more violent cause of death. With few leads to go on, the police apprehended a man seen alongside the deceased on CCTV footage and spent two days in the police laboratory searching for traces of blood or foreign DNA on his leather jacket, but could not establish any. As a last resort, a sniffer dog was allowed to search the jacket, and marked for blood on two spots. These spots had gone unnoticed by sensitive laboratory technologies. Liquid confirmation tests verified the spots as containing blood, and the national forensic genetics laboratory confirmed that both samples matched the deceased's DNA (Hagen and Røssland, 2022). This evidence did not come about because of sophisticated, modern high technologies, but was made visible, detectable, collectable and intelligible through the use of a dog

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– a 'low' technology commonly left out of conversations about science, technological development and the police. The use of a DNA detection dog, I suggest, exemplifies the varieties of forensic technologies across a spectrum of high-tech and low-tech. The precise variety of these technologies, and their role as knowledge producers, is examined in this article.

'Low-tech' is an umbrella term encompassing technological methods and tools that are typically less complex than high-tech solutions, and which often require some manual labour. Whereas 'high-tech' is characterised as advanced, effective, 'smart' and digital, low-tech can be analogue, organic, inexpensive and does not require advanced skills or specialised equipment to operate. Some low-tech enthusiasts 'underscore the potential of past and often forgotten technologies' (Low-tech Magazine, 2023) and warn of the hype and glorification of high-tech by 'refus[ing] to assume that each problem has a high-tech solution' (No Tech Magazine, 2023). Opting for low-tech can thus be an ideological stance focused on resisting or reversing the perceived current trajectory of the technological evolution. Scholars in Criminology and Science and Technology Studies have long been interested in the relationships between technological phenomena and crime and control (Aas et al., 2009; Brown, 2006; Cole, 2001; Powell et al., 2018). Precisely the rapid development within technological innovation mandates a continued critical engagement with the field (Castro-Toledo et al., 2023; Hopman and Bleumink, 2023; Kaufmann and Vestad, 2023). However, even though low-tech innovations are often interconnected with high-tech development (Hirsch-Kreinsen et al., 2008), their influence remains largely under-researched, especially in the fields of forensics and policing. The question this article raises is, therefore: what role does low-tech embody in the crime–technology nexus, and how is it influencing the agency of the actors involved?

Crime scene investigation technologies, such as DNA detection and trace collection tools, are critical to the production of evidence and in the pursuit of unknown identities (Cole, 2001; Granja, 2020; Lynch et al., 2008). The common narrative of technological development in policing is that efficiency is what the police perceives that it needs to tackle crime (Dewald, 2023; Fyfe et al., 2017). Policing actors may feel compelled to adopt new technology and act in line with the practical demands of new tools 'paired with shared fears about the possible consequences of not taking advantage of technological advances' (Quinlan, 2021: 452). The dilemma of whether to adopt and change or to reject and risk falling behind is a contentious issue and has direct consequences for policing in practice. A central theme and motivation for this study is to discuss the extent to which technological changes come from 'within' or 'outside' of the organisation.

The article is organised as follows: first, an overview of research on the efficiency paradigm in policing is given, with particular attention towards the influence of technological change on agency. The article continues with an analysis of empirical data that illustrates how low-tech crime scene investigation practices are integrated with, a contrast to, or a separate necessity alongside high-tech practices. The aim of the analysis is to provide a framework that shows how low-tech positively influences investigators' perceived agency and integrity, and attracts despite slowing down other processes, which is a counterargument in the efficiency debate. The findings provide the basis for the final discussion, which revisits established ideas about the willingness to adapt to technological development with a call for action in research.

Theoretical background: the efficiency paradigm

Predictive thinking and efficiency have for some time dominated innovation in the crime–technology nexus, especially since the 9/11 terror attack. In 2004, Kevin Haggerty wrote that 'we are arguably at a historical watershed in terms of our technological responses to crime' (Haggerty, 2004: 493), meaning that technology is not only becoming integral to how crime and criminal justice is approached and managed, but that the specific techno-practices which are taking shape are increasingly integrated with, if not substituting, human knowledge production about crime and risk. The ambition of efficient policing is reflected in policies across the western world and remains the force driving a technological evolution in policing because 'the world around the police is changing, and the police must change with it' (Giacomantonio, 2015: 110, cited in Fyfe, 2017: 248). In so doing, new, efficient and especially predictive technologies reshape the organisational structures of law enforcement (Ernst et al., 2021; Fyfe, 2017; Fyfe et al., 2017; Jackson and Brown, 2007; Willis et al., 2020).

Although there appears to be an ongoing and consistent move towards a technologically complex police, the implementation of new technologies is not a straight-forward process. Some studies show that police cultures change when technological paradigms shift. Because change often encompasses a redistribution of resources, resistance to new technologies is not uncommon if the police already experience organisational resource shortages (Chan, 2001; Smith, 2019; Willis et al., 2020). Studies have also shown that some police agencies or units may be 'reluctant' and 'tend to avoid' new technologies, particularly because of the organisational changes they require,

such as the budgetary and administrative aspects of daily tasks (Nhan and Huey, 2012; see also Ernst et al., 2021). Even if new technologies are formally implemented, investigators may choose to resist their use in favour of 'tried and tested' methods because of organisational cultures of resistance to change (Manning, 2008; Schroeder and White, 2009). Further, as noted in Strom's research on the impact of technology on policing strategy, 'the level of sophistication and use can be widely divergent [across agencies]' (Strom, 2016: 1–1; see also Willis et al., 2020), meaning factors external to the technology, such as local culture or knowledge, may also impact how it is received and practised.

Part of this issue may be due to the growing concern for black-boxing of knowledge production processes through the data-driven governance (Clavell, 2018; Egbert and Krasmann, 2020), commercialisation (Lawless and Williams, 2010) and privatisation (Flyghed, 2017) of police services. The inclusion of faster, algorithmic and more automated specialised technologies is also directly changing the functions of police personnel in daily tasks. The police risk losing agency when process-specific knowledge is black-boxed by technologies that require new and specialised forms of expertise (Sandhu and Fussey, 2021), both in the form of the technical skills required to operate new tools and in terms of analytical skillsets (Lundgaard, 2023). By introducing technologies that the police lack the competence or authority to control, civilian professionals such as programmers, software engineers and product developers are employed into the domain of law enforcement and change the collective skill base in the field (Hannah-Moffat, 2019). The collection and storage of masses of data also need dedicated maintenance to avoid overwhelming and destabilising informatics systems (Perrow, 1984, cited in Haggerty, 2004: 494). The police may be becoming increasingly more distant from the production of actionable knowledge because the outputs matter more than the technological processes that lead to them (Kaufmann, 2017; Moses and Chan, 2018).

'Efficient' forensic solutions also include resources that are yet to be produced but are predicted to be operable in the near future, such as 'contactless, non-destructive, automated sensors to identify, select and label trace materials' (RISEN Project, 2020). As an expression of broader sociotechnical imaginaries (Jasanoff, 2015) through the anticipation of future tools, resources that are currently inaccessible can be said to already influence the police's way of thinking about their past, current and future agency. 'Imaginaries', Jasanoff (2015: 6) writes, 'encode not only visions of what is attainable through science and technology, but also of how life ought, or ought not, to be lived; in this respect they express a society's shared understandings of good and evil', or of the problematic and the desirable in a professional community. If we conceptualise the future forensic toolbox as an expression of sociotechnical imaginaries, then we must also take into account the duality of these imaginaries: good and evil, positive and negative, utopia and dystopia (Jasanoff 2015). The perceived abilities of these tools to influence other tasks make them a conjunction between what is possible and what is not. The idea of the technology gives it agency, even if the technology does not yet exist. Critical perspectives ask whether all new technologies are, then, hype; do new data practices deliver what commercial providers promise or do they generate new problems that convolute and distract from existing practice (Degeling and Berendt, 2018; Manning, 2008)? The cautions of Bernard Stiegler (2018 [1986], 2019), to be suspicious of narratives that overstate the value of new technology, are relevant here. With his perspective, a turn towards low-tech is a turn away from the 'digital automations [that] have succeeded in short-circuiting the deliberate functions of the mind' (Stiegler, 2019: 26), such as agency, memory production and deep knowledge. In sum, although new technologies aim to make daily tasks more efficient, they may also have consequences that are of a more implicit character, some which are discussed later in this article.

Methods and ethical considerations

This study draws on data from participatory observation and interviews conducted during a series of fieldwork visits at nine police stations and the National Crime Investigation Service in Norway, during 2022 and 2023. The national police directorate and each police district approved of the project's data collection plan, and each interview participant gave written or oral informed consent. The project's data protection plan was approved by the Norwegian Centre for Research Data. This article draws on data from two of these participatory observation sessions and interviews conducted in connection with those, and other observation sessions, lasting from 1.5 to 5 h, and followed a semi-structured interview guide revolving around themes of the use and development of DNA technology. All interviews were recorded and transcribed, during which any personal information relating to interview subjects or third parties, such as persons involved in criminal investigations, were removed.

The aim of the study has been to understand how forensic DNA and crime scene investigation technologies operate in their contexts. For that reason, police interaction with DNA was a requirement for the types of cases observed. Participating in or observing police work as a researcher poses several ethical challenges. The investigation observed and drawn upon in this article was of the possible sexual abuse of a child and one case of domestic murder, which are highly sensitive subjects. When studying

sensitive subjects as an outsider, it is important to consider what level of involvement is appropriate given the circumstances, and further, how any involvement may influence the research process and outcome. Close interaction with serious crimes and atrocities can influence the researcher's way of thinking about their work (Houge, 2022). Further, participation in highly specialised communities may require a degree of prior knowledge to fully understand what is happening. I approached these concerns by conducting interviews before and after each observation session. The second interview was used to discuss the observation in more detail. Investigators could point to moments in the investigation and elaborate on the rationales and logics of what they did, and why. Audio was also recorded during two of the three observation sessions, which later enabled me to reach out to the police district to verify or request additional information if something was unclear. It has not been an aim to obtain details about specific cases, but rather about general trends in how changes to technology influence the production of forensic evidence.

The persistent attractions of low-tech

Although digital technologies have become increasingly important in law enforcement, low-tech methods and tools remain an essential part of the forensic toolbox. Crime scene investigators have a variety of low-tech available for use in evidence collection. Some of these tools are useful to have at hand regardless of the type of case they are investigating, and have thus become part of standard crime scene kits that are pre-packaged and ready for use in every crime scene investigations vehicle. The kits include DNA collection equipment such as plastic gloves, masks, cover-up suits, wipes, paper bags, cotton swabs and paper sheets for keeping track of all items and areas that are collected, searched or documented. Other available low-tech tools are situationally dependent and require some assessment before use, for instance about what number of body bags to bring, whether to pack rain covers, or the types of cameras and lighting devices. This professional environment is in a constant battle of resources, in which low-tech is frequent and central to the procedures at hand. In what follows, observation notes and interview data are combined to sketch out an analysis of how low-tech attracts attention in high-tech environments. The theme is approached from three angles: low-tech as something that is integrated with high-tech; low-tech as a contrast to high-tech; and low-tech as a necessity alongside high-tech. The main argument is that low-tech is attractive despite slowing down these processes because investigators retain agency and integrity through the use of low-tech. These findings are later discussed vis-à-vis the efficiency discourse.

Low-tech and high-tech integration: Multiple levels of backups

At a crime scene, information about every item searched for DNA and every cotton swab is documented. Each item is given a letter and a number, such as A1, A2 and so on, which later allows investigators to keep track of the order and location of every item searched. Investigators have access to tablets, laptops, voice recorders and digital camera equipment, yet when asked about how crime scene information is archived and organised in the digital age, several officers brought up notebooks as their preferred way of keeping track of their work and knowledge.

> It's about integrity. All the way from the first drawing, we're there, taking photos, and making ugly drawings with ugly handwriting. But it's there. Right? And I can use my notes to follow the photos into the evidence collection report, and to the final report we get from the lab. (CSI)

Handwritten information and drawings can later be merged digitally with other types of case information, such as photographs or drone footage from the crime scene. Investigators may clip pictures of objects onto drawings of rooms in such digital spaces. One male investigator explained that even with the sophisticated camera technologies of today, such as body cameras or three-dimension and virtual reality reconstruction software, drawing by hand is a free-flowing practice removed from the boundaries of technological interfaces. The rationale is that manually doing something by hand allows him to focus on what he is drawing in a slowed down fashion rather than navigating a higher paced technological interface. This helps him remember how he physically manoeuvred the crime scene and may later generate other ideas than those he gets from reviewing digital camera footage. The practice corresponds with research on memory construction in the digital age, which finds that a digital platform 'remoulds' memory into new information structures (Schwartz, 2014). Schwartz suggests that the 'pragmatic structure of the database redistributes the agency of memory' (2014: 8). In that perspective, memory becomes artificially preserved (Stiegler, 2018 [1986]). This investigator retains some agency of memory by instead choosing to navigate crime scene information using a type of low-tech method that is less efficient than digital alternatives and slows down later processes by requiring additional steps in the digital space.

Manual documentation tools such as notebooks do not require any advanced technology, internet connectivity or other advanced equipment to use, and are a reliable and portable tool. Their use, however, does pose other practical challenges. DNA is highly sensitive to activity, meaning improper handling of forensic DNA evidence can produce

false test results. Recent retesting of older DNA evidence and subsequent acquittals in several Norwegian high-profile cases have brought discussions about contamination to the forefront of the forensic community (Berglund, 2022). Investigators are therefore careful to avoid touching more than one object at a time; swapping plastic gloves every time they move from one object to another. During an observation in which knife wounds on a piece of clothing were examined, the need to manually document progress posed a practical and time-consuming challenge to the work being conducted:

> One investigator is responsible for operating the camera equipment. The other swaps gloves every time they move between measuring spots on the item with a ruler and writing down measurements on a form. The investigator says, 'two pairs of hands is not enough to move the evidence around on the table and take pictures from above while also filling out this form'. (Observation notes)

An alternative option would be to use a voice recorder to describe measurements, listen back to the recording at a later stage and manually write down the details in an online format. Some investigators state that they do this. The investigator in the excerpt above chose not to go for the high-tech option to reduce the number of steps between investigating and writing the final report. Other investigators also spoke of issues with time-consuming documentation technologies, but emphasised that writing as you go is better than going back to revisit a finding. When the writing is completed on the spot, the investigators can see what it is that they are writing about and correct any details in real time. Still, the information from the form and the notebook needs to become digital in order to be archived and searchable. One investigator explains that logging handwritten drawings and notes are part of ensuring transparency of the process. It allows other investigators or actors in court to retrace his steps during trial:

> What I do is I photograph the page and add it to the [digital case folder] alongside my photos, so it's more practical when I explain it to others. My handwriting is so bad that no one understands what I write anyway … it's like, 'here you go, you can't read my notes, but I promise, they're there!' … They exist. … Drawings and everything. … It's about transparency … and for others to check. You can go to my notes. You can go to my photos. You can go to my report. And see everything I've done. (CSI)

This creates a two-way backup system where the analogue paper acts as a backup for the digital, and the digital form is a backup for the analogue. Instead of adopting newer technologies, such as audio-recorders, handsets or body cameras, they work to render already existing practices more practical for the individual investigator by merging low-tech and high-tech. They actively work with low-tech to retain memory, which, I suggest, illustrates why the more 'efficient' option is not necessarily that which is favoured in practice. At the same time, requiring that colleagues decipher handwriting and drawings or explaining these to the court may be time-consuming and distracting. Additional or excess data is also produced, which requires both equipped digital systems and analogue storage systems. This particular low-tech must, as such, be understood as a tool that attracts because it aids the analytical process of the investigating officer despite its shortcomings in efficiency, and one that persists to attract because of the analytical value it facilitates.

Low-tech as a contrast to high-tech: Triangulation

A new set of resource choices meet investigators as they return to the police station or the laboratory with potential evidence. To check items or samples for human blood, investigators may choose to use local laboratory equipment, rapid or indicative testing, or send samples directly to the national forensic laboratory. Another less-common option is to use DNA dogs. Blood, spit and sperm sniffer dogs are one of the scarcest forensic resources in Norway because there are only six of them in the country. Having access to one is therefore reflective of a certain resource capacity within a police district. Part of what makes them a scarcity is that they require dedicated caretakers and years of training to be operable. Yet for those who have one, the use of a dog at a crime scene is still spoken of as a 'last resort'; an alternative if other methods fail to provide sufficient or reliable information:

> DNA is very vulnerable to other types of activity, so that's why we try to do other DNA tests first. Using [the dog] I would think is sort of the last step in the DNA escalation. First we might just look at it, shine special lighting on it, and if we don't find anything or can't see anything, we give the dog a try at the end. And she can probably break things. … Outdoors, we try the dog first because it's difficult with lights and such. In here we have the time to do everything. It won't rain. (CSI)

DNA dogs are described as a tool that demands dedicated time and space, as well as one that is preferred over other technologies if there is little time or space to conduct humanly operated DNA searches. It is both a method that makes the process efficient and one that slows it down. In either case it is part of a network of tools and practices, and needs to be supplied with other forms of testing. The excerpt below stems from observation notes of a search for bodily fluids on bed sheets and describes how a dog

was used as an investigatory asset after investigators had combed the sheets manually without any findings:

> Bed sheets are spread out across the floor, each corner taped to the floor. Investigators in white covers photograph the sheets from above. The dog is brought forward by her handler. She steps all over the sheets and they become somewhat covered with footsteps left by the dog. After a few minutes, the dog marks a spot by pressing its nose down into the sheet. Her handler cheers, and the dog is rewarded with a ball to play with. The sheet is turned over, facing down, and again the dog steps all over it, sniffing intensely, before marking again at the same, corresponding spot. Again, the dog is rewarded with a ball to play with. Several investigators warn that the dog is young: she might just be marking a spot to get the reward. (Observation notes)

Forensic technologies, and the traces they analyse, are often thought of as 'truth machines' (Lynch et al., 2008) – as better equipped for objective interpretation than the human actor. They promise to follow a logic of accuracy and objectivity (Hopman, 2020) because of genetics' reputation as embodying 'certainties' and 'truths' (Granja, 2020). Service dogs, on the other hand, are familiar, controllable, communicative, but also unpredictable. The results they give by marking a spot can be equal to or even more accurate than results provided by other testing equipment. But the potential of giving false positives by not communicating the truth, as illustrated above, requires investigators to verify its accuracy with additional methods such as presumptive testing:

> Investigators bring out cotton swabs to wipe both sides of the sheet. The swab is dropped into a plastic cylinder containing chemical compounds. Within seconds, a colouring process occurs to confirm which type of bodily fluid the dog has detected. The colour is compared to a printed scale of colours. When confirmed as blood or sperm, a new cotton swab is rubbed onto the sheet, clear water is added to the swab to liquefy the sample, and the swab is rubbed onto special paper, which is then packed in a paper bag and sealed with red tape, each piece of tape having a unique identifier number. The investigators fill out the form on the back of the paper bag, giving the sample a name, a time, and a person responsible. (Observation notes)

The process of confirming the sample is essentially a process of unboxing a black-box – or, making it 'semi-transparent' (Kruse, 2016; see also Granja and Machado, 2020). By testing the contents of the sample using 'tried and tested' methods, the new, uncertain technology of a young dog is protected by and interlinked with the familiar realm of known science. Being a time-consuming, messy, risky and expensive technology to possess, it is a stark contrast to the laboratory equipment that could also provide investigators with these results. Still, in this scenario, the low-tech is favoured because it is a playful contrast to the more cold, sterile and hard laboratory equipment. It does not replace other investigatory efforts, but attracts because it works differently and alongside high-tech to triangulate results across methods.

Low-tech as a necessity alongside high-tech

The final form of tech interaction illustrated in this article concerns situations in which both high-tech and low-tech are necessary to perform an operation. After DNA evidence has been collected on cotton swabs and sealed in paper bags, they are sent to the laboratory for analysis. Norway currently only has one forensic genetics laboratory, located in Oslo, the very south-east of the country. Investigators in the Oslo area can drive to the laboratory to drop off samples, whereas investigators elsewhere use a standard business mail system, which means evidence from further away has a later arrival date. Distance may also cause practical dilemmas when there is little evidence or it has to be handled very carefully. Investigators who are located closer to Oslo may choose to bypass the postal system and drive directly to the laboratory. They do this not to avoid items being lost, but to avoid DNA moving around within evidence containers during shipping, here described by an investigator located within driving distance from the forensic genetics laboratory:

> If we were to get DNA from [important item], we would open a little cardboard box and put a clean DNA sheet at the bottom. We'd pick [the item] up carefully, place it on the sheet, and cover it. Then I'd know that okay, I want it to lay perfectly still because it's very important … and I'll drive it to the lab myself. I don't want to send it by mail, because I know that even if you write 'handle with care', the postman is just going to throw it in their car, and it'll move around in there. So, there are things we really want handled as carefully as possible, so we drive in ourselves and deliver it at the desk. (CSI)

In special situations that require urgent answers, such as cases of missing identity, the police in south-east Norway can also use other methods to deliver evidence to the laboratory. There are, in other words, alternatives across all levels of technological sophistication that may be utilised for moving a trace from one place to another. These methods, to various extents, enhance or diminish the agency the police has during the shipping process:

> For example, the [high-profile] murder we had a few years ago, we got police helicopters to take traces of blood to the laboratory … it's not to keep it under control, but because we wanted answers right away. We had already tested it for humane blood,

> we have tests for that, but we are not Horacio Kane in *CSI Miami* who can just click and 'boom here you go', so it was to confirm that the blood was [the victim's] so that [the perpetrator] could be apprehended. (CSI)

Unlike to police helicopters, the standard business mail system is not supervised by the police. Investigators lose temporary control of items in return for a more cost-effective system. Evidence can be lost, tampered with or destroyed in the mail. However, the cost associated with delivering mail using supervised methods for those located further from Oslo is so high that it is reserved for the types of evidence that would be illegal to ship by mail, here described by an investigator in a different part of the country:

> The worst case is if the mail is lost. But in most cases, we can collect new samples. But if we are to talk about vulnerabilities, it's maybe that we are blessed if nobody loses it or snoops around in it when we ship using civil, normal post, which can happen, so the question is which layer of … cost. Sending a courier, which we have to do if there are large seizures of narcotics, or money, or weapons, we can't send those, we have to use a courier. So it's a cost–benefit thing, and we just have to hope that security is good enough. (CSI)

At the time physical evidence is shipped in the mail, the DNA coordinator at the police station sends an email request in PDF format to the forensic genetics laboratory. The first part of the request consists of a short summary of the case and the personal ID number of any involved persons. The second part is a digitalised evidence seizure list with the same information as is written on each paper bag, along with suggestions of what type of DNA trace to search for. When the laboratory receives the physical evidence by mail, they compare details from the paper bags with that in the email request to ensure that the correct form of analysis is performed on the correct piece of evidence. The laboratory compares their results with the national DNA registry and communicates results back to the police stations' DNA coordinators via email. This process requires information to co-exist in analogue and digital forms in an 'ecology of memory' that is both 'representing and re-presenting the past' (Schwartz, 2014: 8).

This part of the evidence-creation process illustrates how low- and high-tech are necessary in co-existence to meet the needs of a crucial part of the investigation. The more efficient alternative is to provide local access to laboratory equipment, which is costly, and requires other forms of local expertise. The investigators interviewed agreed that because no major incidents have happened yet using the business mailing system, it continues to be the preferred option. But more importantly, as with the other two examples in this section, crime scene investigators often do not appear to feel pressed for time or rushed into technological change. They therefore often choose not to adopt more efficient high-tech, but rather to improve already existing low-tech practices.

Discussion: Revisiting the efficiency paradigm

The efficiency paradigm in policing reaches into every aspect of the policing system. It is productive of changes and developments in both the organisational and the practical sides of police work. Particular attention to the technology that crime scene investigators operate with gives insight into the extent to which the efficiency discourse is reflective of actual practices, and how. As outlined above, crime scene investigators do not necessarily choose to use the most advanced tool available. There is therefore a need to revisit and re-conceptualise the notion of willingness to adapt to technological change, which is described as a key indicator of whether any new tool or method is welcome, actively integrated and successful. Literature suggests that willingness to adopt new technologies depends on the extent to which a new technology interferes with day-to-day tasks and administrative functions (Chan, 2001; Laufs and Borrion, 2022; Schroeder and White, 2009; Strom, 2016). The findings in this article suggest that a willingness to adopt does not depend on whether the implementation in itself is practical or efficient, but on the extent to which the technology protects the integrity of the user. Adding to this, informants explained that they continue to trust the standard business mail system because it has not yet produced any major faults. The explanation suggests that a serious incident has to occur for existing practice to undergo major change. Change is costly and requires restructuring on many levels – organisational, administrative and practical (Laufs and Borrion, 2022; Smith, 2019; Willis et al., 2020). The techno-practices described here are complex and networked, meaning an intervention would have an impact across networks of technologies and actors. A willingness to change may, therefore, require a major force to impact the current practice for it to be replaced. Instead of a forward-looking and, I suggest, vertical progress of change and adaptation, it appears that methods are added to accompany already existing practices in a horizontal expansion of the forensic toolbox.

For crime scene investigators, whose work is questioned at a trial, it may be more crucial that something has been done thoroughly than rapidly. To ensure something is done thoroughly, these actors opt to use what they experience as transparent forms of technology, sometimes vis-à-vis or as backups for more efficient but black-boxed tools. Methods of triangulation by employing laboratory equipment, a dog, plus liquid testing tools, establish the validity of a result in

tandem. As each of these methods may provide false results on their own because they provide the result without detailed human knowledge of the exact processes leading to a conclusion, triangulation improves the reliability of each result provided. Similarly, by using analogue notebooks and digital photographs as backups for each other, and written requests on paper bags vis-à-vis digital email requests, information can be double-checked and verified by multiple sources. By triangulating low-tech and high-tech methods, or using them as backup systems for each other, investigators are able to verify and trust the results. Memory and knowledge are retained in multiple domains, which enhances the perceived integrity of the work of the individual officer, although it also comes at the cost of the efficiency of the broader crime scene investigation process by requiring additional resources and lengthier processing times. The question, then, is whether the attraction of low-tech is indeed due to the current sophistication and complexities of high-tech. It is plausible to suggest that the low-tech method in a triangulation presents investigators with a hands-on way of confirming the results of the equivalent high-tech. Inconsistent results suggest faulty methods. When a dog marks blood that a machine has failed to mark, it provides insight into the limitations of the machine.

The issue of deep epistemic knowledge of evidence production processes is central to discussions about the state of forensic science and crime scene investigations practice today (Amorim, 2012; Kruse, 2016; Hopman, 2020; Santos, 2014). The tension at the core is that when new technological advances are produced, users have the choice of adapting or being left behind. By adapting, a loss of knowledge may occur, as actors are pushed to use more sophisticated but black-boxed tools that are less understandable to the individual user, and can lead to feeling lost or overwhelmed, losing oversight and agency (Sandhu and Fussey, 2021). The development of more efficient technologies provides the police with access to tools that make otherwise invisible traces visible, to calculate probabilities at a rapid speed, and leave less room for human error. The findings in this study, however, illustrate that investigators in the Norwegian context prefer human error over algorithmic or machinery error, which may be explained by the more readily detectable nature of analogue processes as opposed to less detectable errors in the types of knowledge produced via black-boxed methods. In practice, the output is not necessarily more important than the process in the Norwegian crime scene investigations context.

Conclusion

Human navigation within an ever more automated technological landscape is inherently a question of agency. To what extent can, or should, actors of the state rely on automated digital solutions? How is the agency of state actors influenced by a turn to new, digital forms of expertise? This study suggests that practical efficiency is not the most important aspect of technological implementation in practice. For crime scene investigators in Norway, low-tech represents an alternative to black-boxed tools – offering transparent and manual ways to produce results in an otherwise technologically sophisticated environment. Manual technologies do not, however, operate in isolation but are integrated with high-tech in various ways.

Finding that crime scene investigators may prefer to use tools at the lower end of the technological spectrum also constitutes a new angle for approaching police technologies in research. Because low-tech continues to play a crucial role for the crime scene investigations police, it is necessary to bring that perspective into discussions about the scientisation and modernisation of law enforcement. The mundane, or the less flashy, embodies a central role in knowledge production in policing, and is therefore deserving of dedicated academic attention (Hopman and Bleumink, 2023). Further, the question of the role of the human in the crime–technology nexus is made even more acute by ongoing efforts to develop new generations of policing and forensic technologies that seek to produce information from the genome, e.g. CRISPR and forensic DNA phenotyping (Kaufmann and Vestad, 2023; Toom et al., 2023; Wienroth, 2018). It is evident that technological evolution in this field is moving towards increased automation precisely because that which is being examined is invisible to the human eye and is composed of masses of data. Computers and digital solutions are needed to process these new types of information. When crime scene information is processed through technologies it becomes preserved within them as memory accessible to others and is as such a collective object. But the advancement of digital technologies has also rendered this an 'era of systemic stupidity' (Stiegler, 2013, cited in Stiegler, 2019: 25), meaning that deep systemic knowledge may be increasingly becoming a privilege of the machine rather than of the individual. This study shows that the use of low-tech is a way of retaining some agency, control, authority and understanding of knowledge production processes by actors whose core responsibility it is to ensure safe and precise practice. It is not necessarily resistance to change that makes the attractions of low-tech persist, but its value as a more transparent knowledge producer when combined with other high-tech practices.

Acknowledgements

I thank the reviewers for their constructive comments, and I would like to express my gratitude to Stefano Mazzilli-Daechsel, Mareile Kaufmann, Marina Hiller Foshaugen and Katja Franko for sharing their unique perspectives in our discussions of these topics.

Declaration of conflicting interests

The author declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This work was supported by the H2020 European Research Council, (grant number 947681).

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Note

1. This investigation is often referred to as 'the stick case' (pinnesaken).

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