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Tales from the police: Rhythms of interaction with mobile technologies

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Abstract

There is a need to understand and conceptualize the relationships between work activities, the context of work, and the use of mobile technologies because of the widespread diffusion of mobile information and communication technologies within organizational settings. The police have, since the advent of radio communication systems, deployed mobile technologies to support officers in conducting their jobs and offer an exemplary domain for studying the use of mobile technologies. This paper applies the theory of virtualization as a means to characterize the use of mobile technologies for operational policing. The paper suggests the concept of rhythms of interaction as a method of characterizing the alternation in intensity of communication through and with mobile technologies and the intricate relationships between physical and virtual contexts of work.

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1. Introduction

Mobile technologies such as the mobile phone (cell phone in North America) and the laptop have gained an immense success in many organizations as means of supporting geographically distributed work. Whilst the access to organizational

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information and communication with distant colleagues though mobile technology is an emerging phenomenon in the business world, the police have a long tradition of supporting geographically distributed work through the employment of state-of-the-art mobile technologies. Communication technology has transformed police practices. From the introduction of the telegraph in the late 1800s to the usage of two-way radios and computer-aided dispatching during the 1900s (Agar, 2003; Standage, 1998), information and communication technologies have radically changed the organization of police work and, with it, the expectations of various police services. This paper investigates the use of mobile technologies for the support of a particular aspect of police work, namely operational policing, which is time and safety critical work based upon officers attending incident sites by car, often in response to calls from the public (Clarke and Sykes, 1974; Manning, 2003). Operational policing is the core of policing and is highly geographically distributed (Manning, 2003). It involves the use of multiple mobile technologies across a range of activities in a variety of situations, which require some sort of reactive action either initiated by citizens' calls or by a police officer's observations.

Within the general study of mobile technology use in work settings, there is a need for as theoretically informed analysis of the relationships between the situational aspects of work, the institutional context of work and the use of mobile technologies supporting work. This is also the case within studies of police work in general and operational policing in particular. To study such a setting, we have adopted a particular theory on virtualization as one perspective informing our inquiry. This paper, therefore, investigates the question: *How can the theory of virtualization inform the study of mobile technologies applied for operational policing?* We explore this question through analyzing extensive data from a seven-month observational study of operational police work within a British constabulary. In particular this paper presents and discusses Response Vehicle's (RV) and Traffic officers' use of mobile technologies as means of assessing risk and coordinating work around scenes of incidents. The application of the theory of virtualization highlights the issues of coupling and decoupling of mobile technologies and we suggest the concept of *rhythms of interaction* as a characterization of the alternation in intensity of communication through and with mobile technologies.

The next section presents current research on policing and mobile technologies, and outlines our focus on operational policing. Section 3 presents the perspective of virtualization as a means for analyzing the use of mobile technologies. Section 4 outlines the ethnographic research approach chosen. Section 5 characterizes two operational policing roles, and illustrates their work through two tales from the field. Section 6 analyses the findings of the study in terms of rhythms of interaction. Section 7 discusses the findings, and Section 8 concludes the paper.

2. Understanding operational policing in the UK

What are the police? As argued by Klockars (1985), multiple perspectives can be adopted, depending on the observer's background and experiences. However, most

perspectives offer normative definitions that attempt to define the police in terms of its *ends*, and not in terms of actual activities (Klockars, 1985, p. 9). According to Klockars (1985, p. 9), a definition must be based on the *means* used for policing and not what these tools are used to do. *Thus, police are institutions or individuals given the general right to use coercive force by the state within the state's domestic territory.* This definition does, however, not convey the act of policing, and Bittner and Bish (1975, p. 30) cleverly capture the essence of policing as *something-ought-not-to-be-happening-and-about-which-something-ought-to-be-done-NOW*. This definition of police work is carefully calibrated to capture the widest range of alternatives. Police are not only concerned with illegal actions where coercive power is necessary, but also with other activities for the prevention of dangers such as holding people back or resolving disputes. The crucial elements of this definition are time and the implication of reactivity.

Policing in the United Kingdom (UK) is based on the 1829 Metropolitan Police Act, the *New Police* (1829), which has three main tenets still held to be true. The police are to be *unarmed, uniformed*, and only for the prevention of crime.¹ The situations in which the police are supposed to intervene are confined to two major events: helping citizens who approach them in the street and engage in situations that, according to the officer, require their attention. These interventions render the police visible in order to prevent crime, and involve the apolitical use of power in that the police respond indiscriminately to the call of citizens. In addition, the UK police is based on the principle of accountable officers. For one thing, the uniform is used as a symbol of accountability, to the extent that the large majority of police officers do not carry firearms. Most importantly, technology has been and is increasingly used as a mechanism of accountability. The social role of operational police is an important one and as such, is governed by strict guidelines for the practice of interacting with the public (Manning, 2003). The increased application of advanced technology in the police has been characterized as an *entrepreneurial revolution* where police are continuously scrutinized (Ackroyd, 1992). The police are internally held accountable by various surveillance technologies, management systems, audits and investigations. Externally, they are investigated by public complaints systems, the press, watchdog agencies, central auditors, and by the budgetary process (Ackroyd, 1992).

Police have traditionally relied upon *operational policing* – in contrast to *administrative policing* (Ackroyd, 1992), which is patrolling to respond to citizens' calls for help, and increasingly upon achieving faster response time; the NOW aspect (Clarke and Sykes, 1974). The domain of operational police work is the street and forms the core of police work (Manning, 2003). As Bittner (1970, p. 46) states, drawing on Heidegger (1977), *the role of the police is best understood as a mechanism for the distribution of non-negotiable coercive force employed in accordance with the dictates of an intuitive grasp of situational exigencies.* Once in the street, the police are supposed

¹ These tenets of reactive policing are radically different from the ones observed in most western countries including the United States, Italy, and Spain, where police forces have a more para-military and pro-active character (Manning, 2003).

to gain compliance through authority, power, and persuasion rather than by the use of arms (Klockars, 1985). Arguably this power and authority depends upon people acting and coordinating in concert.

The work of reactive policing is the one most often seen on TV.² It is on the street that the foundational and formative training of most police officers is situated (Manning, 2003). According to Manning (1992, pp. 389–390), research into the use of technology for policing has focused narrowly on managerial as well as control room aspects rather than on *employee morale or performance, control or management of crime, or delivery of enhanced services that improve the quality of community life and citizens' satisfaction with policing*. We are concerned particularly with this aspect. Operational policing involves groups of people coordinating and sharing information across space and time, and as such it forms a paradigmatic case of distributed collaborative work.

Information and communication technologies play a key role in the creation of new approaches to operational policing in the UK and other parts of Europe, particularly in intra-agency co-operation for the reduction of crime and disorder and in intelligence led policing (Anon, 1997; Anon, 2001; O'Dowd, 1998). The promise of technology to improve the effectiveness of controlling crime, as well as enhancing professional status and organizational legitimacy, has resulted in a long-lasting close affinity between technology and police work (Ericson and Haggerty, 1997, p. 390; Manning, 1992). As Manning (2003) argues, *the image and practice of police is shaped by information technologies*. Police forces in the UK are at the forefront of their use of information technology to support all aspects of their service delivery in operational terms through strong government support (O'Dowd, 1998; Povey, 2001). This development has been labeled *e-policing* (Povey, 2001). The main aspect of e-policing is that of mobilizing information in order to make it available to officers through mobile computing (Povey, 2001).

One of the ways in which police guidelines are enforced is through documenting and coordinating activities (Jones and Newburn, 2002). An officer must follow a standard of lawful conduct and the documenting and coordinating technique is an integral part of this. Failure to comply with documenting guidelines can have serious consequences in terms of lawful due process. Mobile technologies populate the environment of operational policing, and have received particular attention as a rather unique phenomenon that encapsulates the transformation of the activities of documenting and coordinating (Manning, 2003). According to most official reports (e.g., Povey, 1999), the police are expecting two distinguishable benefits from mobile technologies; better-informed officers, and improved coordination of limited resources at both individual and organizational level. Overall, they expect a better service to citizen in the form of a faster and more informed response to crimes. As Manning (1992) points out, the mere availability and accessibility of information does not necessarily mean that police officers and managers use information

² Our study is not concerned with Problem-Oriented Policing (PoP), a form of preventive policing not dependent on the use of the criminal justice system (Goldstein, 1990), but on the more classic patrol-based policing.

effectively or appropriately. Officers will make better decisions if they have the relevant and accurate information in the appropriate way, and at the appropriate time. Thus, the extent to which mobile technologies lead to more efficient and effective operational police work is a matter of more than just the technical characteristics of the devices. In short, success is highly dependent upon detailed understanding of how mobile technologies are relevant to the context³ of operational police work and to its mission of keeping the community in peace.

3. Virtuality as an analytical lens to study interaction with mobile technologies

This section presents a framework to conceptualize the phenomenon of interaction through and with mobile information and communication technologies (ICTs). The mass-diffusion of mobile ICTs digitizing and converging interaction has allowed information and communication behaviors to leave fixed geographical locations and instead to follow the work (Kakihara, 2003; Lyytinen and Yoo, 2002). Working day encounters are mixtures of mediated and unmediated interactions with the new mediated interaction allowing for the mobility of communicative networks and with them symbols, images and data (Kakihara and Sørensen, 2002; Urry, 2000a). Mobile technologies assume the character of a bridge that makes a distant and absent reality present. The main property of mobile devices is that of creating a virtual environment of interaction. The mass diffusion of such mobile devices have rendered actors interactive whilst situated in or moving between different working contexts, for example by sending and receiving SMS text messages while travelling between home and work.

The introduction of new technologies that populate the daily encounter with the workplace has generated an ongoing debate on the changing nature of human interaction patterns and overall disposition toward the world (Lee and Perry, 2001). At the heart of this debate lie the concepts of virtual worlds and virtuality. Discussion of the physical and virtual worlds, their differences and relationship, has proliferated in information systems literature, from tangible and social computing in the HCI tradition (Dourish, 2001; Heath and Luff, 2000) to more general philosophical accounts in the organizational and social science literature (Castells, 1996, 2001; Kallinikos, 2001; Urry, 2000b).

This paper chooses to focus on the nature and modality of interaction (Kallinikos, 1996, 2001). The way in which we can understand a virtual space is in terms of the nature of our encounter with it and one way to benchmark this encounter is by contra-posing it with situated interaction. This does not imply that situated and virtual interactions are two bipolar forces but that we can only understand the latter in terms of the former (Castells, 1996). Thus, their relationship is both complimentary and substitutive, depending on the situation in which this encounter takes place.

³ The circumstances, situations or events that form the environment within which something exists or takes place.

Virtuality was not born with modern technologies or with the advent of digitalization as can be found in Yates (1989) and Standage (1998). Ong (1988) traces virtuality to shifts from orality to literacy where attention gradually shifted away from natural communication, fragmenting the totality of communication (voice, tone of voice, facial expression, physical disposition, etc.). This virtualization of interaction resulted in *modularization* where only one or two of the human senses are predominant (Kallinikos, 1996, 2004). We become a big ear or a big eye because the symbol system (in the form of books, computers, telephones, etc.) demands only one or at most two of our senses. The devaluing of natural communication has permitted the emptying of physical presence in space and thus a weakening of the link between content and context in favor of a precise symbol system (Kallinikos, 2001).

This modularization has many effects such as emphasizing individuality (Bunzel, 2002), for example the reading of a book requires our complete visual attention and a non-oral environment. Modularization results in a *de-contextualization* of interaction and emphasis on *modularity* (Bunzel, 2002). In order for information to be transmitted across contexts a form of standardized codification is required. The standardization itself is separated from the context-embedded action of individuals but allows the very act of mobility of symbols (Kallinikos, 2001). The abstraction itself is needed for symbols, images and data to be transferred across contexts.

The encounter with the world with and through technology is only partial when compared with the natural (through our body and senses) encounter with it (Heidegger, 1977). Our physical world is a world of *reference*. We come into being by orienting ourselves to the world. In sharp contrast, *representation*, characterized by technology and virtuality, is an abstraction of the physical world modeled upon rules and regulation decided by the agents designing and implementing technology. These tensions between representation and reference are sources of misinterpretation and ambiguity (Agre, 2003). Technologically supported encounters cannot in principle represent the richness of the context that they seek to mediate and support, because of the very nature of modern technology, which seeks to separate and categorize our interaction in terms of the various senses, e.g., vocal interaction, visual interaction, etc. (Kallinikos, 2004). Representation and thus technology is not to be understood solely as the virtualization of a particular technique or set of techniques, but also as a worldview whose orientation filters out all other techniques (Kallinikos, 1996). The separation and categorization of interaction modalities seek to capture a facet of the way in which we interact with the world and not the totality of the experience. For instance, while a closed circuit TV (CCTV) camera can show events in distant parts of the city it can never replace the sense of being there. As Gibson (1979) elegantly puts it *one sees the environment not just with the eyes but with the eyes in the head*. Hence, while the CCTV camera can easily replicate the function of our eyes, it cannot replicate our being there and experiencing the situation (Neyland, 2004). For a police officer, being there is irreplaceable since using all five senses in combination is essential for resolving emerging conflicts, and since visibility is an essential role of the police. Hence, the usage of technology cannot be discussed *in separation from the body, its mediations with the surrounding world and the coherence of an acting self* (Giddens, 1984). When we act through technology we are engaging in a process of

coupling (Maturana and Varela, 1992), that is an intentional reference made effective. When we act with technology, we effectively dissociate it from our acting self. *Coupling* and *decoupling* imply building or breaking a relationship with a particular technology or set of technologies in order to take action (Dourish, 2001).

We argue that interaction with mobile technologies can be encapsulated by the concept of virtuality. Interaction with the virtual is different from situated communication in that we selectively use only one of our senses. Furthermore, technology by virtue of being representation is de-contextualized from the situated context of interaction and tends to increase ambiguity and misunderstanding (Kallinikos, 1996; Lee and Liebenau, 1999, 2002).

Luff and Heath (1998) suggest that *individual orientations toward objects are continually shifting and being transformed with respect to the ongoing interaction and activities*. We can assume that mobile devices, by bringing along the ability to interact with the virtual, change our situated actions. Therefore, understanding the situation of the user becomes of paramount importance. Distinguishing between situated interaction in the world on one hand, and interaction through technologies on the other, is at the heart of the virtuality idea. The paradigmatic perspective on social action motivating this approach is the *situated* perspective, which is grounded in the relationship between social action and the setting in which it unfolds (Clancey, 1997; Suchman, 1987). From a phenomenological perspective, technology can be seen as *representation*, and is then intrinsically linked with the user, the context and all its political, economical, and social rules (macro context). But even more so, the context is the immediate one of action with its people, moods, routines and idiosyncrasies (micro context). These sets of circumstances are bundled together in our understanding of context.

This article focuses on specific situations, namely workspaces. Workspace refers to the way in which spaces become vested with social meaning and behavioral norms that develop when the spatial, the physical and the mechanical elements of the environment are inhabited (Dourish, 2001). Workspaces and technology can be seen as complimentary in that they both contain structuring elements, a set of norms, procedures, and rules that govern the proper functioning of a meaningful process (Orlikowski, 1992). A mobile technology can be technically advanced, can have accommodating organizational arrangements, and could well be serving a social function important to an individual. However the mobile technology may still not be used. The blame for failed interaction with mobile technologies often falls upon the user interface, ergonomics of the devices, infrastructural issues, organizational and social arrangements, and finally, to a lesser extent, work context incompatibilities – that is the dialectical relationship between work contexts and mobile device usage. We argue that this latter issue is under-researched and yet perhaps the most important one to understand. Still, it is also the most problematic since it is the one *where the action is* (Dourish, 2001). Effective action involves being able to reorient ourselves towards the technology, turning it from an object of enquiry and examination into an information tool or communication medium that can be used – in short we must couple with and decouple from technology in order to use it effectively (Kallinikos, 1996). As Dourish (2001) argues; *traditionally the study of human computer*

interaction has in mind the human interacting with a computer interface on a screen. To this we can add that interaction with traditional computer interfaces has been based on the idea of continuous and engaging contact. This idea, as we will demonstrate, is inappropriate for mobile technologies.

4. Research approach

This study is concerned with interaction with and through mobile devices in distributed collaborative institutional settings and situations. In turn, the particular epistemological model presented therein has been chosen to reflect the reality of the case studied. To recapitulate, operational policing is highly regulated, involves a high degree of improvisation through its emergence and uncertainty, and is reliant on mobile technologies due to the geographically distributed nature of work. This calls for a conceptual framework reflecting such structural arrangements focusing on the tension between virtual and situated environments, or more specifically, how users with mobile devices interact in various physical contexts. This requires an initial understanding of the contexts of operational policing and the capacity of mobile technologies to be used effectively across changing situations. As we argued in the previous section, mobile technology is representation. This assumption focuses our understanding and guides us in the detailed analysis of how mobile technologies and users interact in practice. Such understanding is possible only at a micro level (Kallinikos, 2004). In the words of Manning (2003), *we look up and out from the car, rather than down from the subtleties of the changing post-industrial society.*

Initially we set out a theoretically guided inquiry into the problem's domain. We started by examining the main characteristics of interaction with mobile technologies and the relation between work context and virtuality. The concepts emerging from these discussions were applied in the design, execution, and analysis of the case study. Inspired by contemporary socio-technical theories, our analysis places the context of operational policing at centre stage by avoiding the view of mobile technology as a self-contained entity but rather as a highly contextualized tool and medium, which is affected by the social setting in which it is deployed and which in turn affects the social setting. Consequently, central to this research is the belief that technology is never an isolated body in a de-contextualized space, nor is it self-contained. Technology is significant as much for its functional qualities as for the degree to which it is part of a persuasive narrative that binds the object and the user together in a shared system of beliefs. Consequently, the method of this examination relies mainly on qualitative case study techniques (Creswell, 1994; Lee and Baskerville, 2003; Seale, 1999; Yin, 1994).

Observations and informal interviews constituted the primary modes of investigation. Data was collected with the aid of pen and paper, and a mobile phone camera. The use of pen and notepad mirrored how the officers themselves gathered evidence. This method for collecting and documenting data helped foster trust between the officers and the researchers because of the delicate nature of police work (VanMaanen, 1988). For instance, while having nothing to hide, most officers were concerned

that more invasive data collection techniques would be used to evaluate their performance with technologies. Thus, the usage of more *invasive* data collection tools such as audio-visual recording equipment was considered inappropriate for the subjects of study. The confidential nature of the information and the delicate nature of police job almost dictated a low profile gathering technique. Furthermore, pen and paper was the most appropriate technique when considering the rapid changes in the context of documentation and in particular due to the frequent bumpy rides on the backseat of patrol cars driving very fast down narrow English country roads.

A total of 250 hours of observation of police officers were conducted over 7 months in 2003. The study involved response vehicle (RV) officers attending emergency calls, traffic officers covering large areas for traffic accidents and other vehicle related policing, scenes of crime officers (SOCOs) lifting forensic evidence at scenes of crime, and the emergency control room responsible for taking calls from the public and coordinating operational policing. For the purpose of this particular analysis, we focus on the two operational police roles of response vehicle and traffic officer. These two units together represent the core of the operational function in policing in the UK. The study purposefully excluded studying detectives and the top-administrative aspects of policing.

Ethnographically inspired observation techniques allowed the researchers to obtain a deep understanding of the intricate interrelationships between the context of work and the application of a variety of mobile technologies. It is simply not possible to understand in-depth the nature of this relationship through interview methods. The very specific nature of some police work, for example encountering highly uncertain situations potentially involving personal risk for the officers, creates working conditions that must be experienced to be properly understood. The feeling of being there when routine and at times boredom rules, to the rapid changes into uncertain situations is of the essence for us to appreciate the possible motives for officers to couple or de-couple with particular mobile technologies in particular situations. The common depiction of police work as seen on TV and in movies does most often not convey the drama of real life as well as the relatively mundane nature of everyday work. Loud sirens, blue lights and high speed only gives a big adrenalin rush the first few times, then even this becomes part of everyday life. Also, most of the incidents attended were relatively mundane – much to the relief of the officers involved. However, each uncertain situation attended is dramatic in the sense that there always is the danger that someone can get injured.

The ethnographic study produced over 300 pages of handwritten observations and notes. These were transcribed in a digital format. Content analysis was performed with a focus on the mode of interaction with mobile technologies in operational policing and the situational characteristics and the nature of the incident attended. In addition, during the course of the analysis, we used interaction counts (Silverman, 1993) to quantify the various variables in an attempt to provide a theoretical generalization of the findings. The combination of generalization based on both qualitative and quantitative analysis of the extensive data from the observations and interviews provided a sound basis for establishing generalizability of a theory within a setting (Lee and Baskerville, 2003). The time spent on each police

activity was logged and used to create simple statistical data of the amount of time spent by each officer performing a certain activity in terms of the usage of mobile technologies. Some outliers were identified and excluded from the analysis. Member validation (Lincoln and Guba, 1984) was used as an integral part of the research method. Executive and detailed reports describing the job of and giving recommendations for officers were presented to key-representatives for the roles studied. This resulted in minor changes as the officers generally approved our descriptions as representative and precise. In addition, key activities were identified. The average amount of time spent per activity was then presented to the subjects of study for validation and a number of keywords were used (e.g. work, problem, contact, etc.) from which some categories emerged (e.g. activity type and environment type).

In this paper, we present the study through two narratives. The specific value of narrative is to catapult the reader into a particular context (VanMaanen, 1988). The two tales of operational policing aim at providing an accurate and detailed account of how mobile technologies were used in the field, and also serve as evocative accounts of the emotional richness of the situations. The tales are more concerned with the perspective of the users and the situations and less about the mobile technologies. They are about being there and observing and thinking about the setting, the people and the technology as one, and interaction as the phenomenon at the intersection between these, during which the actors perform their work through and with the technology. The tales are presented in a similar manner, as we would tell them to our colleagues, informal and impressionistic accounts open to discussion and falsification. The aim is to convey the feeling of being there without resorting to journalistic methods of simplifying reality (Manning, 2003). We have also included descriptions summarizing typical operational policing activities for the two roles of RV and traffic officer with the aim of providing rich background information on for example geographical and interaction aspects of the work.

5. Two tales of operational policing

“The violence and risk taking of policing is both sought and avoided; but the underlying question is always how to confront the unknown and the unseen. Like the combat soldier, the officer varies between a sense of fatalism and a sense of self-control and fate control. The grounding of the police officer’s social world is uncertainty, and responses to it is a mode of coping.” (Manning, 2003, p. 263)

This section explores the accomplishment of operational policing from the perspectives of RV and traffic officers. The two tales are written in first person to maintain the authenticity as we conducted fieldwork individually.

5.1. *Prelude 1: The work of response vehicle officers*

RV officers attend immediate response incidents such as domestic abuse, burglaries, and public fights. In addition, RV officers have to keep public peace, escort

prisoners, look for wanted people, patrol hot-spots, give a sense of police presence, appear in court as witnesses, collect information about crimes, as well as advise and calm down victims. A significant proportion of RV work can be characterized as “social work on blue lights” and the ability to engage with a variety of people in a commonsensical manner is essential. The key people with whom RV officers interact while on the move are control-room controllers, other officers and supervisors, the ambulance service, crime management centres, victims, offenders and witnesses. The closest and most important link for RV is the control room with intense and ongoing communication though information streamed to the police car MDT⁴ and through personal radio (PR) communication. The context of work for RVs is the office in around 33% of the time, mostly for documenting activities, the crime scene in 20% of their time, the vehicle in 25%, custody in 20%, and the briefing room in approximately 2% of their time. The office and custody are seen as the most time consuming environments. Some RV officers spend entire days doing paperwork in the office. However, RV officers see their core job in and derive most job satisfaction from the field, where they have between two and nine jobs in an 8-h shift. The average is five jobs, but if an arrest is made the number will tend to be much lower. The mobile technologies used by RVs are in decreasing order of frequency: PR, mobile phone, and MDT.

5.2. Tale 1: A domestic with RV

It is three in the afternoon. John, a rapid response vehicle officer, has just arrived at work and he exchanges some comments with the Chief Inspector:

‘The day is nice so they are going to get drunk and cause trouble.’

The Chief Inspector nods. John turns to me and tells me that today they have a very long list of immediate response incidents to take care of and that we are going to have *fun*. I follow John to the briefing room. The sergeant asks the about 15 police constables (PCs) to sit down. He then projects the latest incidents on the wall through a web-portal. With a touch of sarcasm, every incident is gone through and discussed by the various PCs.

‘I recognize this guy! He is Brown! He is extremely violent’ John says.

‘That sneaky criminal did it again, another car theft’ replied another PC. ‘I think his sister lives close to the station; we could go pay her a visit. Who wants to go?’

‘We’ll go later on today’ says John.

⁴ The mobile data terminal (MDT) is a system that provides information access and communication services to police officers via dashboard mounted touch sensitive displays. It can be used to get the log of incidents, communicate with other cars, do background checks and view and accept a list of incidents (Manning, 2003).

Another 10 incidents are discussed. Most of them have to do with small thefts. John, his partner Mary, and I proceed to the open space in the back of the station where RV officers compile their paperwork, check e-mail, input data in computer systems and exchange informal information. John tells me that he has to finish some paperwork from the previous day and then we can be on our way. Half an hour later, we are ready. We are going to a domestic violence incident that just came in through the radio. John takes a PR and equips all of us with stab-proof vests. We go to the vehicle parking just behind the police station. We jump in the vehicle, turn on the blue light and sirens, and *drive out* of the station. Mary is sitting in the passenger seat. While John is driving, Mary asks the control room to send her more details about the domestic in progress. Few seconds later we hear an alarm sound and Mary is reading the details of the incident on the MDT. She informs John that the person has a history of domestic violence and could be dangerous because he tried to attack an officer last time they were there. John tells Mary to ask for some backup if other cars are in the area. Through the PR Mary asks a controller for backup. While this goes on John also asks Mary to look at the log of the crime to see when the call took place and if there is a history at that address. The log tells us that the woman is in a state of distress and that the control room has organized for an ambulance. No previous history shows up for that address. Throughout the journey, Mary guides John when the road is clear on her sides when they need to cross junctions. *We arrive at the incident*. It is a council estate.⁵ A small group of people are standing outside. While John starts making his way to the apartment, Mary is calling the victim on her mobile phone in order to check the status of the incident. However, we get no answer. Mary keeps updating their position and situation via the PR. We decide to go up to the third floor. While we go up we hear the ambulance arriving and we see another RV from the window.

John repeatedly knocks on the door with no answer. The neighbor comes out of her house and claims she was the one making the initial call to the police and that the woman is inside the house. She adds that the guy that beat her has run away. While we speak with the woman collecting some details, the door starts opening slowly. John and Mary ask me to step back. Mary, through the PR, updates the control room of the current situation. From the door, a woman emerges, clearly in a state of shock and bleeding from the nose. Mary asks her if there is anyone in the house and she answers that there is nobody and that the perpetrator escaped using her car. John cautiously makes his way into the apartment to discover that there are no more people inside. Mary gives permission to proceed to paramedics to enter the scene after it is cleared of any possible danger. While the woman is in the care of paramedics, Mary asks her some questions regarding the domestic abuse. The woman gives the registration number of the vehicle used by the perpetrator to escape and the name of the perpetrator. Mary, using the radio, puts a warrant on the vehicle registration number. She then tells the woman that they are going to look for the man and asks how he was dressed and what he looks like. She keeps updating the control

⁵ Public housing with rented accommodation owned by the local authorities.

room with details as well as taking notes in her police issued notebook. Mary proceeds to tell the woman to be calm and that they are going to take care of it. We go back downstairs ‘*Let’s go back to the castle!*’ says John. We jump back in the car and slowly *drive back* to the police station. The MDT is off and the radio keeps broadcasting incidents happening around us. Since it is almost the end of the shift, unlike other times where we would *stand-by* and enquire about other incidents in the area through the MDT and radio, we go back to the office and document the incident we have just witnessed.

5.3. *Prelude 2: Working as a traffic officer*

Traffic officers attend fatal and serious accidents. In addition, officers take statements from accident witnesses, victims, and perpetrators, and they check for unlicensed, disqualified and/or intoxicated drivers, for stolen vehicles (parked or driven), and for dangerous drivers. They also streamline traffic by ensuring that the road is clear of accidents and animals and they support the victims of traffic accidents. While the Traffic officer faces a multitude of tasks, the majority fall into stopping unlicensed, disqualified, dangerous and intoxicated drivers, checking for stolen vehicles (PNC⁶), attending fatal and serious injuries, and other accidents. Their context of work revolves around the vehicle 65% of the work time, the scene of crime 5% of their time, the office 25%, hospitals 4%, and in recovery garages 1% of the time. During a typical day, traffic officers will attend from two to seven incidents. Their day starts in the office where information about the current state of affairs is exchanged with colleagues. After less than an hour the traffic officer is out of the office and will return to the office only during lunch time, there maybe finishing paperwork or go back out for the remainder of the day. Compared with RV, traffic officers spend more time in the vehicle and during stand-by times are constantly checking the MDT for incidents. Traffic officers travel great distances and serve an area of up to 200 square miles, and they are generally single crewed during the day and double-crewed at night. Whilst out on the road, traffic officers typically interact with other traffic officers and supervisors, the ambulance service, hospitals and undertakers, control-room controllers, victims, offenders and witnesses. As in the case of RV officers, the control room plays a vital part in the work of traffic and it can be seen as the closest ally to time-critical operational policing. The primary mobile technologies used by traffic officers in order of frequency are: MDT, KB radio (a long distance force-wide radio system), mobile phone, PR (only in cities), video camera and photographic camera.

5.4. *Tale 2: A high speed car chase with traffic*

It is 9 a.m. and Daniel, a traffic officer, is *waiting* in his BMW. Daniel has been in the traffic division for about 5 years and he loves his job. He describes his job

⁶ Police National Computer background check on people and vehicles.

as exiting and varied. He has to talk to people most of the time. So it never gets boring since *'people always have new ways of committing crimes.'* We get into the car and *start driving* around. Daniel turns the MDT and KB radio on. There are not yet any reported traffic incidents. The sun is shining and the MDT is difficult to read. Daniel drives to a roundabout and parks in a small street with good visibility to the main road. He keeps updating the MDT to see if anything comes in, but nothing so far. Daniel tells me that this is his favorite spot because many cars are stolen around there and if that does not happen there is always a misbehaving driver. He keeps inputting license plates of suspicious vehicles into the MDT. Sure enough a few entries later we find a license plate that matches that of a stolen car. Daniel tells me to hang on tight. I can feel the engine getting louder. Daniel makes a quick U-turn. He turns on the sirens, and through the radio, he updates his position confirming that *he is pursuing* a stolen vehicle. He then accelerates so quickly I disappear deep into the car-seat. The road is straight and we reach high speed in the hope of catching the vehicle. A few seconds later, we are tailing the stolen vehicle. The driver does not seem to want to stop. After various attempts to warn the driver, Daniel tries to look at the driver's face to see if he can recognize him. After glancing at the driver's face for a few seconds, Daniel recognizes him. *He's Liam! He is disqualified and he won't stop since he knows he's going to go in for a while this time.* Daniel updates his position via the radio again and informs the control room that the vehicle is not stopping and identifies the driver.

The stolen vehicle takes a sharp turn and enters a driveway at high speeds. Suddenly the vehicle breaks vigorously to come to a stop. We park right behind it and *Daniel steps out* of the vehicle. The driver of the stolen vehicle is attempting to escape on foot. Daniel tells me to stay next to the police car and wait. The driver is running across the street in an attempt to hide. Daniel is behind him shouting to stop but with little success. Daniel, thanks to the help of various witnesses, then manages to catch up with the driver and handcuff him. The driver is very agitated and attempts to escape. Daniel asks me to open the backdoor of the car. He drags the *driver back* to the car and via the radio informs the police station of an arrest. After the driver is dropped at the police station, Daniel has a lot of paperwork to complete as well as escorting the prisoner to custody and conduct an interview. Two hours later, we are back on the road. We receive a radio call for an accident that has happened on a road out of town. Daniel pulls over and asks for the incident to be sent to the MDT. The MDT reveals that there are two vehicles involved in the crash, a motorcycle and a small van. The log also tells us that an ambulance is on the way. Daniel puts the sirens on and we are on our way. Within 7 min, we are at the incident scene. The ambulance is already there. The driver of the van is uninjured while that of the motorcyclist is unconscious and is being taken inside the ambulance. Daniel starts talking to the driver of the van to reconstruct the incident. Daniel turns to me and tells me that we need to perform blood tests to see if any of the drivers are under the influence of substances. This is due to the fact that there are discrepancies in the reconstruction of the incident. Daniel then calls the control room to get a towing truck for the van.

6. Operational policing and mobile technologies

Both roles studied conducted work in a highly geographically distributed manner. Although both roles spend significant part of their time in the office, we have excluded this from the analysis as they here primarily conduct administrative and not operational police work (Ackroyd, 1992; Manning, 2003). Both roles engage in continuous documenting and coordinating of activities through similar mobile technologies. We can tentatively indicate their behavioral patterns in terms of the functional characterization of travelling, visiting, and wandering (Kristoffersen and Ljungberg, 2000). However, this distinction does not significantly illuminate the relationship between the specific nature of the work experienced and the viability of supporting it through different informational and interactional modalities. The analysis of the interrelationships between mobile technologies and the context of operational policing must be based on an understanding of the specific elements shaping the officers daily work. When asked about their typical context of work, the officers responded with a number of possible contexts. The police vehicle was the most common answer, followed by crime scenes such as domestics, burglaries, and public disturbances. The observed usage of mobile technology changed dramatically depending on the type of activity and the locale of the activity. For instance, when asked about problems they encounter on a daily bases they would discuss in-car usage of mobile technology and outside usage using different standards (e.g. arresting a person or waiting for a call). This observation guided the definition of five primary activity types of operational policing. These were based on a combination of careful codification of the field notes and theoretical reflections. The activity types are based on the fundamental distinction between *waiting in the car*, *travelling* and *engaging with the scene of incident*. This tripartite was further elaborated, distinguishing between waiting in the car before and after an incident, and driving to and from an incident. This leaves us with the generic cycle of operational policing where officers wait in the car before travelling to the incident. Here they engage in resolving the situation after which they drive from the scene of incident and wait around in the car afterwards. These five activity types can be recombined in a number of ways and the streamlined sequence presented is often broken up at various stages, for example when RV officers return to the station after an incident. Furthermore, incidents may be engaged in parallel with less urgent ones being placed in the background to re-emerge later.

The core of operational policing is on the street and at the scenes of the incidents attended by the officers (Manning, 2003). Operational policing represents cycles of waiting, travelling and engaging, and the scenes of incidents represent the source of geographical mobility either from calls from the public or from the officers generating the situation through the use of police information or own background knowledge. Within the activity types and in the rapid and subtle shifts between them there are significant differences in the mobile technologies and interaction modalities chosen by officers. These rhythms of *coupling* and *decoupling* are the situational coming together of the individual officers' routines and their improvised use of familiar

modes of virtual interaction with and through their mobile technologies. The five activity types signify units where we found relative stability in the types of technologies used and the interaction modalities chosen. Changes from one activity type to another imply shifts in the rhythm of interaction since the physical conditions for interaction changes, as does the character of the work involved. This is reflected in Table 1 where the properties of interaction are further elaborated into virtual, situated or both. This shift, as it will made be clear in the next section, represents rhythms of interaction. This implies shifts from coordinating activities to documenting incidents, from relaxed scanning of the MDT to hectic negotiations on the radio and downloading of data to the MDT in order to manage the uncertainties of the incident approaching. Table 1 presents for each activity type, within each role, the ranking of mobile technologies in order of importance, and summarizes the predominant modalities of virtual interaction.

Table 1

The estimated distribution of work activities between the five main operational policing activity types and the ranking of mobile technologies in use according to importance in each activity type, and summary of preferred modality of interaction also by activity type

Role	Technology ranking and virtual modality	Mobile technology and interaction modality by activity type				
		Standing-by in car before incident	Driving to an incident	Taking action at the incident	Driving from the incident	Standing-by in car after incident
RV	Time (%)	15	25	34	13	13
	Ranking	1. MDT 2. Radio 3. Mobile phone	1. Radio 2. MDT 3. Mobile phone	1. Radio 2. Mobile phone	1. Radio	1. Radio 2. Mobile phone 3. MDT
	Modality	Data and voice	Voice or data	Voice or none	Voice	Voice or data
	Interaction properties	Virtual interaction	Virtual and situated interaction	Situated interaction	Situated interaction	Virtual and situated interaction
Traffic	Time (%)	25	34	21	9	11
	Ranking	1. MDT 2. Mobile phone 3. Radio	1. Radio 2. MDT	1. Radio	1. MDT 2. Radio	1. MDT 2. Radio
	Modality	Data and voice	Voice and little data	Voice or none	Data and voice	Data and voice
	Interaction properties	Virtual interaction	Situated interaction	Situated interaction	Virtual and situated interaction	Virtual interaction

As we can see in [Table 1](#), Traffic officers spend more time standing-by than RV officers who in turn spend a significant larger proportion of their time at scenes of incidents. This is also due to the fact that traffic officers have a larger geographical area to cover and do not stop by the police station as often as RV. The uses of mobile technologies were linked to particular tasks and the configurations of technologies studied were generally well adapted over time to the individual officer and activity type. The constabulary studied is considered relatively understaffed and quite busy, compared with neighboring districts. This paradoxically implied a more advanced use of mobile technologies, but this can partly be explained in terms of the primary purposes of the technology. Operational policing is time and safety critical work, and managing uncertainty through gathering information prior to engaging in the incident denotes a careful balancing between the need for a rapid but at the same time informed and coordinated response. This often resulted in a particular rhythm of interaction where the officers, even when at the scene of incident, would purposefully hesitate and gather further information before decoupling all technologies and engaging in the incident. [Table 2](#) illustrates the typical information the officers required across the five activity types, as gleaned from the MDT, over the radio, and from colleagues or callers through the mobile phone.

The geographically distributed and safety critical nature of the work of both roles implied shifts between monochronic and polychronic working patterns ([Lee and Liebenau, 1999, 2002](#)). When waiting in the car and in particular when driving to an incident, the officers simultaneously coordinated, navigated, read out information from MDT, and requested information from the control room over the radio. The driver was continuously kept updated with background information about the incident delivered directly to the MDT, or discussed with the control room over the PR. The other officer would also support the driver in navigating intersections. Here, the virtual represented by the PR and MDT, and the situated in terms of the elegant dance between slightly confused cars, buses and pedestrians melted into one despite high speed and an inferno of noise created by sirens and blinking blue lights.

This polychronicity radically changed when officers engaged in the incident where the temporal behavior of events and tasks demanded monochronic temporal behavior of the officers. Indeed, the main reason for RV cars being double crewed when attending domestic incidents was for each officer to engage with one of the conflicting parties of the incident and in this way diffuse the situation. The rhythms of polychronic and monochronic temporalities also imply coupling and decoupling of various mobile technologies. Whereas there was relative flexibility in interaction modalities whilst officers waited around in the car, this was rapidly transformed into a highly technology hostile environment, where even the unobtrusive PR was not allowed to disturb the attention of the officer. Paradoxically, voice interaction is generally considered obtrusive ([Ljungberg and Sørensen, 2000](#)), but in these situations, the personal or car-mounted radio offered the only possible modularization that would not act as an even more obtrusive virtual filter between the officer and the incident. This can be explained as the radio offering unobtrusive awareness of the situation as well as a lifeline to colleagues ([Heath and Luff, 2000](#)). [Table 3](#) shows the

Table 2
Information types required by the two operational police roles across the activity types

Role	Operational police work distribution by activity type				
	Standing-by in car before incident	Driving to an incident	Taking action at the incident	Driving from the incident	Standing-by in car after incident
RV	Active incidents queue. Wanted people	Destination, risk assessment, vicinity and status of other vehicles	Vicinity and status of other vehicles. Ongoing risk assessment. Positive ID of offender	Status of custody. Active incidents queue	Active incidents queue. Status of custody
Traffic	Active incidents queue, status of other units, wanted people, hot spots and disqualified drivers	Destination, risk assessment, vicinity and status of other vehicles	Vicinity and status of other vehicles, ongoing risk assessment, positive ID of offender	Hot spots, status of custody, active incidents queue	Active incidents queue, status of custody

observed number of uses of the three primary mobile technologies across different tasks.

7. Discussion

Mobile technologies serve multiple purposes and generally extend the institution of the police to the situation of operational policing. This is constituted through a number of elements. The technologies provide legitimacy for the officers by symbolically representing the institution; they render the officers accountable through documentation and control of actions; they provide a sense of security through connecting to control rooms and colleagues, and they support some emancipation of officers through the ability to provide global and individually tailored views of police databases and activity logs. The technologies provide essential background information through polychronic temporal behavior, and serve as an essential “life-line” to colleagues and the control room during intense monochronic temporal behavior. In an unobtrusive manner the technologies award officers awareness of current states-of-affairs, such as other incidents, the active queue of incidents, other officers, etc. In order for a mobile technology to be successfully adopted it must decouple with ease and slide in the background when the officer enters an incident and the need for monochronic engagement intensifies. As the rhythms of interaction suggest, both coupling and decoupling are needed for a mobile technology to be effectively embraced in the workplace. This is one of the primary reasons for the personal radio being highly regarded by the officers and personal digital assistant experiments failing for operational policing. The process of decoupling the technology is time-critical simply because the process of shifting attention and engaging is time-critical. However, it is equally important that the technology can swiftly enter into the situation when required in the “now”, i.e. engage in instant coupling.

Adopting a view of mobile technology in which the device and its associated infrastructure is viewed as a separate entity in the analysis of its use will fail to take into consideration essential aspects governing the individual users’ choices regarding its use. The coupling and decoupling of the mobile technology is constituted by a wide range of elements spanning the specific characteristics of the technology, the routines of the user, specific idiosyncratic choices by the user, the actualities of the situation, the norms, values and rules governing the role played by the user, and the institutional context in which the technology is residing. Virtualization is a theoretical lens characterizing mediated communication through and with mobile technologies in the context of operational policing understood through rich descriptions from detailed observations; we suggest the concept of *rhythms of interaction* as a theoretical means of characterizing the alternation in intensity of communication through and with mobile technologies as exercised by officers each and every day. The *coupling* and *decoupling* of technology is not an instance of action but a *rhythmical* relationship between the virtual and the physical unfolding in time. Rhythms are *the alternation in the intensity of being busy* (Lee and Liebenau, 2002). They are the juggling between virtual and situated spaces of interaction and they unfold in the action (Bunzel,

Table 3

Overview of the number of observed uses of the three primary mobile technologies across various tasks

Mobile technology	Overview list of incidents	PNC name	PNC vehicle	Communicate with other officers	Get incident log details	Update geographical position	Update crime log
MDT	21	5	16	3	17	2	4
Radio	5	3	9	8	11	15	10
Mobile phone	1	1	2	23	0	8	1

2002). The rhythms themselves reflect the sense of simultaneity (Bunzel, 2002), of improvisation meeting routines, and of institutions meeting situations. Rhythms are a form of situated action and can be associated with the concept of improvisation (Ciborra, 2002; Weick, 1998). The frequent coupling and decoupling from mobile technologies are pre-cognitive resolves of routines and improvisation in the “now” (Ciborra, 2002; Weick, 1998). These lead to changes in interaction modality within and between the five identified activity types; standing-by in car before an incident, driving to an incident, taking action at the incident, driving from the incident, and standing-by in car after an incident.

A commonly adopted paradigm of mobile technology use is one of *perpetual contact* (Katz and Aakhus, 2002), as also reflected in the ways in which mobile phones are marketed by handset and service providers (Agar, 2003). The logic of perpetual contact is the compelling image of pure communication that has abandoned the constraints of the body (Katz and Aakhus, 2002). However, phenomenologically, mobile technologies sit at odds with our bodies (Fortunati, 2002). For operational policing it is, however, not the quantity of encounters but the quality of the interaction that is important, and successful use is not necessarily a linear function where increased percentage of use indicates increased utility. Through the lens of the theory of virtuality we find the paradox that as the degree of mobile data support increases, the degree of de-contextualization increases as well. The closer we get the more distant we are. Given the mediating functions relying on modularization and abstraction, mobile devices separate the actor from the physical scene of action or rather make the actor interact with such a scene in a virtual way. This represents a transformation of the situation into one in which we become a big ear or a big eye with less peripheral awareness and not a fully engaging individual with the ability to engage with all our senses (Heath and Luff, 2000). The notion of perpetual contact also relates to the notion that mobile technologies are becoming ubiquitous implying pervasive, mobile and embedded devices (Lyytinen et al., 2004). As such we can of course perceive the mobile technologies studied in operational policing as embedded in the car (MDT) or embedded in the uniform (personal radio). However, the notion of ubiquitous technologies engenders the view that they are effortlessly available at all times and indeed that they are desired and useful at all times – forever *ready-to-hand* (Flores and Winograd, 1986). Our study clearly shows this not to be the case. In this respect we have attempted a deeper understanding of the ubiquity of mobile technologies in a physical sense. The continuity is paradoxically characterized by discontinuity, namely the coupling and decoupling with the technology in use through the rhythms of interaction. When the officer enters the incident, mobile technologies will often be required to instantly disappear and be transformed from *ready-to-hand* to *in-the-pocket*. During conversations, several officers mentioned the lack of usability of, for example, handheld PDA's as means of supporting the identification of suspects. As one officer argued: “*When faced with a person, who potentially can hurt you badly, you want to look that person in the eyes and not stand there and stare into a screen*”. Thus, operational police officers cope with the unknown through varying senses of fatalism and fate control (Manning, 2003, p. 263), and immersed in the situation, the officers must cope with complex and potentially conflicting relationships

between virtual interactions and physical actions. Furthermore, operational police officers' primary purpose is to engage with the physical world and their choices of mobile technology use depend heavily on the ability of the technologies to accommodate this.

8. Conclusion

The aim of this paper has been to provide a detailed analysis of the role of mobile technologies for operational policing. To accomplish this we presented two examples of operational policing in the UK, the roles of response vehicle and traffic officers. We analyzed in detail how their operational police work was conducted through and with mobile technologies in the physical contexts of the police cars and the incidents. The analysis highlighted five general activity types particularly pertinent for the coupling and decoupling of mobile technologies. We forwarded the concept of *rhythms of interaction* characterizing the alternations in intensity of communication through and with mobile technologies as characterized by the five general activity types in operational police work. The research can contribute to the understanding of highly distributed work and use of mobile technologies within the police. This area of work is quite difficult to gather proper entry to and there are very few studies within information systems of the operational aspects of policing, in particular research following police officers. The research can also contribute to a more general discussion of the role of mobile technologies in terms of virtualization, and of the rhythms of interaction – as means of coupling and decoupling. The rhythms of interaction make an important contribution when seen in light of current research on ubiquitous computing. The ubiquitous computing environment is not uniformly ubiquitous. Different mobile technologies come back and forth in the environment of work as virtualized and situated interactions interlace over time. This questions the basis of ubiquitous and pervasive computing, namely the design of ever-present information systems. Although, as argued by Jones and Newburn (2002), police organizations are different from commercial firms since their use of information technology is not driven by market considerations but rather externally imposed demands for public accountability, there are perhaps lessons to be learnt from this study regarding the use and role of mobile technologies in commercial organizations. This will, however, remain a subject for further research.

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References

- Ackroyd, S. (1992). *New technology and practical police work: The social context of technical innovation*. Buckingham: Open University Press.
- Agar, J. (2003). *Constant touch: A global history of the mobile phone*. Cambridge: Icon Books.
- Agre, P. (2003). Writing and representation. In M. Mateas & P. Sengers (Eds.), *Narrative intelligence*. Amsterdam: John Benjamins.
- Anon (1997). Policing with intelligence: Criminal intelligence – a thematic inspection on good practice. Her Majesty's Inspectorate of Constabulary.
- Anon (2001). White paper: Policing a new century: A blueprint for reform. Police Reform and Bill Unit Home Office, 5 December.
- Bittner, E. (1970). *The functions of the police in modern society: a review of background factors, current practices, and possible role models. Crime and delinquency issues*. Chevy Chase, MD: National Institute of Mental Health, Center for Studies of Crime and Delinquency.
- Bittner, E., & Bish, R. L. (1975). *The functions of the police in modern society: a review of background factors, current practices, and possible role models*. Seattle: University of Washington Press.
- Bunzel, D. (2002). The rhythm of the organization. In R. Whipp B. Adam & I. Sabelis (Eds.), *Making time: Time and management in modern organizations*. Oxford: Oxford University Press.
- Castells, M. (1996). *The rise of the network society*. Oxford: Blackwell.
- Castells, M. (2001). *The Internet galaxy*. Oxford: Oxford University Press.
- Ciborra, C. (2002). *The labyrinths of information: Challenging the wisdom of systems*. Oxford: Oxford University Press.
- Clancey, W. J. (1997). *Situated cognition*. Cambridge: Cambridge University Press.
- Clarke, J. P., & Sykes, R. (1974). Some determinants of police organization and practice in a modern industrial democracy. In D. Glaser (Ed.), *Handbook of criminology* (pp. 455–494). Chicago, USA: Rand-McNally.
- Creswell, J. W. (1994). *Research design: qualitative and quantitative approaches*. Thousand Oaks, CA: Sage Publications.
- Dourish, P. (2001). *Where the action is. The foundations of embodied interaction*. Cambridge, MA: MIT.
- Ericson, R. V., & Haggerty, K. D. (1997). *Policing the risk society*. Toronto; Buffalo: University of Toronto Press.
- Flores, F., & Winograd, T. (1986). *Understanding computers and cognition – a new foundation for design*. USA: Addison-Wesley.
- Fortunati, L. (2002). Italy: Stereotypes, true and false. In J. E. Katz & M. Aakhus (Eds.), *Perpetual contact* (pp. 42–62). Cambridge: Cambridge University Press.
- Gibson, J. J. (1979). *The ecological approach to visual perception*. Boston: Houghton-Mifflin.
- Giddens, A. (1984). *The constitution of society*. Cambridge: Polity Press.
- Goldstein, H. (1990). *Problem-oriented policing*. London: McGraw-Hill.
- Heath, C., & Luff, P. (2000). *Technology in action*. Cambridge, UK: Cambridge University Press.
- Heidegger, M. (1977). *The question concerning technology and other essays*. New York: Harper & Row.
- Jones, T., & Newburn, T. (2002). The transformation of policing? Understanding current trends in policing systems. *British Journal of Criminology*, 42, 129–146.
- Kakihara, M. (2003). *Emerging Work Practices of ICT-Enabled Mobile Professionals*. PhD Thesis. The London School of Economics and Political Science. Available from: <http://is.lse.ac.uk/research/theses/>.

- Kakihara, M., & Sørensen, C. (2002). 'Post-modern professionals' work and mobile technology. In *Information Systems Research Seminar in Scandinavia (IRIS'25)*. Denmark: Copenhagen Business School.
- Kallinikos, J. (1996). *Technology and society*. Munich: Accedo.
- Kallinikos, J. (2001). *The age of flexibility*. Sweden: Academia Adapta.
- Kallinikos, J. (2004). Farewell to constructivism: Technology and context-embedded action. In C. Avgerou C. Ciborra & F. Land (Eds.), *The Social Study of Information and Communication Technology: Innovation, Actors, and Contexts*. Oxford: University Press.
- Katz, J. E., & Aakhus, M. (Eds.). (2002). *Perpetual contact*. Cambridge: Cambridge University Press.
- Klockars, C. B. (1985). *The idea of police. Law and criminal justice series*. Beverly Hills, CA: Sage Publications.
- Kristoffersen, S., & Ljungberg, F. (2000). Mobility: From stationary to mobile work. In K. Braa C. Sørensen & B. Dahlbom (Eds.), *Planet Internet* (pp. 41–64). Lund, Sweden: Studentlitteratur.
- Lee, A., & Baskerville, R. (2003). Generalizing generalizability in information systems research. *Information Systems Research*, 14(3), 221–243.
- Lee, H., & Liebenau, J. (1999). Time in management and organization studies: A critical review and a new direction of research. *Organizational Studies*, 20(6), 1035–1058.
- Lee, H., & Liebenau, J. (2002). Managing virtual work environments. In R. Whipp B. Adam & I. Sabelis (Eds.), *Making time: Time and management in modern organizations*. Oxford: Oxford University Press.
- Lee, H., & Perry, M. (2001). Contextualising virtuality: Polychronicity and multipresence. In Proceedings of the international conference on spacing and timing: Rethinking globalization & standardization, Palermo, Italy, 1–3 November 2001.
- Lincoln, Y. S., & Guba, E. G. (1984). *Naturalistic inquiry*. Beverly Hills, CA: Sage Publications.
- Ljungberg, F., & Sørensen, C. (2000). Overload: From transaction to interaction. In K. Braa C. Sørensen & B. Dahlbom (Eds.), *Planet Internet* (pp. 113–136). Lund, Sweden: Studentlitteratur.
- Luff, P., & Heath, C. (1998). Mobility in collaboration. In *Proceedings of ACM 1998 conference on computer supported cooperative work* (pp. 14–18). ACM Press.
- Lyytinen, K., & Yoo, Y. (2002). The next wave of nomadic computing: a research agenda for information systems research. *Information Systems Research*, 13(4), 377–388.
- Lyytinen, K. J., Yoo, Y., Varshney, U., Ackerman, M., Davis, G., & Avital, M. et al. (2004). Surfing the next wave: design and implementation challenges of ubiquitous computing. *Communications of the AIS*, 13, Article 40. <http://cais.aisnet.org/> .
- Manning, P. K. (1992). *Organizational communication. Communication and social order*. New York: A. de Gruyter.
- Manning, P. K. (2003). *Policing contingencies*. Chicago: University of Chicago Press.
- Maturana, H. R., & Varela, F. J., 1992. The tree of knowledge: The biological roots of human understanding. Revised edition. Shambhala, Boston, MA.
- New Police, (1829) Metropolitan Police Act – The new police. Available from: <http://dspace.dial.pipex.com/town/terrace/adw03/peel/laworder/metact.htm>.
- Neyland, D. (2004). Moving images: The mobility and immobility of kids standing still. In N. Green & S. Smith (Eds.), *The life of mobile data: Technology, mobility and data subjectivity*. University of Surrey.
- O'Dowd, D. J. (1998). Beating Crime: HMIC Thematic Inspection Report 1998. Her Majesty's Inspectorate of Constabulary.
- Ong, W. J. (1988). *Orality and literacy: The technologizing of the word*. London, UK: Routledge.
- Orlikowski, W. (1992). The duality of technology: Rethinking the concept of technology in organizations. *Organization Science*, 3(3), 398–427.
- Povey, A. (1999). *Plans, plans, plans: An education policy based on central control*. London: Centre for Policy Studies.
- Povey, K. (2001). Open all hours: A thematic inspection report on the role of police visibility and accessibility in public reassurance. Her Majesty's Inspector of Constabulary, December.
- Seale, C. (1999). *The quality of qualitative research. Introducing qualitative methods*. London: Sage.
- Silverman, D. (1993). *Interpreting qualitative data: Methods for analysing talk, text and interaction*. London: Sage.

- Standage, T. (1998). *The Victorian Internet*. London: Weidenfeld & Nicholson.
- Suchman, L. (1987). *Plans and situated actions: The problem of human-machine communication*. Cambridge: Cambridge University Press.
- Urry, J. (2000a). Mobile Sociology. *British Journal of Sociology*, 51(1), 185–203.
- Urry, J. (2000b). *Sociology beyond societies: Mobilities for the twenty-first century*. London: Routledge.
- VanMaanen, J. (1988). *Tales of the field: On writing ethnography*. London: The University of Chicago Press Ltd..
- Weick, K. E. (1998). Improvisation as a mindset for organizational analysis. *Organization Science*, 9(5), 543–555.
- Yates, J. (1989). *Control through communication: The rise of system in american management*. Baltimore: The Johns Hopkins University Press.
- Yin, R. K. (1994). *Case study research: Design and methods* (2nd ed.). Newbury Park: Sage Publications.