A spatial and temporal analysis of the collaborative information behaviour of police officers performing Stop and Search.

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ABSTRACT

This study explores the impacts arising from the introduction of mobile technology (a Personal Digital Terminal or PDT) as a way to introduce information disintermediation within policing. Using a case approach, the activities' and reactions of police officers performing a common task that of the Stop and Search was used as a means to understand this change.

It was found that the intended audience, officers working alone, rejected the technology because usage encouraged engrossment on the PDT leading to discontinuities in their aware of the passage of time (Temporal) and the surrounding environment and the people within it (Spatial). As an occupational group preoccupied with risk, this was seen as posing an unacceptable risk to their safety. However, this was overcome in an unanticipated usage scenario where officers collaborated to perform the Stop and Search. A three factor conceptual model built around the intersection of Spatial/temporal factors and the perception of risk is presented and common usage scenarios from the case study were mapped against it.

The study argues that there is a need for those designing and implementing mobile technologies to consider more carefully not simply the organisational role that technology is provided for but the cultures that underpin them and informs the actions of individuals fulfilling such roles. In this case, the preoccupation with managing and minimising risk that Police officers develop due to a mixture of experience and occupational culture. In addition, the study has highlighted that our understanding of how individuals come together as groups for the purposes of information seeking when using technology designed to remove information intermediaries is rudimentary and more work must be done in this area to overcome the issues highlighted here.

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GLOSSARY OF TERMS

50/90:	Form used to record the details of any "Stop and Search" or "Stop and Account" that an officer conducts
ASB:	Anti-social Behaviour
ACPO:	Association of Chief Police Officers
BCU:	Borough Command Unit – a geographically defined area within a force to provide sub-divisions for operational policing
AVLS:	Automatic vehicle localization systems
BVPI:	Best Value Performance Indicator
Disproportionality:	The term used to describe the use of the Stop and search powers to stop a higher percentage of any given ethnic community than the indigenous white community
C&C:	Command and Control
CPA:	Crime Pattern Analysis
CBM:	Community Beat Manager
GPRS:	General Packets Radio System
HMIC	Her Majesty's Inspectorate of Constabulary
MDT:	Mobile Data Terminal
PDA:	Personal Digital Assistant
PDT:	Personal Digital Terminal
PNT:	Personal Navigation Terminal
PNC:	Police National Computer
PITO:	Police Information Technology Organisation
NPIA:	National Police Improvement Agency
IBO:	Integrated borough operations
R61:	Recommendation of the Lawrence enquiry that all stops and searches provide a receipt/audit trail for the public
SOCO:	Scenes of Crimes Officer

Chapter 1 – Introduction

1.1 Introduction

Much has been written about the changing nature of work and activity with industrial nations, where developed (and increasingly developing) economies have moved away from manufacturing and the mass production of goods to a economic model based around the capture and dissemination of information, experience and knowledge - the so-called "knowledge economy" (Tordoir 1995). Organisations operate in an environment radically different from the model developed during the industrial revolution; one where the fiscal worth of a firm is based more on the Labour of its workforce rather than the capital that it possesses (Clark 1985; Feng & Zou 1998; Smith & Webster 2000; Claver et al. 2001; Glass 2001; Imparato 2001). This shift to a knowledge economy has created an organisational need for timely and efficient access and the ability for workers to be able to access information wherever they are at any time, something that Perry et al describe as an 'irresistible urge' (2001, p.3) for 'anytime, anywhere' access. One of the primary consequences of this change has been the shift away from large centralised information management systems managed to more decentralised systems where the primary user of the information is in charge of managing and maintaining information (Davenport et al. 1992; Barua & Ravindran 1996; Nonaka et al. 1996; Diefenbacher 1997).

For the individual, this has resulted in the need to develop a different attitude and skill set from what was desirable in the past, the need to become an information worker. The information worker operates in a world where physical location or presence and the boundaries to access are continuously being destroyed, while their ability to skilfully interrogate and manage the information systems that they require to fulfil their duties has increased. Moreover, supporting those knowledge workers has lead to innovation in both information systems and the telecommunication infrastructures needed to overcome the limitations that bind people to specific locations (Foy 1995; Adam & Fitzgerald 1996; Dahlbom & Ljungberg 1998; Stevenson 2001; Sørensen & Pica 2005). Unchained from their desktop computers, the mobile workforce now use a variety of devices and means to access and update information from to a wide range of corporate, governmental and social systems and networks. Sales forces update customer relationship databases from hotels

using net books, social workers update their case files using digital pens at the homes of their clients, and journalists capture and send photographs directly from the scene of a notable event. Tied to this, organisations have seen the introduction of mobile information systems and direct access to information as a way to reduce organisation costs and speed up the collection and management of information by removing intermediation from the relationship between the producers and users. An example of these types of changes can be seen in how students access academic journals. At first, the student would have to go to a physical spatial location, the library and with the assistance of the staff would find the physical copies of the journals they wanted. Over time, access to electronic copies of the journals was provided and the student could access those via campus machines. Now the student can directly access most academic journals from anywhere they have an internet connection and many students now never visit or make use of the library or the services of the librarians.

1.2 The situational context of policing

This thesis looks at a group of information workers as they experience a number of changes in how they interact with their organisation, and the public, and make use of and collect information that is integral to the successful performance of routine work tasks. This group is that of 90 police officers who work for a large metropolitan police force within England. Those officers are of the occupational group referred to in different literatures as 'response', 'front-line', 'general duty', 'patrol' or 'operational' officers (Allen et al. 2008; J. Burrows & Lewis 1988c; Fielding & Innes 2006; Flin et al. 2007; Gowri 2003; Hassell 2007). In a vehicle or on foot, these officers will patrol a set geographic area, deal with crime and public disorder offenses and provide the most visible example of policing within a community and wider society. If a member of public makes a call for assistance, it is this group of officers who will be the first to attend the scene. It falls to them to determine what is occurring, what action needs to be taken immediately and to request that additional organisational resources should be deployed or that external agencies should be contacted. These officers will often be working alone and in circumstances where the physical environment, the social context, the seasons and the time of day make their work more challenging. They are an example of a work group that operates and co-ordinates across time and space and represent 'distribute collaborative work' (Sørensen & Pica 2005, p.128).

It cannot be claimed that *policing* as an area of enquiry is one that is under researched; it has been explored in exhaustive detail by various disciplines within academia over many decades. Policing as a concept, what it is and its role in society has been covered and explored in great detail; sociologists such as Bittner have considered the central role of violence and force in the constitution of policing and how the application of violence is arguable the main 'technology' employed (Ashby et al. 2007; Bittner 1979; Bittner 1990; C. Crawford & Burns 2008; Ericson 1993; Ericson 2007a; Ericson & Haggerty 1997b). Within this wider discussion, the organisation and management of policing has also been covered in extensive detail by socialists and criminologists, as has the historical development of the modern policing models found in Western democracies; concepts such as community policing, the theories of zero tolerance and broken windows and so forth (Wilson & Kelling 1982; Hinkle & Weisburd 2008). The culture of policing and the impact that this has on relationship between police officers, and between police officers and the public, has been discussed from the number of different perceptive. The collective culture of policing has been described by several studies (Barton 2003; Crank 2004; Fielding 1988; Loader & Mulcahy 2003), and spaces such as the police canteen has been identified as important to the development of culture because they allow officers to swop stories and reinforce their own ideas of what policing is and what a police officer should be (Waddington 1999). The management and responsibilities of police officers and the concerns and tribulations of middle level supervisors such as police inspectors and sergeants have been examined, as have the significant changes to those roles that have arisen out of the new public management (Butterfield et al. 2005; Leishman & Savage 1993; Barton 2003; Mitchell & Casey 2007).

At the operational level, different occupational roles including the uniformed officer, the detective, the scene of crime officer have also been discussed and analysed at great length and work on the individual officer, the methods and means that officers' use when conducting investigations, how they manage and validate information have also been covered in great detail (Christiansen 1996; Dean et al. 2006; Ericson 1993; Foster 2008; Daglis et al. 2009). Detectives or investigative officers have been particularly well-considered and much thought has been given to how they approach their investigative duties and manage evidence, interact with witness and suspects, and more broadly, how they see themselves as information workers (Innes 2003; Foster 2008; Lundin & Nulden 2007; Christiansen 1996). From a cognitive and psychological perceptive, the ways that

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officers perceive danger or risk, assess and consider the validity of information and evidence has also been exhibited in exhaustive detail, as have studies about the reactions of the officers to stress during the performance of routine duties (Anderson et al. 2002; Liberman et al. 2002; Brown & Frank 2005; Ericson 2007a; Maguire 2000). Others have explored how variation in occupational roles in policing leads to variations in behaviour when engaging with the public (Kelling & Kliesmet 1996; Paoline & Terrill 2005). However, even within this well researched area, there are topics of enquiry around the changing technological capabilities of policing; the introduction of personal hand held computers on the organisation and uniformed officers has not received the same level of coverage.

The last decade has been seen a number of UK police organisations experiment with, and make use of, small hand-held devices such as tablet PCs, smart phones and Personal Digital Assistants (PDA). The nature of mobile information systems and mobility are considered in detail in the literature review but this thesis considers that it is a concept concerned with technology and processes that 'may provide the ability to access information, symbols and people across a number of spatial, temporal and contextual constraints' (this classification and how it is derived is discussed further in the literature review). Those technologies have been used in a variation of ways from allowing officers to take notes or photos at the scene of an incident, complete route paperwork, and access a variety of police specific and more general information sources. The historical constitution and autonomy of policing within the UK and the lack of central direction or guidance has meant that those technologies have been largely tried on an organisation by organisation basis with little or no overlap of technologies, applications or implementation methodologies. The use of handheld devices by policing is one that has been considered within the technical literature and also by those who have a systems perceptive but the impact on the working habits and information seeking behaviour of officers as they attempt to integrate them into their activities and the existing working practices is one that has been underexplored in the literature with only a handful of relevant studies becoming conducted in the last decade (Manning 2008; Sørensen & Pica 2005). In addition, the changes that this introduces to existing communication channels, predominately verbally via the radio, have been similarly under researched.

Understanding the historical importance of mobile communications to policing is helpful in understanding the urge for mobile technology to be introduced, an urge that goes beyond

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the usual economic cost based motivations of effectiveness and effectiveness seen in private sector and commercial implementations. Sørensen & Pica (2005), in their study of a specific implementation of mobile technology, note that the police have always supported geographically distributed work via state of the art technology. While this is true, the channels and means used for the passing of information from the organisation to uniformed officer have remained relatively static over a long period of time, this study is concerned with the changes that result when significant changes are made and those channels are removed. The history of police communications is one of distance and frequency – attempts to increase the distance at which officers can communicate with the organisation and attempts to increase the distance at which the organisation can track the activities and location of the officer. Tied to this, is the desire to increase the frequency at which the organisation and officers can communicate with each other about activities and requests for information. The first major communication tool for the uniformed officer was that of the wooden rattle[i]. Used during the 1840-1880s, this was a wooden device that would rotate and produce a sound that could be heard for a radius of approximately 500 feet. Officers would use this noise to summon assistance when required. Rattles were dual-purpose, in that, they could be used to strike people over the head if the situation demanded such a response.

Figure 1: A Police Rattle from circa 1860

However, in many interactions, the rattles were wrestled from the officers and used to attack them; this was considered unsatisfactory and a replacement was sought. Following feasibility studies and limited trial implementations, whistles were introduced, first for special operations and then with the design of the GSW (General Service Whistle) across policing during the 1880s.
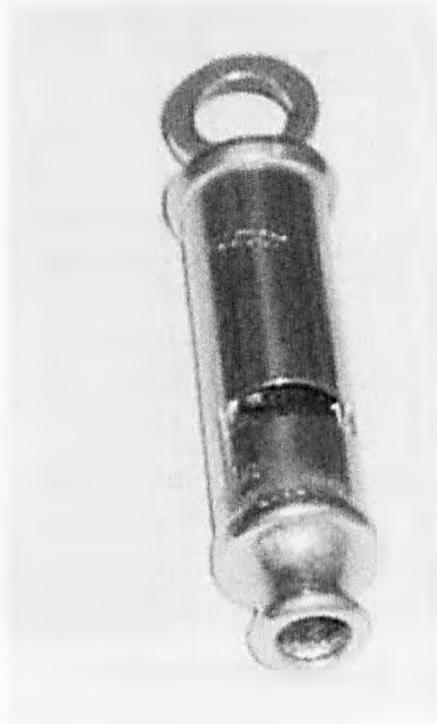
Figure 2: The General Service Whistle (GSW)

An improvement on the rattle, the officers' call for attention could now be heard at distances approaching 900ft, almost doubling their ability to communicate their needs for assistance. The limited usefulness of the rattle and the whistle for the purposes of communication meant that the uniformed officer was routinely cut off from the organisation when in the field, and would use his notebook to keep a record of his activities and interactions, information he could provide to his superiors when he returned to his station house. If the officer came across a dangerous or trying situation, he would shake his rattle or blow his whistle and hope that another officer was near-by and would heed his call. Like the modern police radio, the police whistle was considered a communications technology that should be restricted in supply to prevent it failing into the hands of those who would misuse it or use it for corrupt purposes (Fuld 1910).

From 1891 onwards, advances in telecommunications saw the widespread adoption of the police box, a small fixed kiosk located in a public place (Stewart 1994). During this period, officers would walk a 'fixed to point' beat, where they would move from Police Box to Police Box with the intention of reaching the next waypoint at a set time.

Figure 3: A Police Call Box circa 1950

Used in conjunction with their whistle, this allowed officers to report back their progress and activities via the box to their immediate supervisor, the sergeant. Moreover, the timing of the movement of officers meant that members of the public knew when they could expect to see an officer in their area or they could use a phone on the outside of the box to call the station for assistance (Burrows & Lewis 1988c). If the local police station wished an officer to contact them on arrival at the box, a light affixed to the top of the box would flash blue[ii] and the officer would know that he had to report to the station (Stewart 1994). With no feasible or cost-effective means of on-the-move communication, this was the most effective way to track the work and current location of the officers. At this point in history, the officer was still limited in the areas that he could cover by foot but now had more frequent opportunities to communicate to and receive instructions from his police force as he reached his waypoints. Furthermore, the opportunities for the officer to access (paper based) information increased, now the officer could ask for information about an

address or individual and in turn, messages and information that had come into the station house could be passed to the officer for them to deal with and act upon.

The next major advancement was the increasingly widespread adoption of the police car and radio during the1940s and onwards. At first, this was one way, with the sets acting purely as receives, but over time, the sets made use of the FM band to become two-way (Ziskin 2004). Originally seen as a fad with limited application, officers became contactable wherever they were and therefore could cover a larger geographic area, a 'beat' rather than moving point-to-point (Leonard 1964; Stewart 1994). The radio provided the officers with greater access to the resources of the organisation and they could quickly summon assistance, report their status or ask for further information, their ability to send and receive became continuous rather than fragmented and subject to geographical location (Leonard & More 1978) . From an organisational perceptive, this allowed units to be more quickly deployed to areas of trouble and the ability to track the whereabouts and activities of officers became more advanced, allowing the organisation to better manage their finite resources. This advancement was followed by the introduction of the personal radio and even those without access to a car became contactable and measurable wherever they were and they also gained the facility of near continuous communications. Moreover, those officers could now quickly report their current activities and their ability to deal with arising incidents. Parallel to those developments in telecommunications, there was an information technology revolution with the development of the vacuum tube, the mainframe and the microchip (Campbell-Kelly & Aspray 2004). As with other organisations, the information revolution allowed policing to organise, collocate and cross-reference their paper records. This in turn meant that information about criminals could be quickly analysed and used to better manage the resources of the organisation in their attempts to fight crime and maintain public order. Objects, locations and people could be linked in such a way that police organisations could better determine the relationships between them and identify patterns and trends, resulting in 'intelligence' (this concept and the use of information systems in policing is discussed further in the literature review) that could be use to respond in a systematic manner.

This short historical account indicates that, from the early emergence of telecommunications and across all of the technological and organisation progress, one aspect of policing has never changed to any significant degree, the need for a voice on the

end of the radio or telephone to carry out information intermediation tasks for the officers when they are in field. To better manage those verbal interactions, , and officers' need to access information from a range of sources, the police service developed specialist command and control (often referred to as C2) functions that had a dual role of serving the information needs of officers and also managing their activities and assigning work tasks. In those centres, trained call handlers hand thousands of routine requests for information a day and in turn relay thousands of instructions and orders to officers (Dorset Police Authority 2005; Her Majesty's Inspectorate of Constabulary 2007; Police Standards Unit 2003; O'Conner 2005). While in the course of their duties, officers will make use of a multiple of information systems, the most common need expressed by officers are related to the confirmation of identity and/or ownership. An officer attending an incident where a youth has broken a shop window will wish to confirm both the identity of the youth and the owner of the shop. Similarly, if an officer finds a car abandoned at the side of the road he will wish to know the details of the registered owner and his address.

As this thesis will discuss, this need for identification is one of the primary concerns of uniformed officers because of its relationship to both the safety of the officers and the decisions they take to resolve an incident. The Police National Computer (PNC) is the most frequently used source of information in such circumstances and provides information on the criminal history of individuals and importantly, 'markers' that warn an officer if they have a history of carrying weapons or violence. The officer may also make use of, the local (to his organisation) intelligence system. The intelligence system will contain further information about individuals who are of interest to the public, where they go and who are they are connected to. For example, a police intelligence system may note than an individual with a criminal history is frequently seen in a local public house where he is known to associate with other known individuals with criminal histories. These types of systems allow police forces to link individuals, objects and places together in an attempt to determine patterns of behaviour and on that basis take meaningful action to reduce criminality in the organisation's geographical area. Other common sources of information are the local voters register that allows an officer to confirm the identity of someone who does not have a criminal record and therefore is not on the PNC, and the internal news service that provides information and about wanted individuals and other notable recent events.

The intermediation service provided via radio communications and by a call handler is how the majority of information requests made by officer when they are in the field are managed. This means they must rely on the ability of the call handler to be able to skilfully and quickly manage their requests for information, filter and provide the results. The intermediation service provide by police command and control systems have been subject to various criticism, but for the purposes of this thesis, the most critical from the perceptive of the officers are that the volume of demands on the service means that officers often have to wait for prolonged periods of time for their requests for information to fulfilled. Further, officers have noted concerns about the quality of information that the service provides because of the variable skill of the call handlers (Her Majesty's Inspectorate of Constabulary 2007).

The development of mobile technology and remote access to information has therefore become seen as one of the ways to manage a number of related issues. Direct access to information is perceived as a change that will empower the officer and ultimately reduce the bottle-necks that exist in the information intermediation service offered to the officers. Moreover, there is an ongoing public debate about the amount of time that officers spent within the station per duty shift and the use of mobile information systems is seen as a way to allow officers to stay out of the station for longer periods and complete routine administrative tasks in the field (Blunkett 2001; Berry 2009; PA Consulting 2001). The need for officers to have an instant link to the organisation for the purposes of safety means that the introduction of mobile information systems is not perceived as a replacement for the police radio but rather a complementary technology that will allow tasks currently undertaken by the information intermediation service provided by the Command and Control service to be performed by the officers themselves in the field. The majority of the changes to police telecommunication since the introduction of the radio and the telephone have been to increase distance and availability of voice communications, the change here is different in that it signals a move away from information tasks being performed by the intermediary at the end of the radio (the call handler in the command and control centre) to the officers performing these tasks themselves.

As with the police radio, the initial moves to introduce mobile information systems occurred within vehicles, with the introduction of geographical information systems to

provide directions to unknown addresses and the implementation of in-car mobile data terminals (MDTs) to update an officer's status and allow them to check a record on the PNC or other information source. Moreover, advances in this area allow an MDT unit to automatically read a car licence plate (known as Automatic Number Plate Recognition) and alert the officer if it has been reported stolen or is wanted in connection with a crime. The increasingly common use of automatic vehicle location systems (AVLS) now allow the command and control environment to track the movement of resources on a real-time basis and officers can be automatically be allocated work tasks due to geographical location and the classification of their skills or vehicle capabilities. Parallel to the increased use of in-car technology, the last decade has seen an increased interest in and expectations for, the potential of mobile data[iii] on the person. Within the United Kingdom those were heighten by the introduction of TETRA-Airwave, a secure digital, encrypted telephony network that can be used for both voice and data transmission. The introduction of this network was important for two reasons; first because it was developed as a secure network for policing, it meant that any services or applications that were run over it could be considered secure[iv]. Secondly because it offers the ability to send and receive data from the same radio terminal (more commonly referred to as a handset) that would be used for secure voice communication, it offered a "two in one" solution. In addition, because devices that use the airwave network have to be accredited and approved, forces could be confident about how it would perform. However, while the TETRA-Airwave system provides secure communications, its ability to receive and send data was limited and many forces started to experiment with commercial networks and the use of off-the-shelf consumer technology for functions and applications more complex than simply updating the status of the officer. The case study explores the use of such devices to perform a routine work task known as the 'Stop and Search'.

1.2.1 The Stop and Search task

The 'Stop and Search', also known as the 'Stop and Account' is a legal power for an officer to stop an individual and ask them to account for their actions or allow a search of their belongings to be performed. This task is controversial because it is felt that the powers are used to harass the ethnic minorities of the United Kingdom and that disproportionality exists in its usage, a term that is used to describe 'the extent to which police powers are exercised on a group out of proportion to the number of that group in the general

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population' (Riley et al. 2009, p.32). This study takes no view on the issue of disproportionality and sheds no light on this subject; rather the concentration on this work task was for a number of reasons related to how and where the task is completed.

First, the task is one that requires interaction with both the organisation and members of the public. The interaction with the organisation is of interest because the introduction of the devices was intended to break or at least reduce the use of the intermediation service for routine information tasks. The interaction with the public is of interest because the collaboration between the two can be both tense and contested. If an officer stops an individual and asks them to account for their actions, he is indicating that he thinks that they are involved in crime or *might* be involved in crime. Indeed, the legal power that allows an officer to stop an individual requires that they have this suspicion and can articulate it in some way; it is not enough for an officer to stop someone because he has a hunch or a feeling. The suspicion of the possession of drugs and/or stolen property are the two most common reasons give by officers for initiating this work task (Riley et al. 2009). In turn this means that when considered within the hierarchy of trusted sources[v] that police officers use, that the information provided by this person is subject to independent checks and confirmation before being considered valid or accurate. Many of the people questioned will not be guilty of any crime or public order offense[vi] and after satisfying the officer of this will continue with their lawful activities. However, some individuals will be engaged in criminal activities or have some other reason that they do not wish to be either truthful or co-operative in those situations. This means during the questioning process, they may attempt to mislead the officers over their recent actions, movements and even their identity. Officers are therefore always trying to ensure that they 'maintain the edge' (Paoline & Terrill 2005, p.458).

These encounters are made more complex by their performance in public spaces such as parks, shopping centres and other places that are not fully under the control of the officer. In addition, the officer must try and ensure that their safety and the safety of other individuals are not compromised during the completion of the work task and to this end, they are constantly monitor for behavioural and verbal cues that an individual is about to become violent or attempt to abscond from the area. The nature of policing means that even the routine occupational tasks of police work can be fraught with stressful and contested encounters with members of the public (Brown & Frank 2005; Johnson 2004;

Johnson 2006; Paoline & Terrill 2005). Some research has suggested that over the long-term such encounter are as stressful to officers as attending critical incidents involving death and injury (Liberman et al. 2002).

1.2.2 The case and case study

The case study and the thesis follows and examines the introduction of mobile devices, over a three month period to 90 officers, to assist in the recording of the Stop and Search process and to allow the officers to directly access information sources such as the PNC to help them confirm the identity of an individual. The devices had electronic copies of the Stop and Search form that must be completed at every Stop and the officers were expected to make use of a separate belt-attached printer to provide a record of the Stop to the named individual. In addition to the benefits that the project team hoped that the uniformed officers would obtain from direct access to information, the trial had a wider organisation objective in that it would assist the organisation with its *compliancy* statistics – evidence that the organisation was not stopping disproportional numbers of the local ethnic communities in comparison to the general population. The case study discusses the problems, arising out of various technical, cultural and contextual issues that the officer experienced with the use of the devices and why over the life of the trial, usage of the devices decreased except for very some specific circumstances or when officers were working together in a collaborative manner. The concept of mobility is discussed in detail within the literature review, but the interest here is not with the technology but what mobility means, as Brewer and Dourish note '...we must think about mobile technologies not so much as devices that help solve problems, but as sites at which social and cultural categories are enacted' (2008, p.973).

1.3 The important of the temporal and spatial to this study

Over the course of conducting the research it became apparent that the temporal and spatial aspects of trying to complete a task in public were critical to understanding what was occurring and that the ways in which that officers try to manage their environments was providing some interesting and under researched findings on how the management of the spatial context has some impact on information seeking behaviour. A very simple example of this is the way that officers will deal with two individuals that they suspect of committing a crime. A standard response is for the officers to separate the individuals, this

not only allows them to better manage the environment or *locale,* but directly impacts on their information seeking behaviour – the officers can compare the stories that they are given by each boys without being concerned that the story of one has influenced others an in turn, discrepancies between the two will be highlighted. This in turn leads to the initiation of more information related activities as the officers try to establish a true account of what has occurred.

Mobility literature has discussed the spatial and had a concentration of the idea of travelling, the individual moving from place to place but as the literature review discusses often at the expense of understanding the temporal. It became apparent that this study was not about mobile technology or data but of mobility in a far broader sense, people and objects moving both in time and space and interacting with others also moving in space but with their own temporal contexts and goals. The Stop and Search task simply provided an productive way to investigate those issues more closely and to provide a 'before' (Traditional process) and 'after' (handheld process) situation that allows those issues to be more clearly illuminate than in previous studies.

With the temporal and spatial becoming the dimensions or axis for investigation, the path of the research became easier to understand and analyse. Policing provides a clearly understood culture; the organisation provided an organisation setting, the introduction of mobility provided a change to ways of working that illuminates the spatial and temporal dimensions, the uniformed officers on the trial provided the case for a case study analysis. Moreover, the Stop and Search task was well established and therefore could be mapped and used as a way to break down the changes to process and information seeking – that is, it was possible to clearly understand what information was required for the task to be initiated, undertaken and concluded.
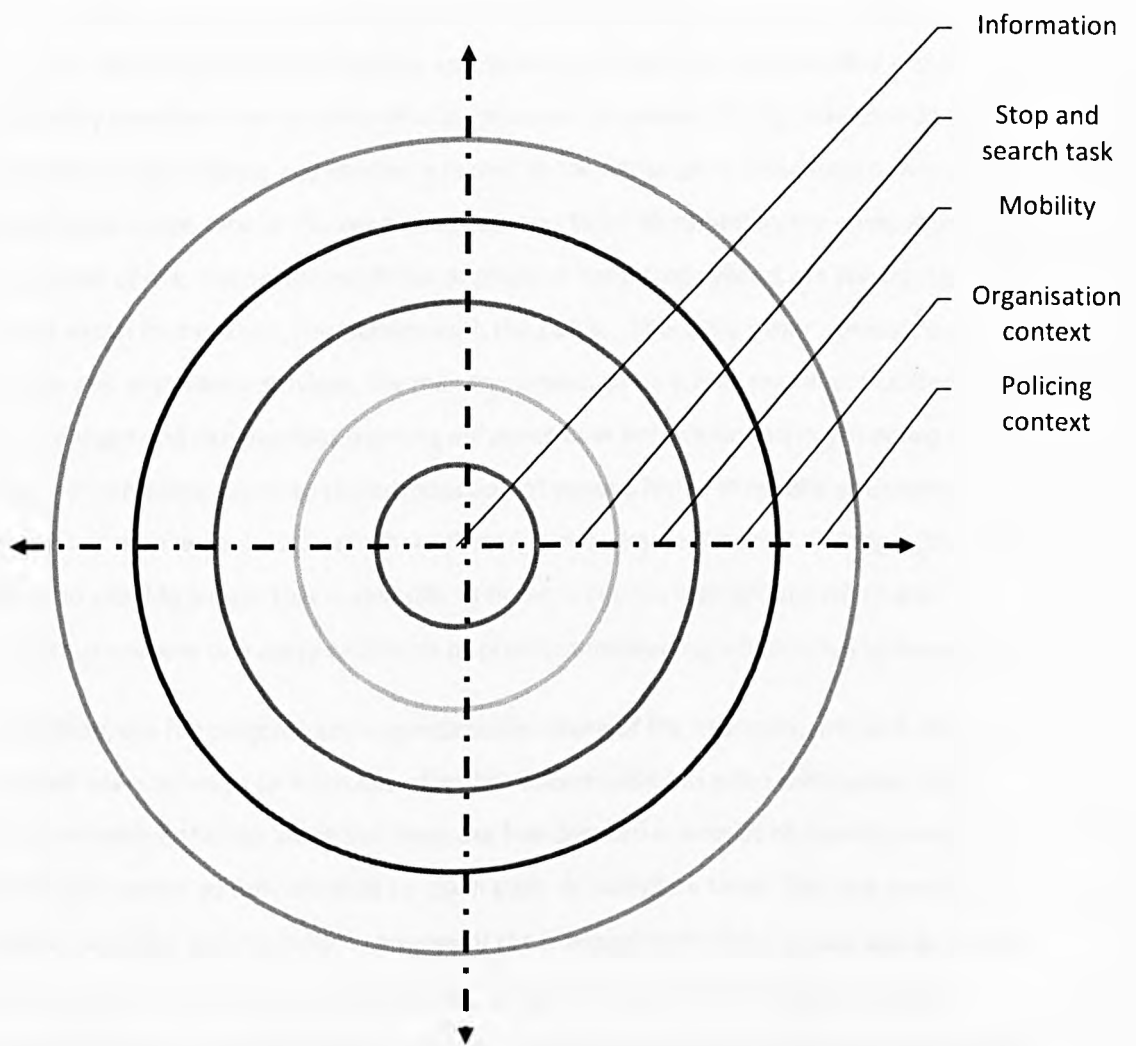
Figure 4: The levels of the case and case study

Even this diagram is more of an abstraction than an accurate discretion of what occurred, the temporal and spatial issues overlapping and cutting across all of those areas of interest in a quite messy and chaotic fashion. As the coding of the interviews, notes, observations, simulations and organisational documents was undertaken, it became clear that considering this a study of how time and space cut across an organisation allowed a better understanding of what was occurring. It also allowed for further questions to be asked to the trial participants that provided a deeper understanding of how those dimensions reverberate up and down the organisation – from the command and control environment to the individual officer on the street corner asking a member of public to answer questions at 2.am in the morning.

1.4 The contribution of this study

In the introduction to this chapter, it was noted that this is not a study of Policing, however, the examination of the Stop and Search work task provides an ideal opportunity to identify how the manifestation of cultural norms provides a strong influence on the behaviour of the officers and creates a barrier to the adoption of hand held devices for operational usage. One of the key thematic issues to be identified by the study is that of *perception of risk*, the perceived threat of physical harm that officers are constantly aware of and which frames their interactions with the public. There are other services, such as the fire and ambulance services, the military, where, while it may manifest in different ways, danger and risk provides a strong influence over behaviour and might acting as a barrier or inhibiting factor to the introduction of various forms of mobile information systems or mobile devices. Even where there is not an immediate risk of danger, the study may also provide insight that is valuable to those examines interactions which are contested – where one party withholds or provides misleading information to the other.

In addition, the heterogenic and unpredictable nature of the environments and situations in which users attempt to make use of mobile information has been anticipated and discussed within the literature but there are few detailed examples of how this results in meaningful action as they attempt to reach goals or complete tasks. The case study and analysis provides some specific examples of the management of the spatial and its impact on the work of the individual. In particular, it shows how individuals who attempt to complete tasks in spaces and public areas that provide a high level of unpredictability will attempt to configure and manage the environment around them to both reduce this unpredictability and better manage their collection and use of information. It is hoped that the findings will have more general application when reconsidered or tested in other organisational contexts and situations where interaction between an information seeker and others is occurring in dynamic work contexts – one where the environment is not under the control of the seeker. With the increasing normalisation and diffusion of mobility technology in organisations, it is essential to understand how this will affect the information behaviour of the workforce, in their intra-organisation and extra-organisational activities and performance of their work tasks. This understanding will assist in the development of best practice, the optimal division of labour and information systems in this operational context. It will also be of particular interest and value to those

who have a public safety management perceptive given the increasingly widespread diffusion of hand held and mobile technologies in this area of work.

Moreover, while this study starts with the 'information man', the lone individual engaged in information seeking and searching, and their reaction to changes in an existing work task, it also provides insights into the same work task but when performed collaboratively by a group of officers and the impact that this has on the collaborative information behaviour of those on the trial and their use of the traditional intermediation service. It has been noted in the information sciences literature, that while much work has been done on the information behaviour of individuals, the area of collaborative information behaviour is an under investigated area and that the relationship between physical activity, work process and information behaviour is unclear. Hyldegard (2009) notes that 'we need more research into the behaviour associated with the group based problem solving in terms of group members' activities as well as cognitive and affective experiences". Finally, the study provides a greater understanding of the use and pitfalls of mobile technology within policing at the operational level, an area that Sørensen & Pica (2005) note is underreported within the literature because of the problems of access. Those findings may have limited application outside of this field but as Policing has spent significant sums of monies on mobile information systems for what appears to be little or limited returns, it may have interest for those working in this area.

The study therefore has the following aims:

- To conduct an in-depth study of mobility and the impacts of mobile technology on a specific group – here the case is based around the actions and activities of Response Officers, the largest single occupational role and function of Police Officers in the UK;

- To contribute to the small body of research that intersect information seeking and mobility by providing novel findings around the group described in the case;

- to contribute to the limited current understanding of how collaborative/group information seeking is undertaken within a framework of mobility;

- to provide specific recommendations to those involved in system/hardware design on how to both anticipate and overcome issues of rejection in trial implementations.

1.5 The Structure of the thesis

The main body of this thesis is structured around ten chapters; a literature review, an outline of the methods and methodology used to collect and analyse data, key thematic themes, a descriptive case-study, two chapters of analysis and discussion, a conceptual model and a conclusion that provides a summary of findings along with some further commentary about the contribution of this work.

The literature review (**Chapter 2**) outlines the core theories of information behaviour as they relate to both the lone worker and when collaborating with others to complete tasks. The nature and constitution of the task as a unit of analysis is discussed as is current work in the information sciences on how temporal and spatial constraints impact on both the completion of a task and information related activities. While this is not a study of policing but rather one in which it provides the context, the nature of policing is also discussed to provide an orientation into this culture and how it provides some unique challenges to information workers in this area. Some consideration is given to why policing information systems work as they do and where historical failures in the provision of information to officers can be recognised. As the relationship of the trial participants with staff within the command and control function of their organisation also provides to be critical to understanding the thematic issues raised in the analysis, a brief overview of pertinent studies in this area is provided. Finally, mobility and mobile information is explored from a non-technical perceptive and its conceptual foundations are identified and discussed and the relationships and boundaries between the overlapping areas of mobility, nomadic and ubiquitous computing are considered. Tied to this, relevant practice is discussed and an overview of recent research that explores the use of mobile technology for policing is provided.

This is followed by a discussion of the methodology (**Chapter 3**) and theoretical approach to the study. A case study approach was adopted as a research strategy, with grounded theory used, not as a total methodology, but as a conceptual analytical tool as has been established with the management information systems and information sciences literature. The coding and code families that arose out of the analysis of the transcripts and interviews are discussed along with the evolution of both is explained in detail. Some consideration is also given to how pragmatic and organisational concerns shaped the direction of the study and the thematic issues that emerged from the ground theory

approach that was adopted. This chapter also discusses the practical approach taken to conducting the research and provide information about the research design and the ethic issues that were considered and managed when dealing with the participants on the study. The study uses observation of the work task, interviews with trial participants and analysis of written organisational and legal documentation.

The thematic analysis **(Chapter 4)** explores in more detail the key issues arising out of the grounded theory analysis and provides some theatrical perceptive on each of those areas; the intent is to provide the reader with some knowledge of each important concept as a way of interpreting the following chapters and the discussion and analysis presented. Risk is highlighted along with some discussion of how an individual perceives it and how it is seen within policing, both as a concern for the individual and for the overall culture of policing. The police's ability and right to use force is highlighted and discussed, with some thought given to the situations and contexts under which an officer will be compelled or feel compelled to make use of violence. Tied to both of those issues, the idea of officer cover or officer safety is defined and explored. Finally, the chapter considers more carefully the concept of disintermediation.

This is followed by the case study **(Chapter 5)**, which provides a descriptive account of the trial implementation of hand held computing devices known as PDTs (Personal Digital Terminals) to police officers. The implementation ran for a period of three months and was intended to change the routine work task of the 'Stop and Search'. Using the work task as the highest level of analysis, the chapter outlines how the performance of sub-ordinate tasks changed the information behaviour of the officers on the trial – both as individuals and as members of small teams. The narrative outlines the problems and successes that officers experienced and the overall failure of the trial to change their existing working practices. Following this, **Chapter 6** considers *the* Stop and Search task in more detail and identifies the different sub-tasks that make it up and what the information requirements are at each stage, the role of the intermediation service provided by the command and control centre is identified and discussed, as are the reasons why the officers were initially happy to move away from this traditional process.

The issues that arose out of the research are then discussed over two chapters. The first of those considers the impact of the changed Stop and Search process on the solitary officer **(Chapter 7)**, and how introduction of the devices changes their ability to both manage and

complete the task. The cultural issues of perception of risk and performance are identified and discussed as they relate to this change. The temporal and spatial concerns of the individuals are considered in how they relate to their perception of safety, their ability to use the device and their ability to undertake information related tasks. In particular, a sense of spatial and temporal dissociation is seen as being the root cause for the failure of the devices, both when engaged with the devices and in the 'in-between' moments when interacting with a member of the public.

This is followed by a discussion of the impact of the changed stop and search process on collaborative work (**Chapter 8**), which re-examines the same issues raised in chapter 6 but considers how their impact is lessened or changed by the performance of the Stop and Search task by many rather than a solitary officer and why the devices saw a more successful adoption in situations where used by officers who were working collaboratively with other officers to complete the stop and search task. In addition, the questions raised in chapter 6 are discussed again within this changed emphasis of the team. The ability of a PDT equipped officer to assist his fellow officers is considered as well as the temporal and spatial issues that arise in this changed context, particular, the increased ability of officers as a collective to configure and manage the spatial aspects of the stop and search to increase both their control of the context and enhancing their ability to engage in information seeking and acquisitions is considered.

The discussion of the previous chapters is then brought together and mapped against a three factors or dimension (Spatial/Temporal/Risk) model (**Chapter 9**). The chapter looks at common usage cases as outlined in the case study and analysis chapters and maps each of those against the model. Some consideration is given to the why different usage scenarios such as a single officer with a PDT would appear at different points on the model to a single officer making use of their radio.

Finally, the Conclusion (**Chapter 10**) looks at the possible lessons from the study, in particular what the behaviour of the officers on this study means for those wishing to both studies the information usage of police officers and more generally for those involved in the development of user interfaces and systems that will provide access for mobile workforces. Arising out of the analysis of the implementation of the case study, the question of if the environmental challenges presented by uniformed police work simply makes some technology, such as hand held devices, inherently unsuitable for using in

routine work tasks is considered. Some thought is also given to the limitations of the study design and how some of the tentative findings of this study could be explored further.

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[i] The telegraph was also in use by policing by the 1880s but it was not a technology that uniformed officers could make use of in any systematic manner while mobile and away from their host organisations.

[ii] There are many variations of this method found in Policing. One ingenious method used during the 1930s in Galva, Illinois was for problems to be passed via phone to an employee at the city's power plant, where he would make the streetlights flash and the night officer would know that his services were required and would phone the power plant to obtain further details (Coe 1996).

[iii] Within UK police, the term 'Mobile Data' is used as a umbrella term to refer to any projects or work that involve the development or deployment of mobile information and communication technologies.

[iv] Applications or services run over the public GSM or 3G telecommunication networks operated in the UK require a lengthy certification to ensure that the vital or confidential information cannot be intercepted.

[v] Manning (2008) suggests that there are six main sources of information or raw data into police forces. Those six broad categories or 'social worlds' are: (1) other police agencies and units; (2) the alarms of citizens and businesses; (3) businesses; (4) private security companies; (5) citizens who are victims of crime or non-perpetrators'; and (6) criminals and those on the fringes of criminality.

[vi] The Ministry of Justice document *Statistics on Race and the Criminal Justice System 2007/2008* notes that that in 2007/2008 there were 1,035,438 Stop and Searches of people and that 11% of those encountered resulted in an arrest. (Riley et al. 2009)

Chapter 2 – Literature Review

2.1 Introduction

This thesis explores the changes to information seeking practices of a specific occupational group, uniformed police officers, when they are provided with a handheld computer to perform a common work task, the Stop and Search. This chapter provides an overview of three broad areas and defines the terms and concepts that are used to inform the rest of the thesis. First, information seeking and need are considered and defined, as well as the relationship between these concepts and common models of information seeking. Second, the use of information by police organisations and occupational roles such as uniformed police officers and detectives is explored in detail. Some consideration is also given to the difference between data, information and intelligence within policing. The conceptual basis of remote mobility and mobile technologies is investigating and the field is defined and boundaries with similar but distinct areas such as spatial mobility and nomad computing are identified. Key studies and models in mobility are explained and the influence of culture, organisation and individual preferences on the adoption of mobile technologies is highlighted. Finally operational studies of police use of mobile technologies are outlined and key findings are examined.

2.2 Information related terminology and models

2.2.1 Information seek and need

This thesis regards need as arising from an information gap or lack that causes dissatisfaction in some expressible way for the information seeker and therefore is treated as the precipitating action from which information seeking behaviour stems. Within the case study, the need at the broadest level is to determine if the stopped member of public is a criminal or is connected to criminal behaviour. Once the officer has engaged a

member of the public, a need arises to determine if that person is a danger to themselves or others. The attempt to answer these questions can be described as a form of purposive behaviour, the attempt to meet those needs will lead to some form of positive or self-directed action and interaction with others or information systems.

The information needs of individuals can be highly complex; Wilson (1997) concludes that investigation of information needs has proved to be intractable, that is to say that the need is an entirely subjective concept that occurs on an cognitive level, and therefore cannot be documented or satisfactory explained by third-party questioning or observation, and that too much time is spend trying to define need when the focus is actually that of information behaviours. Similarly Belkin and Vickery (1985) argue that the process of an independent observer identifying the needs of others is difficult because it must be based on inference. The capture and understanding of information needs is made more complex because the perceived information need of an individual may differ from the actual information need. The individual's misconception of the problem area is seen as leading to this gap between the actual and perceived (Coppola et al. 2004); within the information retrieval literature, the inability of information seekers to articulate their need in the form of a relevant search query is regarded as another example of this problem (Spink & Cole 2005).

The need has also been defined as a lack, Dervin and Nilan (1986) describes this as the cognitive gap that exists between situation and use. Similarly, the need has been understood as the information seeker trying to reduce uncertainly or unease about something (Case 2002). Kuththau's Information Seeking Process model (discussed below) revolves around uncertainty, as does the work of Belkin (1980) who sees the information need in terms of 'anomalous state of knowledge' (ASK) or as an inadequate state of knowledge. When faced with this anomalous state, the information seeker will attempt to review or find information that will reduce their gap, lack, uncertainty, or incoherence. If this does not resolve the problem, they may generate another finer grained ASK or they may simply conclude their activities at this point (Belkin et al. 1982). Dervin in turn sees information need as being part of a process where the individual is attempting to reduce uncertainly and make sense of the context they are situated within, questions are

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therefore aimed towards making sense of the situation and reducing gaps as they move through the world in both a temporal and spatial sense; 'Her head is filled with questions. Those questions can be seen as her "information" needs' (1983, p.180). The information need does not have to revolve around acquiring new or novel information but can be a matter of reducing uncertainty or providing validity to that which is internally known by the individual and the information need may therefore be to confirm what is already known (Shenton & Dixon Summer). Within the information retrieval field, the need is often seen as that which the information seeker articulates via the formulation of a request or query for information (Rose 1994).

In relation to information seeking, Case states that 'researchers have less to say about this than they have about need. Perhaps the meaning of the term is thought to the obvious' (2002, p.80) and that much discussion about seeking relates to circular references to need. Wilson (1999) regards information seeking as the 'the purposive seeking for information as a consequence of a need to satisfy some goal', while Johnson provides a more systems orientated view by defining it as 'the purposive acquisition of information from selected information carriers' (2003). It is the situation when the information lack problem appears and the process of its acquisition is realised. Studies of the information-seeking behaviour of individuals has shown that they use a number of factors to determine how they select and use information, these include but are not limited to, cost, accuracy, reliability, convenience of access, comprehensiveness, usefulness, response time, accessibility, technical quality and the actual form. In addition, authors such as Leckie et al. (1996) have argued that the education and experience of the information-seeker will also come into play as will contextual variables such as the organisational characteristics and the size of the host community. Furthermore the process of information seeking is not isolated but rather it is part of a wider process of problem solving that is dynamic in nature, Indeed, "...as an individual's propensity to seek information increases so too will their need for information and vice versa" (Rees, Sheard et al. 2003). Walton (1998) sees dialogue between individuals as a form of information seeking where the respondent is a repository of information that the proponent cannot obtain in ways other than by questioning the respondent. Problem solving and decision making and therefore the information need are

contingent on the demands of the task being performed, the information load (number of attributes) relates directly to the task complexity (Umanath 1994). In other circumstances, if the individual perceives that the gap is too large or that some emotional, political or psychical risk attached to information seeking, they may decide not to undertaking seeking activities (Chatman 2000). In a study of cancer-patents, Rees et al (2003) found that 'monitoring' and 'blunting' responses could occur. A patient who exhibits 'monitoring' type behaviour is one who is trying to deal with a threat situation (cancer) by learning as much about his/her condition as possible. Conversely those who try and avoid information about their problems (as a coping strategy) are engaged in blunting fashion.

2.2.3 Information-seeking models

Studies within the information sciences field have generated a number of models that may be applied to understand the behaviour of the officers on the trial and their information seeking. Collectively these models suggest that information-seeking within context and can be viewed as occurring as occurring in a number of iterative stages. When considering research in the overlapping areas or silos of information behaviour and information retrieval, Wilson notes that there are no overarching accepted paradigms at work and that 'researchers in one area may not understand the problem areas defined by another' (2007, p.119). Four of the widely used models are those of Dervin's sense-making model, Ellis's feature set, Kuhlthau's information searching process (ISP) model, and Wilson's model(s) of information behaviour. The models presented are in no way an exhaustive examination of the field but are use to provide a historical and theoretical background for the analysis that follows.

Dervin notes that 'the ways humans individually and collectively design the sense (i.e. create the information) that permits them to move from one to the other' (2000, p.54), and that sense-making as a process of bridging gaps in existence, between people, between people and society, between organisations and so on. The core assumption is, therefore one of 'gappiness' or discontinuity, a concern or issue that people will attempt to bridge. Within this model, information seeking is seen as being a 'sub-set of human sense-making and sense-unmaking' (Dervin & Reinhard 2007, p.51). Sense making has at its core a 'methodological metaphor' (2000, p. 45) that see the individual moving through

time and space, bridging gaps as they go and moving on to the next discontinuity. Dervin does not perceive information as an independent entity, but as something that is constructed by individuals as they try to make sense of the world, it is constructed rather than transmitted from individual from individual. Sense-making as a research tool, provides the basis for asking questions and the triangle show in figure 5 is used to inform the researcher. Others such as Godbold (2006) have reconceptualised the triangle more explicitly using the bridge-building metaphor, the bridge creating a way to move across a gap and allowing the conceptual journey of the individual to continue.

Situation

Use   Gap
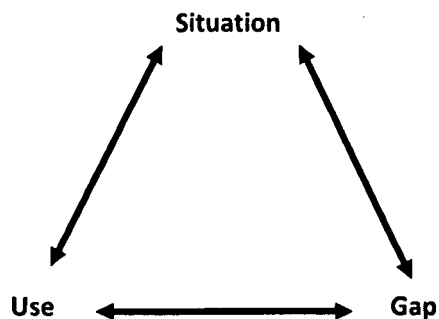
Figure 5: Dervin's Sense making model

Kuhlthau's Information Seeking Process (ISP) model is a six stage model of the information seekers experience in the processing of information. It identifies and discusses three areas or 'realms' of experience, the affective (feelings), the cognitive (thoughts) and the physical (actions). As with Belkin's work, the idea of uncertainty is central to the model and is seen to increase and decrease across the process. Where uncertainty is high, there is an opportunity for information intermediaries to intervene (Case 2002). Central to this model is the notion that the individual's feelings influence their information seeking behaviour and vice-versa. The six stages of the process are outline below and are shown in as a process in figure 6:

- **Initiation:** The individual becomes aware of a lack of understanding or knowledge of an area and this causes feelings of uncertainty that they wish to reduce.
- **Selection:** The individual identified the problem or topic area and they are ready to get started and may feel optimist about their activities.
- **Exploration:** The individual explores information sources and encounters contradictions and confusion, leading to increasing uncertainly and doubt.
- **Formulation:** The individual develops a focused perceptive and uncertainty starts to diminish.
- **Collection:** Information sources are gathered and uncertainty subsides as the individual becomes family with the domain and its boundaries.
- **Presentation:** The individual is able to integrate their information collection as learnings which they themselves can use or explain to others.

	Initiation	Selection	Exploration	Formulation	Collection	Presentation	Assessment
Feelings (Affective)	Uncertainty	Optimism	Confusion Frustration Doubt	Clarity	Sense of direction / Confidence	Satisfaction or Disappointment	Sense of accomplish-ment
Thoughts (Cognitive)	vague		→	focused	increased	interest	Increased self-awareness
Actions (Physical)	seeking	relevant Exploring	information	seeking	pertinent Documenting	information	

Figure 6: Information Search Process Model (from Kuhlthau 2004)

Hyldegård (2009) notes that the ISP-model may be considered as a metaphor for common experience in the information seeking process and that its importance lies in focus on the information seeker is process of making sense of the world in conjunction with their actions and activities. David Ellis, in his own work and with others, identified characteristic actions within information seeking that could be seen to be representative of the process. Ellis's feature set was originally based around detailed investigation of the information seeking habits of social scientists (Ellis 1989), further work was done by Ellis and others in the physical sciences (Ellis et al. 1993), and on the habits of engineers and research scientists (Ellis & Haugan 1997). The feature set has been widely adopted by others researchers looking at studying information-seeking in a range of contexts, for example

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Sutton's (1994) study of the information-seeking behaviour of lawyers. Ellis and Haugan describes eight generic categories or cognitive features (described as stages in some works, although Ellis does not use this term) of information seeking. Those are:

- **Starting:** the start of a project or task. May involve asking a colleague or making a library or database search. The likelihood of a source being selected is related to the perceived accessibility.
- **Chaining:** The following of links from initial information sources such as footnotes and citations.
- **Browsing:** Semi-directed search in the area of interest, structured scanning of documents and sources.
- **Differentiating:** The filtering and selection of sources by identifying differences, such as quality or approach to limit the amount of information obtained.
- **Monitoring:** Keeping abreast of developments by regular review and updating of specific sources.
- **Extracting:** Systematically working through a source to identify material of interest either by direct consultation or via electronic databases.
- **Verifying:** the information seeker checks the accuracy of the information.
- **Ending:** activities come to an end and the information seeking process concludes.

Ellis's work has been described as both a feature set and a model, Ingwersen and Järvelin (2005) state that 'it is explicitly a process model of fairly concrete process sets' (p. 64) and note that the model has applicability and validity over a range of domains. White and Roth (2009) argue that the feature set does not consider external causative factors and is summary rather than analytical in nature. Ellis himself notes that '...the detailed interrelation or interaction of the features in any individual information seeking pattern will depend on the unique circumstances of the information seeking activities of the person concerned at that particular point in time' (1989, p.178) and does not provide a temporal location for those features. However, Wilson (1999) provides a process based version of this model that does provide some temporal structure for the feature set.
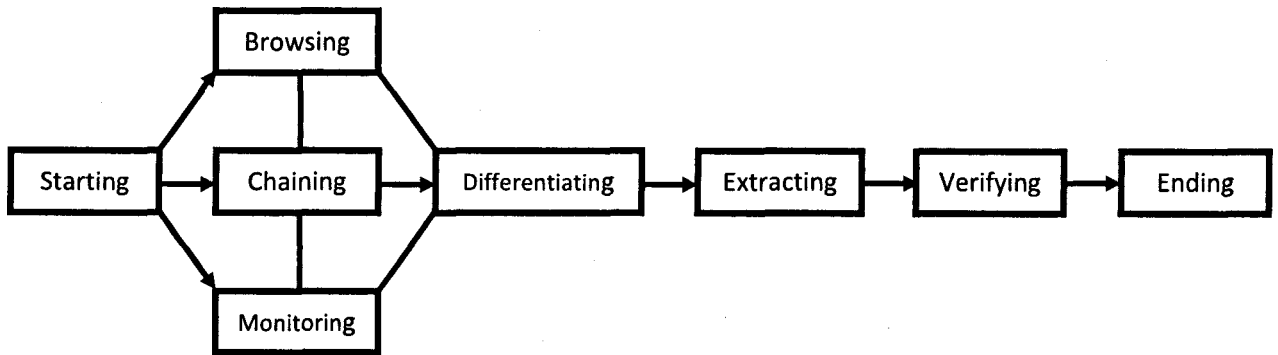
Figure 7: A process version of Ellis' feature set (Wilson 1999)

Over the years, Wilson has presented many models of information behaviour; the first was proposed in 1981 and is seen below in figure 8, modified in 1999 to include Ellis's feature set:

Figure 8: General Model of Information Seeking Behaviour (taken from Wilson 1981)

His first model had three broad aspects or components:

- Information need is a dependent and connected to the physiological, affective and cognitive states of the person. They are subjective in nature and situated within the social, environment and personal sub-contexts of the seeker.
- Social role provides the context which informs the information need and seeking process of the individual
- Information-seeking behaviour is affected by a number of barriers which may be personal, role-related or environment in nature.

Wilson later expanded this model further in 1999 and this model can be seen below in figure 9 (below) and included the following areas:

- The context of the information need.
- The activating mechanism, which encompasses stress and coping factors (Risk/Reward, learning and self-efficacy).
- Intervening variables (psychological, demographical, role-related, interpersonal factors as well as environmental and information source characteristics)
- Information-seeking behaviour (specified passive attention, passive search, and active/on-going search).
- Information processing and use.
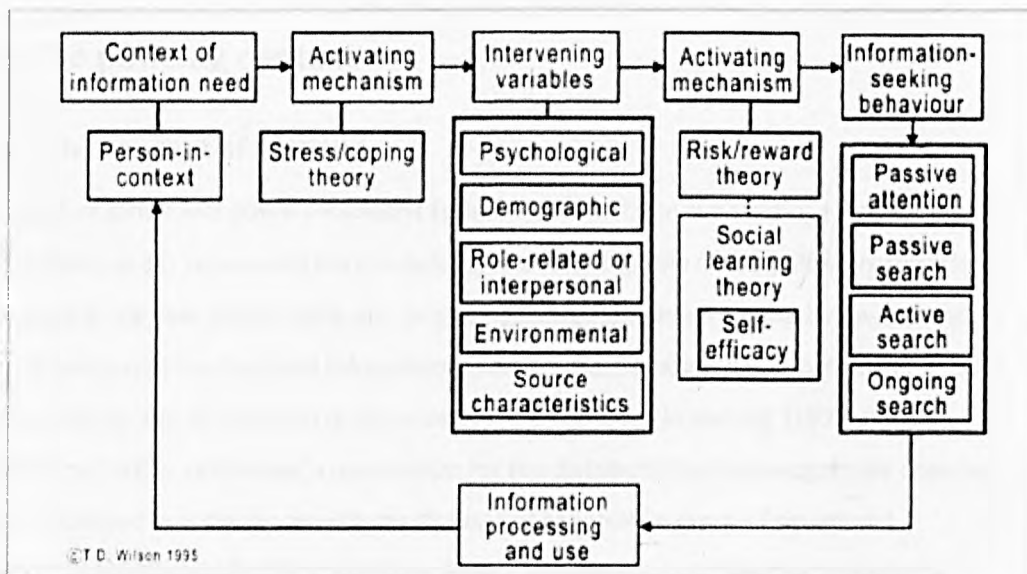
Figure 9: Wilson's model of information behaviour (Taken from Wilson 2005)

In this model, the emphasis is on the complete context of information seeking and drawing upon other areas of research such decision making and psychology. This revised model is more complex than the first because of the expansion and addition of a number of different variables. Case (2007) sees the addition of different types of information seeking behaviour as being important addition, as well as the use of other fields to better explain and understand the intervening variables. Wilson perceives the Ellis feature as operating at a different level from his model and therefore it can be nested within the active searching element of information seeking behaviour, as can that of Kuhlthau-ISP model. Wilson, in his discussion of the development of this most recent model, indicates that there seems to be a general level of commensurability between the work of Ellis and Kuhlthau, but notes that ultimately the models represent different approaches for their creators because of the temporal difference in the two, Ellis's feature set does not have strict temporal structuring while the ISP model of Kuhlthau makes use of stages. Wilson suggests that his later model is 'less a theory than a theoretical framework: that is, although in its latest manifestation, theory plays a role, the model is aimed at linking theories to action (Wilson 2005, p.35).

2.3 The policing context

2.3.1 The concept of policing

The work of influential police sociologist Egon Bittner has been the starting point for many researchers, and it serves well here in helping to define the role of the police organisation discussed in the case study, while also providing contextualisation for the behaviour and preoccupations of the featured information workers. Bittner argued that policing is 'a mechanism for the distribution of situationally justified force in society' (1979, p.9), a position he further refined as 'a mechanism for the distribution of non-negotiable coercive force employed in accordance with the dictates of an intuitive grasp of situational exigencies' (1990, p.130). The centrality of coercive violence to policing has remained constant in both the process and the academic discourse on policing (Bowling & Phillips 2007; Crawford & Burns 2008; Ericson 2007a; Hawdon et al. 2003); Ponsaers (2001) in a review of the development of modern policing models notes that regardless of the

doctrine emphasis on concepts such as community partnerships or zero tolerance for minor offensives that each retains an aspect of 'the monopoly of force' (p.473) by police organisations.

Manning (1992) suggests that, on this basis, the core *technology* of policing has remained unchanged over time; it is the application of violence, informed by situational awareness, permitted by rapid decision-making authority. Further, that the introduction of information technology enhances rather than changes this central process. Critical to their appropriate use of force, officers must be able to rapidly assess a situation and decide on a course of (sometimes physical) action. This is often based upon a 'gut-reaction', a form of situational awareness that encompasses information gathering, situational assessment and mental preparation for possible future changes in the current environment based on previous experience (Flin et al. 2007). Critically, at the operational level, officers enjoy a broad discretion on how they carry out their duties with decisions often being influenced by the culture of fellow officers rather than the strict application of standardised rules and procedures (Hassell 2007; Allinson 2004; Archbold 2005; Barton 2003; Bittner 1990; Brunetto & Farr-Wharton 2003; Crawford & Burns 2008; Ericson 2007a; Ericson & Haggerty 1997b; Flin et al. 2007; Foster 2008; Hawdon et al. 2003; Innes 2003; Johnson 2006). Although there is a constant tension between trying to manage officers and allowing them this discretion, it is widely accepted that officers must be able to act 'without direction from above' (Burrows & Lewis 1988c, p.2). The idea that conflict and rapid decision-making is at the heart of policing has entered the public consciousness as normative practice, fed by a diet of police centric television shows and literature that put great emphasis on 'rough-and-tumble' (Wilson 2000, p.129). However, this extreme form of interaction with the public represents a minority activity for officers in terms of how they spend their time. Ericson and Haggerty (1997b) in an extensive review of this area argue that officers spend little time dealing with criminality as opposed to information, and that the conceptualisation of this group as crime fighters is a construction of the public sphere and the mass media rather than a reflection of the reality of their work, which is centred around the recording and management of data and its transformation into information. *Diary of a Police Officer* (PA Consulting 2001), a Home Office

commissioned time and motion study of the working habits of front-line UK police officers found:

> That **more than three-quarters of available officers are outside the station for only four hours in the day.** Two of these hours are between 23.00 and 01.00 hours. Over most of the day a presence of between 25 and 75% of officers is maintained outside the station. **For five hours in every 24, half or more of the shift are in the police station.** These times are concentrated at the beginning and end of shifts and between 17.00 and 18.00. Even between 6.00 and 7.00 am, when two shifts are on duty in our sample, the maximum number of officers out of the station is 24 – less than half of those available (p.12).

A similar study found that one information intensive process, the completion of a summary sheet after the taped interview of a suspect, was estimated to take the equivalent time of 1,400 full-time police officers per year (Royal Commission of the Criminal Justice System 1993), while a nation study of police activity found that the types of officers covered in this study, the response or general duty officer spent about two-fifths of their typical duty shift within the police station (Bennett & Lupton 1992a). Brodeur and Dupont (2006) observe, in a study of the relationship between knowledge, knowledge work and policing, that the quantity of data captured and disseminated within police forces is 'overwhelming' (p.17), while Manning in a review of the application of technology to policing found that the work of officers is 'information dependent' (1992, p.349). Similarly Berg et al. (2008) notes that '...the amount of information police officers come into contact with in the course of their daily work is enormous' (p.273) and as a result, information overload is a constant problem (Luen & Al-Hawamdeh 2001; Dean et al. 2006; Puonti 2004). Leun and Al-Hawamdeh (2001) observe that policing is 'dynamic, complex and stressful. As part of their day-to-day routine, police officers have to deal with a myriad of fast-changing, complex and demanding problems involving crime prevention, incident management, investigation and community policing' (p.312).

2.3.2 Accounts and accountability

Brodeur and Dupont (2006) suggests that a significant development in the theory of policing has been the explicit acknowledgement of information at the centre of policing and the emergence of concepts and practices to support this – concepts such as 'meaning,

intelligence, knowledge, information technology and data mining' (p.7). Influenced by this changed emphasis and shifting importance, the last two decades has seen the rise of new public management, an ideological focus on effectiveness and the measurement of economic 'added value'. The heavy emphasis on information management allows for the careful measurement of performance indicators and numerical goals (Butterfield et al. 2005; Ferlie & Ashburner 1996), a culture of managerism depending on utilitarian ideas of efficiency, effectiveness and economy (Terpstra & Trommel 2009; Ayling & Grabosky 2006). Targets are important within the new public management because of their value to central government and other bodies as they attempt to illustrate to the public which services and activities provide economic value. Furthermore, they indicate how that value is relative to other public spending (Kiely & Peek 2002; Fielding & Innes 2006). These have become integrated into the routine of policing and have shaped and influenced the performances and tasking of organisational business units in order to comply with externally set targets (Loader & Mulcahy 2003; A. Crawford & Lister 2004; Butterfield et al. 2005; Fielding & Innes 2006; Ratcliffe 2003; Hale et al. 2004; Leishman et al. 1996; Chan 2003; Ashby et al. 2007).

This has occurred parallel to an increased drive for accountability and probity that has contributed further to the administrative and information burden experienced by rank and file officers (Chan 2003). Many tasks are performed simply to document an incident for the purposes of auditing rather than because they have any evidential or operational value (Brunetto & Farr-Wharton 2003). The demographic information collected for the work task (The Stop and Search process) discussed in this thesis is an example of the increased administrative burden, it has no operational value. The additional costs incurred by police organisations as a result of these recording activities have lead to further work to turn information into a commodity that can be packaged and sold to external agencies including other public bodies and organisations such as insurance companies (Chan 2003).

2.3.3 Increased emphasis on management of information within policing

Focus on information was made more explicit at the operational level during the 1990s and 2000s with the rise of the intelligence-led policing[1] (ILP) model, a style of policing that relies on the careful gathering and analysis of information. The Home Office defines intelligence as 'the result of gathering and collating of information from a variety of sources to assist police officers in the prevention, reduction and detection of crime and other incidents' (Stop and Search Action Team 2005, p.8). Alternatively Ratcliffe (2003) defines intelligence-led (or drive) policing as being fundamentally an information organising process and '...the application of criminal intelligence analysis as an objective decision-making tool in order to facilitate crime reduction and prevention through effective policing and external partnership projects drawn from an evidential base' (p. 3). In essence, it is future-oriented rather than reactive; information is used for predictive purposes and to identify persistent problems (Verfaillie & Vander Beken 2008; Maguire & John 2006). As an example, the use of Stop and Search, the work task discussed in the case study is seen by central government as an important tool for both collecting information about an area and helping to tackling crime when used in a strategic and planned manner within a small geographic area (Stop and Search Action Team 2005, p.8). Hughes and Jackson (2004d) in their exploration of the rise intelligence-led policing observe that the work of specialist collators who are able to 'intuitively and serendipitously link seemingly unrelated pieces of data to produce intelligence (knowledge)' (p.66) have become part of the daily responsibility of all officers.

2.3.4 Occupational use of information within policing

When considering individual roles within policing, the work of detectives or investigative officers has most frequently been the major focus for explorations of information usage, knowledge and the management of both (Berg et al. 2008; Bittner 1990; Brodeur & Dupont 2006; Dean et al. 2006; Ericson 1993; Ericson & Haggerty 1997b; Lundin & Nulden

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[1] The 1990s and 2000s saw four styles or models of policing experience political backing as the 'answer' or part of the answer. Those were "community", "problem-oriented", "zero-tolerance" and "intelligence". See Hale et al. (2004) for an extended discussion on the use and development of those styles across the 1990s. The officers in the case-study operated under an intelligent-led policing model and this is concentrated upon here.

2007). The role is seen as being fundamentally information based (Innes 2003), and the 5 Cs of investigative work are all information based, consisting as they do of collecting, checking, considering, connecting, and constructing (Dean et al. 2006). Investigative work is an intensive, time-critical process, where activity revolves around the criminal incident and determining its circumstances and the actors involved (Chen et al. 2002; Puonti 2004). Officers work in situations where the investigative process itself is framed by 'uncertainty, unresolved issues about motive, and multiple perceptions and explanation' (Foster 2008, p.110) and where the planning process may make extensive use of informal chats and meetings or mediating tools that are created at the local level – such as ad-hoc project plans or search maps (Puonti 2004). Christiansen offers an activity theory perspective based upon observation of the work of 'flying squad' detectives, and noted that they have three motivations – solving a puzzle, catching a criminal and keeping a track of documentation that may assist them satisfying the first two motivations (Christiansen 1996).

These chaotic, fast changing situations have been a fertile group for academic enquiry into how investigative officers gather data and collect evidence to make arrests and ultimately support criminal prosecutions or other punitive actions (Luen & Al-Hawamdeh 2001). Smith and Flanagan (2000) in a longitudinal study of senior investigating officers interviewed forty individuals across ten police organisations and found that effective practice required skills in three core areas or clusters – management skills (people, general and investigative), investigative skills (the ability to assimilate information, judge its relevance and importance and then makes inferences from that information) and domain expertise (investigative procedures, legal and court procedures). Other studies have touched upon similar themes and suggested that key to the success of an investigative officer is the ability to be able to relate effectively to a variety of people in order to obtain the information they require and show creativity in the approaches they take when doing so (Dean et al. 2006; Archbold 2005; Kiely & Peek 2002). Similarly, the ability to assess and grade and collate raw data is a theme that has been touched upon in a number of studies (Innes 2003), as has the sharing of information between officers, something that Gottschalk (2008) argues is of 'critical importance' (p.64). Ericson (1993) found that more

than in other areas of policing, more time was spent on the recording of officer activity for the purposes of administration and monitoring rather than on performing the investigation itself.

In contrast to the numerous and multi-faceted studies on information usage and management within policing (as a collective entity) and the sub-group of the investigative officer, the role of the uniformed patrol officer in regards to their use of information and information management technology is surprisingly uninformed and patchwork like. Conversely, the use of, and reasons for, violence have been covered in great depth, as have the occupational culture of this group and their resistance to change. This group has been the focus of multiple studies on various facets of the use of discretion in decision making by officers in their daily activities. In addition, a large body of literature exists that explores the cognitive, cultural and environmental factors that influence an officers' decision to stop and question a member of the public about their behaviour. However, there is a paucity of academic study covering this group either as the information man or as part of a group engaged in collaborative information behaviour. What little does exist tends to consider those questions not as the focus as investigation but as a secondary matter of importance.

Manning (2008) makes the following points about uniformed police in regards to their use and selection of information during incidents. That is to say, how the officers themselves perceive their behaviour and needs. First that the boundaries of an 'incident' are fuzzy, and action might be taken by actors independent of the officer, which resolves the situation in some satisfactory manner or simply changes the actions of the officers as they become aware of the intervention. Once an officer has, at least a basic understanding of an incident, this will shape the information need; 'that which is accessible and useful for the incident at hand, and arrives "just in time" for active use by the officer' (2008, p.80). Second that the queries made by officers tend to relate to a limited group of data sources: vehicle registration and driving licence, outstanding warrants and criminal records. Moreover, the officers' definition of the incident type will drive the administrative records and which information is captured for statically or performance purposes. Finally, that the technologies and information sources required or used are a matter for the officer at the

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scene to determine. Manning further notes that when recording information, 'what is written is just enough and just in time to accomplish the officer anticipates accomplishing, and no more (2008, p. 81). Further moreover he suggests that there are six main sources of information or raw data into police forces. Those six broad categories or 'social worlds' are: (1) other police agencies and units; (2) the alarms of citizens and businesses; (3) businesses; (4) private security companies; (5) citizens who are victims of crime or non-perpetrators'; and (6) criminals and those on the fringes of criminality. Those categories also carry with them a hierarchy of trust, with information received from fellow police agencies being the most trusted and information received from the public and criminals being rigorously screened and subject to checks and balances. Other sources of data that fit within those categories include the monitoring of telephone and electronic and email communications, personal observations of officers, informants and miscellaneous data received from external organisations (Brodeur & Dupont 2006; Berg et al. 2008). Once information has entered the organisation, it can be categorised into four broad categories based upon the classifications of Green (2006) who notes that the further away information becomes from primary, the more abstract it becomes.

Primary (data gathered by officers):	Secondary (Data processed by investigators):
- Notes taken by officers - Stop and Search forms completed by officers - Traffic tickets completed by officers - Status updates sent from the officer to the control room ("I am at the scene")	- Detectives examining and making links between statements - Detectives examining and making links between collected documents such as receipts and banks records
Tertiary (Data processed by special units):	Policy (Data organised into abstract categories):
- Analysis of officer records by professional standards unit - Analysis of domestic violence information	- Analysis of number of call received per call handler per shift - The number of miles driven per shift per police car

Table 1: Types of information within police organisations (adapted from Green 2006)

The point of first contact for most members of the public, and one of the most significant sources of information into a police organisation is the call centre. Within the United Kingdom, these collectively receive in excess of 80 million calls per year (Her Majesty's Inspectorate of Constabulary 2007, p.2). Of this number, eight million require no officer intervention to resolve, but information from calls is collated and used to identify trends and hotspots in accordance with intelligence-led and pro-active policing models (Her Majesty's Inspectorate of Constabulary 2007, p.4). Another significant source of information for police organizations is the non-structured contract between its officers and members of the public in various public spheres such as streets, schools and shops, much of which consists of short conversations or the passing of small pieces of discreet entities of data, often devoid of much context – the name of an individual, an unusual car that has been spotted in a neighbourhood (V. Hughes & P. Jackson 2004d; Manning 1992; 2008). The volume and sheer variety of encounters makes this type of interaction the most important 'conduits of information' (Manning 2008, p.76; 2001). In addition, more structured interaction with community groups and leaders provides access for the police to 'vast, if unstructured reservoirs of local knowledge' (Williamson 2008, p.18) which helps police organisations to better understand what is happening within an area.

2.3.5 Cultural and technical issues with information management within policing

Given the central importance of information and information management to the day to day activities of policing officers, it is alarming that the development of ICT systems within policing is littered with danger, death and dysfunctional practices. There are currently 43 separate legal entities responsible for the provision of policing and protective services with the United Kingdom, 52 of which are territorial in nature and cover geographical areas broadly congruent with a local government area, and 4 more which have a specialist function (such as the British Transport Police) that span a number of territorial areas. Although all organisations operate to a common set of statutory instruments and are measured against standard performance measures, how they conduct their day to day activities has been the subject of considerable latitude. This latitude has extended to the development of information systems and practices and has lead to a patchwork of diverse

ways of working and technological development across police forces. The range of information systems available included many unconnected information systems at the local and regional level. Some of those key information systems are national, for example force intelligence systems are designed, managed and available on a local basis, and in addition, there are a small number of linked national information systems such as the Police National Computer (PNC). Those are national because they are accessible to all and updated by all police forces and other relevant organisations.

Against this context, it has long been recognised that there is a disconnect between 'the business' and Information Systems support functions, IT professionals struggle to comprehend and implement the needs and wants of their operational counterparts (Alter 2006; Berry 2009; Bichard 2004). Moreover, the long development and operational lifecycles of bespoken information systems has lead to further complications in ensuring that systems are fit for purpose when they are implemented rather than when they were conceived (Hackney & McBride 1995; Brunetto & Farr-Wharton 2003; Fowler & Pryke 2003). All of these issues have lead to systems that operate as silos, where data interoperability is simply not possible or only possible with the development of an intermediary system to clean up and makes the information held in database (Bundred 2006). The problems experienced by police forces are not simply technical, but also cultural and organisational in nature, the lack of individual training and the ineffectiveness of managers to communicate objectives to their sub-ordinates is noted as being a barrier to the flow of information within organisations (Brunetto & Farr-Wharton 2003; Collier et al. 2004). Moreover, senior figures with policing have also identified issues with basic computer literacy as being a barrier to effective communications and the management of information and that without challenging those and other cultural issues that 'an investment in technology might not yield the appropriate changes in behaviour' (Collier et al. 2004, p.466). In addition, officers engaged in frontline policing activities do not perceive the management of information as being a core activity, but something separate and performed by those who have a low status and second rate minds (Brodeur & Dupont 2006). This is an issue that is difficult to overcome in an occupational culture that is highly resistant to change (Barton 2003) and where skills are lost due to the promotion, rotation

or retirement of officers and the poor provision of training programmes (Gamble 1999; Collier 2001; Brunetto & Farr-Wharton 2003; Collier et al. 2004).

More issues were highlighted in *Calling Time on Crime,* a critical investigation into information sharing within and between police forces. It argued that excess caution and a lack of common standards and protocols for sharing information and data interoperability hindered the effective use of information to protect the public and detective criminal activity and could lead to serious failure (Audit Commission 2000). Following this, a watershed moment was reached in 2003 when Ian Huntley was convicted of murdering two school girls, Jessica Chapman and Holly Wells, in the village of Soham, Oxfordshire. The investigation and trial revealed that while Humberside Police Force were aware of eight allegations of sexual misconduct, and social services were aware of three other allegations, that the silo nature of information systems in these organisations meant that none of this data was shared with or accessible by other police forces or relevant organisations. When Huntley applied for a position as a school caretaker, he was subject to a criminal record check, a safeguard that suggested that there was nothing untoward in his history.

Against a backdrop of public recriminations, a public enquiry was led by Sir Michael Bichard and his final report provided damning critique of the then stage of police information systems, the protocols around them and the people who managed them. The failures in information sharing lead to 'errors, omissions, failures and shortcomings which are deeply shocking' (p.2) and the officers' response for managing the Humberside Police Force intelligence system were 'alarmingly ignorant of how records were created and how the system worked" (Bichard 2004, p.2) While there are multiple reasons for these failures, two broad interwoven themes appear time and again in the literature– a cultural aversion to risk and, as mentioned above, the historical constitution of policing within the United Kingdom. In a research study for the Police Reform Unit, Berry (2009) argues that police officers have been 'risk-averse' (p.13) due to impact of the new public management and the linking of performance to numerical measures. In turn this had led to officers who have little experience of 'problem solving or the use of discretion' (p.13) and a tendency for senior management figures to adopt overly strict interpretations of legal restrictions.

2.3.6 Increased emphasis on mobile data and technologies within policing

It is against this background that the demand for and the development of remote access to information systems has occurred. While the aspect of police work has been made more explicit in the last decade with the rise of 'intelligence based' policing strategic, the judicial capture, manipulation, analysis and dissemination of information has always been core to their effectiveness. The geographically roaming nature of police officers and the need to rapidly identify individuals, artefacts (cars, premises) and the possible linkage between these entities has always made the facility for remote access to information a necessity for modern policing. The prevalent model makes extensive use of call-centres and intermediaries, with officers using telephony and other radio based communications to request information access while on the move. However, these systems are not infinitely scalable and the demands on those centres meaning that bottlenecks limit the speed of response and the level of detail that can be provided. The concept of putting information 'in the hands of the officer' has become a powerful one.

Another recurring theme in the drive for the implementation of mobile information systems by police forces is that of the reduction of the administrative burden on officers to allow them to spend more time per working day (or 'tour of duty') outside of the station and dealing with issues of criminality both by direction and by increased visibility. As part of its findings, *Diary of a police officer* (PA Consulting 2001) recommended that the application of mobile technology such as handheld computers could 'allow the police to complete much of their paperwork more quickly and in the community' (pg. Viii) but that problems might occur because of the 'patchwork' (pg.Viii) nature of existing systems and the barriers that exist to interoperability. The report also noted that it was realistic for forced to be using mobile data routinely within three years. The findings of that report were echoed by a number of government reports and white papers. *Policing a new century* concluded that the use of mobile data was essential to the successful delivery of protective services to the public (Blunkett 2001), while the Home Office based Crime Reduction and Community Safety Group argued that remote access to information was vital to reduce the administrative burden (Policing Bureaucracy Taskforce 2002). The increased importance of mobile technology was also noted by the then Home Secretary

David Blunkett in a keynote speech at the 2002 Police Federation conference. He argued that changes needed to be made in 'how crime reports are accessed and data is made available for people who shouldn't have to go back to the station in order to be able to get it'. Eight years after the release of *Diary of a Police officer* and after significant investment in mobile information systems to increase the 'cashable saves' of time spend out of the station, Berry (2009) notes that in 2007/2008, officers spent 18% of their time out of the station and their paperwork burden had increased by 17%. The same report, when considering the current use of mobile devices notes that 'While many officers are today benefiting from new mobile data devices, the range of applications varies widely and there are few examples of integration' (p. 15) and that "mobile devices have limitations – what works on paper does not necessarily transfer to a machine" (p. 15).

2.4 Concepts in Temporality

The mobility literature and the discussion around the case study presented in chapter 5 makes extensive use of temporality and the passage of time as one of the focuses for analysis when considering the changes that result from mobile technologies and mobility. The terms that are used frequently in that literature to discuss time and also adopted to describe the changes in the case-study are outlined below.

2.4.1 Temporal classifications

The most commonly used classification is that of objective time, subject to linear progression and measurable without ambiguity (Tuttle 1997). This is arguably the oldest concept of time and has existed for well over a thousand years in the work of Aristotle, Newton and others, time represented as both absolute and transcendent (Neary and Rikowski 2002). Objective time is also 'clock time', it is divisible and quantifiable, homogeneous and uniform, regular and mechanistic, and used by individuals, organisations and cultures to construct conventions and segment time into milestones, deadlines and schedules (McGrath & Rotchford 1983; McGrath 1988; Ancona, Goodman, et al. 2001; Ancona, Okhuysen, et al. 2001; Labianca et al. 2005). This form of time was the basis for the work of the original management guru Fredrick Taylor, who based his text *the principles of Scientific Management* (1911) around the measure and management of what

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is termed 'objective' time for the purposes of effectiveness and efficient use of labour. Over the years there have been many studies that have examined the role of objective or natural time within the organisation and how its measurement can be deployed for various effects. Within many organisations, time is the focal unit of production rather than the task, placing the clock as the key influence over co-ordination and control (Scarbrough & Corbett 1992). The study of time has been seen as important when studying organisations because the examination of variables such as sequencing, pace and duration of change highlight aspects of organisational behaviour that would not be covered by examinations of either culture or of strategy (Huy 2001). Within information systems research, the frequency of access to a system is one of the primary units of analysis used to determine the success of a change or implementation process (Savolainen Spring); while within processual research, the time allocation study is a popular method, in such investigations, standard unit such as minutes and hours are used to both define behaviours and the duration and sequence of actions and activities (Birth 2004; D. R. Gross 1984).

Other important developments include time as both social process and a product of collective consciousness, for example, gender divisions alters both the perception and place of time in everyday life and the exploration of time as a dual concern centred round 'social' and 'natural' constructs (Zerubavel 1985; Zerubavel 1990; Glucksmann 1998; Neary & Rikowski 2002). Work in this area highlights the limitations of treating temporality as an exclusively homogeneous concern, one that is collective and the same for all. As a result, the social sciences recognise a plurality of time covering concepts such as social time, astrological time, leisure time, work time, down time and gendered time (Hassard 1990; Wallerstein 1991; Tuttle 1997; Lee & Liebenau 2000a; Lee & Liebenau 2000b). These socially constructed times can vary according to actors and activities, time can pass quickly or slowly for an actor according to how tense they are or the level of enjoyment or engrossment they derive from an activity. The activities of actors also directly impacts on their perception of the speed at which time passes (tempo), with actors who are busy experiencing time passing more quickly than those who are not fully occupied (Ancona, Okhuysen, et al. 2001).

In the case study, the introduction of mobile technology changed how officers perform the Stop and Search task and the intertwined processes they follow when trying to reach the meaningful goal of that task. Tuttle (1997) offers four broad categories for understanding time and how it relates to individual behaviour and temporal orientation when conducting research that investigates organisational processes.

	Objective time	Psychological Time	Physiological Time
Temporal awareness	Planning and schedule Awareness of time Form of pace change	Past orientation Present orientation Future orientation	
Pattern-intensity of activities	Pace Polychroncity	Perceived tempo of time Adequacy of resource	Circadian rhythm
Responsiveness to environment	Punctuality	Temporal Autonomy	Susceptibility to entrainment

Table 2: A classification system of temporal orientation (from Tuttle 19977)

Objective time as discussed above, is based around planning and scheduling and the individual working to meet their own and organisational goals as measured by temporal markers or goals (deadlines). Many roles rely heavily on an awareness of clock time and meeting those temporal markers. The call-handlers within the case-study are measured against clock time measures of how many calls per hour they should answer or deal with. They are aware of these performance measurements and therefore try to manage their work by constantly monitoring the passage of time as displayed on their desks and also on big display screens within the command and control environment. The reliance on temporal milestones to measure their performance against organisation goals affects the pace, the shifts in intensity of activity that individuals demonstrate when trying to reach a goal.

Psychological time is subjectively experienced by the individual and is affected by age, perception and personality. It is a fluid view of the passage of time shaped by the environmental context, light, sound and stimuli which impact on these subjective perceptions. Tempo, the perception of the rate at which time passes, is an element of subjective time. Tuttle notes that 'the relative weighting of the importance of the past, present and future is expected to affect behaviour' (p. 356), and that environmental factors and experiences such as culture, personal and family history will influence the development of temporal awareness. The more that an individual considers the future, the more important it becomes in contrast to the present. Within organisation settings, the future is often the most important orientation or temporal horizon and manifests itself in sales projections, daily production schedules etcetera. Physiological temporal awareness relates to the awareness of the individual according to their internal body clock and the circadian rhythm is related to the sleep-wake patterns, physical and mental activities levels and various other physiological processes. For example, Individuals are more alert and aware of the passage of time during daylight hours than during the evening.

The final classification, that of socially constructed-relative, encompasses all of the other temporal orientations and therefore is contained within each and is implicit. In addition to his system of classification, he argues that although we now recognise that a number of different temporal contexts exist, how or if they co-exist with a single individual is still largely unknown and that little research has considered this point in detail. Moreover individuals' concepts of time overlap or mesh together is equally unclear. Within the study, there are at least three sets of actors, the uniformed officers, the call-handlers and the members of the public who might demonstrate or indicate differing temporal contexts.

2.4.3 Research on temporality in organisations

Organisational work has been conducted that explores the relationships between organisation culture and temporality (McGrath and Rotchford 1983; Thierry and Meijman 1994); the effects of changes in working practices on temporal norms (Knights and Odih 2002); differing notations of time as expressed in the relationships between joint and

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trans-national ventures; and the psychological differences in the concepts of time that are shaped by role or occupation (Clark 1985). It is clear that a significant degree of this work is not conducted by organisational or management disciplines, but rather as part of psychological or other health-care related studies; indeed one of the largest bodies of research in this area is the effects of degenerative mental illness on cognitive processes of time amongst individuals (Hazan 1984; Orona 1997).

One important study for the understanding of temporality within organisations where technology mediated change occurs is that of Barley (1988). Using an ethnographical study to explore how the introduction of computer-based equipment affected the working practices of hospital radiology departments, Barley contended that to understand the influence of technology on organisational structure it is necessary to view structure both as product and constraint to human action. He identified that the introduction of such technology had a marked effect on the patterns of interaction that existed between radiologists and the technicians that worked with them; this was a consequence of the technology bringing various working schedules closer together and leading to structures with various degrees of decentralisation. While he explored a number of temporal dimensions to explore the problem situation his most important contribution was to note how the application of technology lead to changes in individuals and cultures organise time: they are either monochronistic or polychronistic in nature. Monochronistic behaviour is observed when the individual anticipates and plans for events and occurrences by scheduling slots of time and trying to perform one task at a time, Polychronistic behaviour, in contrast, involves the individual working with less of a structure of order and being more accepting of divergence creeping into a schedule or simply being more open to multi-tasking. Those terms derive from Hall's (1959) study and division of cultures into polychromic and monochromic. The culture determines if individuals have a preference for multi-tasking (polychrons) or completing one task after another (monochrons), it therefore represents both a temporal style and an individual characteristic. At the level of the organisation or the group, the influence of the culture will lead to tasks or projects being scheduled together or one after another.

This idea that the introduction of information technology has implications for interaction and temporal perspectives is also centre to the work of Failla and Bagnara (1992). They argued that the key temporal effect of implementation is the elimination of rigidity in working rhythms and that '…information technologies help to eliminate or diminish the importance of time-frames generally accepted as appropriate for performing a given activity.' (p. 658). Furthermore they suggest that the developmental stage of the technology will influence how greatly rigidity is reduced and propose a three stage model of technology development for measure of effect: automation of routine activities, decision support, and virtual reality technology. The higher the stage the more the level of rigidity is reduced. While process is being automated, the level of rigidity is high because workers are expected to adjust to the time-frames that are introduced by the technology. In the next stage, the widespread usage of personal computers, decentralised processing power and individual computer packages leads to increasingly disruptive effects on temporal rigidity as users become increasingly independent in their use of the technology. Finally the introduction of virtual reality technology allows for the forecasting of situations and contexts before they occur and this allows for the simulation of future consequences before they occur, thus reducing temporal rigidity even further. This overlaps with the policing literature is that a perennial management concern is that information technology will provide for more officer discretion and a reduction in the control provided by the military style top-down command and control (Manning 2006).

The influence of Barley's work can also be seen in the work of Lee and Liebenau (2000a) who explored the impact of a Korean EDI solution on temporal schemas. They identified six key temporal variables that could be used to measure the effects of information systems on work practices. The six dimensions are based upon a conflagration of two earlier works, Zebrubavel (1985) who explored the temporal profiles of social situations and Schriber (1986) who investigated the existence of norms about time in organisations and the difference that could occur between both different workgroups and occupations. Building on Lee's (1997; 1999) early work, they propose six key dimensions of temporality related to business processes: duration, temporal location, sequence, deadline, cycle and rhythm. By measuring the increase or decrease in each of the dimensions they argue that

it is possible to assess the effect that information technology produces. This approach does not use an clock time framework, but rather they explore and apply the six dimensions using the subject's own concept of time as a point of reference, terms and units such as 'after lunch', 'about an hour' and so on, an approach seen by others such as Adam (1990). Together and separately, Lee and Liebenau have returned to, and refined those dimensions a number of times; even in their relatively recent work they note there is still 'not much work that addresses time and computers substantially' highlighting our lack of understanding in regards to the interaction that occurs between the two (Lee and Liebenau 2000). While as described above, time is a social constant and a fundamental part of everyday life and everyday information seeking, any activity is bound up with time and interdependent cooperative activities that need to be co-ordinated in time. However, as a concept, time and temporality, is an area that presents a special challenge for those who wish to research its influence on organisations, individuals and behaviour. The dimensions are presented below and are adopted as the basic definition of terms for this thesis.

Duration	The amount of time spend to complete a task or activity
Temporal location	The location of activities and task at particular points over the continuum of time
Sequence	The order in which activities and tasks take place
Deadline	The fixed time by when work is to be done
Cycle	The periodic regularity in which work is completed repeatly
Rhythm	The alternation in the intensity of being busy

Figure 10: Six dimensions of temporality (from Lee & Libenau 2000a)

When discussing 'duration', Lee and Liebenau argue that the introduction of new technologies is seen to shorten the time taken to complete a task because of the more immediate access to information sources but that it would be better to recognise that there are lag-times in accessing and downloading sought-after material and this can often cause frustration and sometimes expense, something that describe as 'pseudo-instantaneous access' (2000b, p.9).

Their definition of temporal location suggests that tasks must be performed at certain time, either because of process, social or technological constraints. For example, within the case study, the officers must provide a reason to a stopped individual before they examine or search their belongings. The introduction of new technology can change the temporal location by allowing a task to be performed at a different point of the temporal continuum, the home PC allows the checking of emails to be shifted from 'work' time to 'home time'.

The concept of sequence can be seen to related to synchronisation, an attempt to make sure that action 'a' by person '1' occurs at the right moment in relationship to action 'b' by person '2'. It is an operational aspect of temporal co-ordination between individuals (Badram 2000, McGrath & Kelly 2000, McGrath 1986). In turn, this is linked to scheduling, the identification and management of temporal goals by setting deadlines that anticipate action and temporal co-ordination (Badram 2000, McGrath & Kelly 2000, McGrath 1986). A deadline is a form of a temporal goal and key to scheduling is an understanding of timing – how long each aspect of a task or a project should take and how this relates to the overall time taken or permitted (Huy 2001); temporal planning has been defined in similar terms, the extent to which an individual schedules activities and keeps to that plan. Similarly, temporal allocation is deciding how much time to devote to various activities or tasks and can be seen to relate to deadline in that the allocation will reflect the time needed to complete elements of a work to meet the overall temporal goal – the deadline (Badram 2000, McGrath & Kelly 2000, McGrath 1986). One of the major restraining factors within information seeking activities is the temporal, the amount of time available to the seeker and the deadlines or constricts that they are operating under (Case 2002). Savolainen (2006) notes that the time available to perform an information search is the

scarce resource for many information seekers, while Edmunds and Morris (2000) relate Information overload to temporality, too much useful information to process in too small a frame of time.

When exploring the relationship between information seeking behaviour and time, it is important to consider the basis of behaviour in terms of their rhythm; it is the pattern of variability in the intensity and frequency of organisational or individual activities which can be episodic or repeating (Huy 2001). The key difference being one of frequency, the former being performed on an irregular and/or isolated infrequent basis and the latter being performed on a regular and frequent basis, this is a rather opaque distinction and the line between episodic and repeating has been the subject of much debate (Venkatesh, Maruping et al. 2006). Rhythm has also been explored in other works and is seen as being not only an alternation in intensity but also something that acts as a signal that guides individuals engaging in information behaviour. Reddy et al (2006) explores further the concept of rhythm, within a clinical setting, and argues they can be large scale, related to work shifts and the movements of objects and individuals through a process, or small and fine-grained related to activities such as the administrating of drugs or writing up patient notes. Rhythm itself provides information, in that it also acts as a signal to individuals to inform when others will be available to fulfil their information requests or will make information requests of them. In their study, the nurse knows that the doctor will want patient information when they make their morning rounds and also knows that in the evening the doctor will not be available to provide information for them, they therefore use this rhythm to plan their information behaviour.

All of these activities can be seen to occur with temporal schemata, the cognitive frameworks that give meaning to experiences. Within the collective experience, it allows team members to share an understanding of deadlines and how and when activities should occur or when they should have occurred. The developments of these are influenced by the external context (social, economy, cultural). Within policing, these manifest in many different ways, the call-centres have targets for the acceptable time it takes for a call to be answered and officers have to respond to urgent calls for assistance with alacrity. Clock time provides one of the strongest foundations of temporal schemas

and also they become prototypical – 9am-5pm being the accepted time for the duration of the working day, 1pm-2pm being the lunch for many. If the organisation tries to adjust those prototypical examples, there may be resistance and tension (Labianca et al. 2005). Within temporal schemata, artefacts such as the clock, the work shift, or the calendar provide the units of measurement, they provide temporal co-ordination.

2.6 Mobility

2.6.1 Mobility as concept

In the case study (Chapter 6), the uniformed officers made use of a small hand held computer known as a Personal Data Terminal (PDT) to remotely access organisational databases for the purposes of confirming the identity of members of the public and to complete an electronic version of a data collection form. Once completed, the form was automatically sent from the device to a remote database for processing and management information purposes. The most commonly used and simplified definition of mobility as it relates to the use of technology within popular and technical literature is that which provides the ability to access information 'anytime, anyplace' (Axtell et al. 2008). The officers' usage meets this basic definition, indeed, an internal project document for the trial noted that the use of the PDTs would allow officers to directly access organisational databases 'wherever they are'. However, this is a definition that is intended to articulate, in a positive manner, the benefits of a technological solution to the differing and varied needs of both organisations and private individuals as they move around from geographic location to geographical location. As a result, advertising and commentary around such devices is informed by this articulation of benefit and portrays technologies such as mobile phones as allowing users to transcend all of the limits imposed by geographic and distance (Venkatraman 1994; Spender & Helminski 1996; De Poorter 1998; Helal et al. 1999; Kakihara & Sørensen 2002).

First, the idea of 'anytime, anyplace' is limited, it (and the popular and commercial literature it is a synthesis of) presents an entirely functionalist perspective on transcending geographical locations, one concerned with the technology rather than the richness of the user experience and the various complex situations and contexts that they operate within.

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Second, the concept of 'anytime' is unfocused and trite with little analysis and only limited classification as in the temporal literature explored above. This idea that access to technology is the same as access to information is one that has long been discredited in the information sciences literature (Burnett et al. 2008; McCreadie & Rice 1999; Culnan 1985). While this idea of instant access here is, as Perry et al. (2001) notes, a useful rhetorical tool to promote adoption of mobile technologies, 'the user's ability to get information and the user's ability to employ information to accomplish particular goals are very different' (Burnett et al. 2008, p.58). Moreover, it is another expression of the pseudo-instantaneous access often attributed to new forms of communication. Others have gone further and suggest that a simplistic narrative is being created not simply for promotional purposes but because of a lack of understanding about what actually constitutes mobility (Perry et al. 2001) and that the current technical constricts mean that in fact it is difficult to communicate 'every time, ever where' (Kristoffersen & Ljungberg 1999b; Kristoffersen & Ljungberg 1999a; Kristoffersen & Ljungberg 2000; Lamming et al. 2000).

While the study of the underlying technology behind remote or mobile access to information is well established within the technical literature, the relatively recent interest in its social and organisational impacts has lead to a number of terms such as 'wireless' and 'nomadic' computing being poorly or interchangeably used to describe this type of activity (Scheepers & J. Rose 2001). For example the term 'Wireless' has been used in the literature to discuss information systems that can communicate without the use of wires or cables; this has been taken by some to suggest that being wireless equals being mobile (Nakata et al. 1999; Levy 2001; Stevenson 2001). While there are elements that provide an overlap between the two concepts, they are not synonymous. A device may be connected to an information system or database wireless (via radio waves) but remain geographically fixed in nature and within the physical confines of the organisation (Perkins 1999). A personal computer in an office block can be fixed but wireless, as can a tourist information terminal in an urban environment which makes use of a wireless connection but is unmovable in terms of geographical location. For this reason, the interaction between the user and stored information where the user is physically located away from the

organisation – in the street or a home, airport or some other aspect of the private sphere not under their control is often seen as one of the key indicators of remote mobility.

Axtell el (2008) notes that for tasks that are socially independent (no interaction with others) that the technology to support them must be portable, and able to fit within those spaces. If they must interact with others, to be socially interdependent, then the devices must also support some element of network connection to allow communication if the other person is not co-located. The task described in the case study has characteristics requires both social independence and interdependence. First, the technology must be socially independent in that the officer is able to carry it and use it in the street and second, to complete an important part of the Stop and Search task, the confirmation of identity of a stopped member of the public, it must be connected to his organisation's networks. This task differs from many of the descriptions within the mobility literature because it requires both communication with the organisation, but also interaction with an individual (the stopped member of the public) who is co-located with the officer. In most scenarios described or anticipated in the literature, the mobile worker is operating independently or alone, nowhere but here there is an aspect of interaction in person rather than over a network connection.

2.6.2 Mobility as movement

The idea that geographic distance is a key part of remote mobility is often articulated within the concept of 'travelling' (Perry et al. 2001; Kakihara & Sørensen 2001; Kakihara & Sørensen 2002), something that Kristoffersen & Ljungberg (2000) further break down into modalities – travelling, visiting, and wandering. Travelling involves the process of going from one place to another, while visiting is a process where a mobile worker may visit a client site, finally there is wandering, extensive local mobility with a building or small area. This notion of wandering overlaps with the work of Bardram and Bossen (2005) who see this as being a part of spatial mobility rather than remote mobility, a process they see as being concerned with the activities and co-operative working of mobile workers across large (remote) geographical areas. In the same vein, the term "nomadic computing" is not concerned with supporting remote access to information but rather the working practices and behaviours exhibited by users who are on the move, a subtle but distinct difference.

Bellotti and Bly (1996) do not use the term nomadic computing but describe a similar process when they talk about local mobility (within the context of a hospital), where users need access to information systems (such as e-mail) for collaboration but have to be supported as they move around the building and away from their desktops. Local or spatial mobility therefore 'constitutes the spatial dimension of a work trajectory: to accomplish their trajectory projection, clinicians move themselves, others and things with space to combine these at certain spaces' (Bardram & Bossen 2005, p.133). The study interest in this thesis is of workers engaging in remote mobility, people moving around geographical areas that are not under their control or part of their organisations, although there is some obvious overlap as nothing prevented the officers on the trial making use of the PDTs within the station to complete notes or tasks. Bardram and Bossen (2005) see mobility work as a complementary concept of articulation work[2], and they define it as 'The right configuration of people, resources, knowledge and place to carry out a task' (p. 132). However, unlike their work, this study places a larger emphasis on the interplay between the temporal and the spatial in the context of those wider geographic spaces. Moreover the Bardram and Bossen work was exploring environments which, over time, actors could reconfigure to make the most optimal use of space and therefore their analysis was focused on environments under the control of the organisations providing the technology. In this study, the officers are called to, and make use of the PDT, in environments where they have limited or no control. The right configuration may therefore be impossible and the mobile worker has to deal with configurations that are 'make do' rather than 'right'.

2.6.3 Mobility and contextual constraints

The context of usage can been seen as critical, as remote mobility puts the worker in a situation where they must attempt to control the configuration of their working space due to the greater heterogeneity of the physical environments within which they must operate Kristoffersen & Ljungberg (1999a; 1999b; 2000). By granting remote access to users on the

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[2] Strauss's (1991) concept of Articulation work is "a kind of supra-type of work in any division of labor, done by the various actors Articulation work amounts to the following: First, the meshing of the often numerous tasks, clusters of tasks, and segments of the total arc. Second, the meshing of efforts of various unit-workers (individuals, departments, etc.). Third, the meshing of actors with their various types of work and implicated tasks' (p. 81).

move, the degree of heterogeneity will be increased and users' control over local contextual constraints will be decreased, context here is taken to mean both the physical and social space that the mobile worker is operating within (Axtell et al. 2008). To understand what is meant by these contextual constraints, it is important to understand the mobile worker and the environments that they are likely to face while on the move and at their intended destination. These may be airports, train stations or the client's office; they may be a mixture of various modes of public transport, or as in the case study, they may be working in the street. In all of these varied environments there are a number of issues that come into play to form a context; issues such as the communications infrastructures, access methods, noise, workspace and other HCI issues (Okuda & Sato 2001; Perry et al. 2001). Moreover, in many circumstances, the very act of travelling can result in 'dead time', periods where the worker is unable to access or use certain technologies or artefact because of the demands placed upon them when moving (B. Brown & O Hara 2003). This is in contrast to contexts that office workers finds themselves operating in; environments that are tailor made for purpose and contain all of the resources needed to achieve their goals, even as they move around a building (Lamming et al. 2000; Axtell et al. 2008). This may form part of a more complete explanation for the 'irresistible urge' that Perkins (1999) describes as pushing the development of mobile technology. It is a method for removing the links and associated difficulties of maintaining a link between a fixed spatial location and the user's information and communication resources (Perry et al. 2001; Kakihara & Sørensen 2002). Similarly work in this area includes Luff and Heath (1998) who see mobility as being related to the amount of distance covered by actors and artefacts and distinguishable as micro, local and remote. Some work has seen another level of interconnection between what can termed remote and local mobility. In their study of the use of mobile technologies on trains, Axtell et al. (2008) discuss micro-mobility and its relationship with remote mobility. They see remote mobility as being related to an individual's ability to communicate with others over distance, while micro-mobility is the work of individual to configure and use technology or artefacts while working in very small locations such as train carriages, space that are both static but mobile. All of those concepts of mobility can be seen as having a heavy emphasis on the spatial, and the idea that travelling or movement is important but not a complete

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concept of mobility, is developed in work by Kakihara & Sørensen (2002) who note that 'being mobile' is not simply a matter of travelling, but also is related to the interactions of the individual with the environment and other actors in both their professional and social lives. They propose that there are three dimensions of mobility: spatiality, temporality and contextuality. Those are summarised below in table 3:

Dimensions of Mobility	Aspects of interaction	Aspects of interaction
Spatiality	• Where	• Geographical movement of not just human but objects, symbols, images, voice etc.
Temporality	• When	• Clock time vs. Social time (Objective vs. Subjective) • Monochronicity vs. Polychronicity
Contextuality	• In what way • In what circumstances • Towards which Actor(s)	• Multimodality of interaction (unobtrusive vs. obtrusive/ ephemeral vs. persistent) • Weakly & strongly tied social networks

Table 3: Characteristics of Fluid Mobility (from Kakihara & Sørensen 2002)

The first element of this is spatiality, in this framework, geographical location (or corporeal travel as they refer to it) is just a small element of spatial mobility; a fuller picture given by a consideration of the interaction between objects, symbols and space. Examining first the question of objects, they argue that this is intertwined with the issue of corporeal travel using the Sony Walkman as an example of the link between objects and I travel, 'it is virtually an extension of the skin. It is designed for movement- for mobility, for people who are always out and about, for travelling light....'. Spatial mobility has also transformed the role and place of *symbols*; they now rapidly transcend culture on a global scale for all measure of economic and social interaction. The combination of numbers such as 9/11 would have little meaning for an audience that could not contextualise them as the American date system. However, in a digital age where media networks are able to beam pictures and images in to millions of homes world-wide as they happen, they becoming

identifiable symbols carrying significant meaning even for those who do not use western characters. Finally, there is the mobility of space; in terms of computer meditated communication, geographical distance no longer represents a fundamental factor of interaction between individuals. The Internet, for example, has allows the formation of virtual communities, virtual spatiality when millions of people are connected in loose networks, exchanging ideas and information.

Following on from this, Kakihara & Sørensen address the second dimension of interaction, that of temporality. They use the example of people attending a meeting to illustrate this; these people inhabit the same linear timeframe. However, mobility means that as well as not needing to share the same geographical location they also do not need to share the same time zone. This demonstrates a leap from a synchronous temporal dimension into one that is asynchronous in nature and that 'the temporality of human interaction can no longer be explained from a linear 'clock-time' perspective: it is now highly mobilized into multiple temporal models based on each actor's perspective and interpretation'. They argue that as ICT becomes more diffused in societies and industries, that the level of monochronicity present will decrease as a result, and polychronistic behaviour will increase, an argument that is supported with the previous work of others in this area (Barley 1988; Failla & Bagnara 1992).

The last dimension is that of contextual mobility, that is to say the situations that people inhabit with in various activities are directly affected and affect human interactions. These contexts can include cultural backgrounds, the current mood or behaviour of the individuals, familiarity of involved parties and so on; in face-to-face interaction, it is preferable that those factors share a high level of conformity. However in a mobile situation, the provision of mobile technology increases the number of different contexts that may be present. The crux of this argument is that the relationship between people and contexts is producing more flexible patterns of interaction across different contexts. Bringing together all of these dimensions (Spatial, Temporal, contextual), they produce a framework that they define as Fluid Mobility; fluidity is used as a metaphor as it represents the 'the remarkably uneven and fragmented flows of people, information, objects, money, images and risks across regions in strikingly fast and unpredictable

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shapes'. As a model for analysis, the concept of fluid mobility seems to be a step beyond those previously presented.

2.6.4 Mobility and time

The acknowledgement of complexity and unpredictability reflects more fully the realities that mobile workers may face, and the under emphasis on the temporal has been discussed by a number of other authors. Churchill and Wakeford state that the experience of mobile workers is one in which their experience of mobility 'is embedded in an experience of temporality, which includes mutually negotiated rhythms of contact, availability, and accessibility' (2001, p.173). Nilsson and Hertzum (2005) argue that the concept of mobility as currently used is vague and is more of an explanation of what is it is not – people working within static office spaces, rather than a statement of what is actually occurring, and has too much of a concentration on objective clock time. Building on the work of Zerubavel, they concentrate on changes to the rhythm of social interactions when mobile technologies are introduced. They argue that this provides a number of analytical benefits to those trying to unpick the complex relationships between individuals, space and time and this form of analysis of mobile moves the focus away from simply the movement of individuals and makes explicit the link to the temporal. Moreover, it makes explicit the idea that multiple temporalities (objective, social, collective) can occur in conjunction with each other and the tensions between them can add to the complexity for the mobile worker. Another important reason for the adoption of this means of analysis is that it allows the co-location and interaction of individuals to come to the fore – 'sometimes collocated moments of collaboration are needed and at other times collaboration is best served when workers avoid collocation' (p.156).

Axtell et al. (2008) also explore issues around rhythm and structure and they argue that mobile workers are always operating within two or more work contexts, that of the local environment (such as the train carriage) and the organisational norms of communication that exist. They provide an example of a worker turning off his phone on the train so he can concentrate on working on his laptop, while this allows the worker to concentrate on a single task. Later he is asked by other members of the organisation while they were not able to contact him during office hours and this is seen as a transgression of acceptable

behaviour. This is an example of the temporal structuring discussed above; time experienced through collective organisational practice and also part of the temporal mobility described by Kakihara & Sørensen. The user is therefore always mindful of not only their need to configure themselves and the technology to best match the local context, but also these non-visible geographic distant demands of the organisation, there is a share time consciousness of how things should occur (Labianca et al. 2005).

Drawing on this literature, in this thesis rather than consider mobile technology that which provides the ability to access information and people 'anytime, anywhere', a functionalist spatial outlook, it is argued that one based around fluid mobility and the highlighting of temporal and contextual influences and constraints' better represent the inherent complexity face by mobile workers. On this basis, mobile technology is simply 'that which may provide the ability to access information, symbols and people across a number of spatial, temporal and contextual dimensions'. The inclusion of the 'may' Clause is a reflection of the current state of technology that more accurately reflects the current "sometimes, some places" realities of mobile technology i.e. one device may not fit all mobile purposes and situations (Gallis et al. 2000).

2.7 Operational studies of policing and mobile technology usage

When considering field studies of the police use of mobile technologies, Norman and Allen comment that 'there has been little academic interest in this area' (2005, p.205), while Allen et al. notes there are few studies of 'genuinely mobile technology' (Allen et al. 2008, p.5). Sørensen & Pica suggest that this may be due to the difficulties of performing field research and that 'this area of work is quite difficult to gain proper access to and there are few studies within information systems of the operational aspects of policing, in particular, research following police officers' (2005, p.146). This lack of interest is part of a wider historical neglect, the impact of radio communications via VHS and other radio bands on how police officers perform their duties and communicate with the public and each other has been similarly underexplored within the academic literature (Weilenmann 2001).

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A review was conducted of leading journals and conferences using common terms such as 'police + information', 'police + technology' and variations of those with 'mobile', 'handheld', 'PDT', 'communications', 'MDT' etcetera. Technical studies such as those concerned with signal strength, security protocols and developments in telecommunication standards were excluded as were speculative studies that explored how the introduction of mobile technology could assist police officers by outlining possible usage scenarios. The focus for this thesis was on studies that satisfied two criteria. First, that they considered where the implementation or use of that technology had changed activity or the existing relationships between officers, between officers and the organisation, between officers and the public or any variation of the above. The second criterion was that the studies were not desk or paper based, but had involved some element of interview and/or field observation of the use of mobile technologies by police officers. Conference papers and proceedings of length of less than two pages were excluded as necessary detail was not provided to determine what had changes has occurred to relationships, interactions and the use and management of information at anything but the most abstract level. A number of papers were located that investigated similar areas within policing but not mobile technologies, for example, Chen's (2002) widely cited exploration of a desk based information system, Borglund's (2005) examination of electronic records in Sweden, Ashby's (2007) study of the impact of the new public management and Baker's (2004) study of the information needs of undercover police officers. Within the policing literature, various general accounts of mobile technology usage were identified and disregarded for not matching the criteria (Adderley & Musgrove 2001; Dean & Gottschalk 2007; Gottschalk 2006; Ioimo & Aronson 2004). Similarly, Borglund & Nuldén's (2008) interesting study of police activity via the critical lens of sense-making was disregarded for this section because the consideration of information systems was during what they termed the 'waiting stage', that is to say, while working at the station. Relevant studies are presented in a tabular form and discussed in the sections below. In addition to detailing the findings and research methods, the tables indicate where there were changes to interactions between the officer and the organisation/public and any changes to the flow of information.

2.7.1 The studies

The studies explore a range of technologies across a number of countries and geographic areas and user settings. The majority of the studies explore the impact of mobile technologies on the operational activities of officers; however there is one study that explores the impact of mobile technologies on senior operational managers within policing (Allen and Shoard 2005). Across those studies, four technologies can be identified, the use of in-car mobile data terminals (MDTs), laptop personal computers with telecommunication capabilities, hand-held personal data terminals (PDTs) and standard mobile phones.

Information Technology in the Police Context: The "Sailor" Phone - (Manning 1996)

Study overview	Research methods/theoretical perceptive	Findings	Interaction	Information flows
Explores the impact of the mobile phone as example of low-tech innovation in an American police organisation.	Qualitative data analysis approach using interviews, focus groups, and observations.	The introduction of mobile phones allows officers to communicate amongst themselves and members of the public. Officers will attempt to find ways to complete tasks that may not comply with 'doing it by the book' and the phones allowed them to deviate from the norms of the bureaucracy that exists within their organisation and manages their behaviour and activities. Technology may be subject to counter symbolization (undervaluing or underuse of a technology), counterappropriation (use of a technology to undermine domination by the organisation), or counter	The call handler is removed from their traditional intermediation process as officers contact each other directly and make more use of the informal information channels provided by the availability of mobile phones. Reduction in the ability of immediate supervisors to manage and anticipate actions of uniformed officers. The public are contacted directed by officers in attempt to quickly resolve problems and open cases rather than via the information intermediation service.	Mobile phones allow the development of 'back channels', communication between members of the organisation and those outside in ways not intended by the information routines of the organisation thus making them invisible to the organisation. Identification of formal (officer to call hander via radio) information flows and informal information flows (officer to officer via mobile phone). The introduction of the mobile phones allowed the officers to more inefficiently engage in

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	delegation (overvaluing of a technology at various levels of the organisation). The introduction of the phone increases officer discretion at the local level.	The presence of the phones increases mutual co-operation between the officers and allows them to communicate across political and organisation boundaries.	the passing of information via informal communication forms. Reduction in the shared knowledge of a situation that is provided by constant conversation over shared radio system (formal information channel) and there is the risk that activities can become more disjointed.

Impact of mobile computing terminals in police work - (Rao & Sanders 2003)

Study overview	Research methods/theoretical perceptive	Findings	Interaction	Information flows
The introduction and use of MDT units for the purposes of checking licences plates, issuing warrants and executing arrests in an American police organisation.	Quantitative and logio-deductive approach, use of survey instruments, time and motion studies, statistical analysis and hypothesis testing.	The devices increased the access of officers to information, allowed them to complete tasks more quickly resulting in increased job satisfaction.

Development of a structural equation model to show how increased access to information benefited the performance of the officers.

The increased availability of information increased the job satisfaction of the officers. | Interaction between the officers increases.

The use of the technology removed the call handler from elements of the process and allowed officers to directly access remote databases. | The increased communication between officers using MDTs was found to result in a significant time saving for the flow of information between officers.

The introduction and use of an additional channel of information allowed the officers to more quickly complete the identified routine tasks.

The introduction of alternative methods for the exchange of information via the MDT. |

On mobile technology in context: exploring police work - (Pica & Sørensen 2004)

Study overview	Research methods/theoretical perceptive	Findings	Interaction	Information flows
Explores the impact of the use of mobile technologies on the work of two groups – the Scene of Crime Officer (SOCO) and the Police Community Support officer (PCSO) within a UK police organisation.	Case approach, use of interviews and observation guided by socio-technical theories.	The introduction of mobile technology provides a mixture of the virtual and real environments. Different roles require different technologies to support their work. Contextual factors such as how long it takes to configure a device, risk, and infrastructure will impact on usage. The locale may provide a barrier to the use of technology by the users. Develops a matrix for considering the relationship between a user-device-environment that is based upon the idea of active and passive environments and structured and unstructured work tasks.	The use of mobile technologies create virtual environment of interaction, users belong to a communicative network rather than a physical space. The use of mobile technology increases modularisation, the predominance of one human sense over another. Voice is the best way to communicate during time critical events and where the attention of the officer is needed in the environment	Mobile technology leads to a higher de-contextualisation of information because of codified of symbols. Some users will rely on structured information flows to manage and control their processes, while others will require more ad-hoc access.

A contextual study of police car telematics: the future of in-car information systems - (Hampton & Langham 2005)

Study overview	Research methods/theoretical perceptive	Findings	Interaction	Information flows
Study of the impact of the introduction of MDT on Surrey police and the question of if the technology should be designed as part of the car or as a mobile computer.	HCI methodologies used to evaluate information systems. Data collected by interviewing three groups of officers against HCI standards.	The use of MDT terminals has provided benefit for the organisation and generally enhanced collaboration but more work needs to be done to determine problems with HCI issues.	Possible issues with cognitive overload and absorption resulting from the need to concentrate on the MDT terminals.	Introduction of MDT may provide a distraction to the solitary officer when trying to deal with driving and the environment. Cars with two officers allow for more variation in activity and for tasks to be completed while moving.

Action, Interaction and the Role of Ambiguity in the Introduction of Mobile Information Systems in a UK Police Force - (Allen & T. D. Wilson 2005)

Study overview	Research methods/theoretical perceptive	Findings	Interaction	Information flows
The influence of ambiguity on the adoption and rejection of a mobile office solution by two groups of police officers – uniformed officers, detectives within a UK police organisation.	Application of Strauss's theory of action and the concept of trajectories – the course of a phenomenon over time and the actions and actions that led to that course. Research conducted using mainly qualitative data including semi-structured questionnaires, observation and some documentation analysis.	The technology was adopted into the work practices of one group (detectives) while rejected by the second (community safety officers). Devices rejected by the community safety officers due to ambiguity about the purpose of the trial and the usefulness of the technology to their work and the reaction of the existing supervisor culture to their use of the technology to complete information related tasks rather than 'fight crime'. Detectives adopted the devices because there was less ambiguity on how the devices fitted in their existing temporal, spatial and work orders.	The introduction of the devices was seen as a threat to the existing practices of co-location of officers and supervisors for the uniformed officers. Supervisors of uniformed officers were concerned that the officers were using the devices in unintended ways. Seen as reinforcing working practices of the detectives. Peer-to-peer support amongst the detectives on how best to use the devices for work related tasks. Relationship between call	Introduction of laptops augmented existing information channels and allowed them to bypass information intermediaries to directly access remote databases. Information behaviour changed so that seeking was moved from the third person (call handler) to the officer using the laptop. Inexperienced officers more likely to use technology to find information.

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| | handlers and officers strained because of their differing reward systems. | Officers became more productive information seekers and more active about managing their own information needs.

Temporal schema changed because officers could complete reports in the field that they would have waited until they returned to the officer to complete.

Information updated on force systems in real-time.

Officers reported being better informed because they could access information from any location. |

Spreading the load: mobile information and communications technologies and their effect on information overload - (Allen & Shoard 2005)

Study overview	Research methods/theoretical perceptive	Findings	Interaction	Information flows
Use of hand-held devices by senior managers for email and personal information management and email within a UK police organisation.	Case approach with qualitative data analysis techniques and Glaserian based grounded theory coding used to generate conceptual findings.	Information overload exists in the organisation at the individual and ground level. Information overload is shaped by information-rich interaction-rich nature of policing. Managers' information behaviour and coping strategies changed as result of the introduction of technology. Erodes the boundaries between work/home further but not seen as a problem because this was an extension of normal practice. The introduction of the devices reinforced information behaviour that caused overload.	Changed temporal locations of interactions due to ability to access force systems at any time from any location. Increased interactions from 'always on' officers viewed as positive by some. Displacement of email and administrative work from 'work' time to 'leisure' allow the senior managers to spent more time engaged in face to face meetings.	E-mail most cited example of information overload for senior managers, followed by the level of information acquisition performed on a daily basis. The introduction of the devices saw the raise of short messages between individuals as they responded to requests for information. The officers were better able to make use of 'dead time' to respond to requests for information.

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Deployment and use of mobile information systems - (Norman & Allen 2005)

Study overview	Research methods/theoretical perceptive	Findings	Interaction	Information flows
Initial impacts of the mobile technology on two groups – scene of crime officers and detectives using laptops and detectives within a UK police organisation.	Activity theory approach based on multiple studies using qualitative data analysis techniques including semi-structured questionnaires. Use of grounded theory techniques for inductive data analysis.	Five key themes identified in relation to introduction of mobile technologies: Changes in working procedures, changes in the organisational capability, changes in relationships, and effectiveness of equipment and effectiveness of infrastructure. Officers felt that the technology would have increasing potential to improve their work and access to information, however concerns that the ability for the organisation to audit their work would lead to a decline in their discretion. The success of the technology requires careful planning and that organisational and cultural	Officers switching between monochronicity and polychroncity as their work allowed and when they wished to work on many tasks or concentrate on one. Officers able to make better use of slow or dead time to complete tasks. The use of the technology allowed for the more efficient scheduling of tasks as SOCOs moved from area to area to conduct work. Officers able to spend more time outside of the station and engage in operational	Decision support activities improved by the abilities of the officers to access information on guidelines and procedures when considering what to do in novel situations. Mobile technology seen as complementary to existing information channels and the intermediation service provided by the command and control environment. Ability to update criminal intelligence

change would be required.	rather than administrative police activities. Officers concerned about the impact of the introduction of mobile technologies on their personal safety and the need to retain the services of information intermediaries in such circumstances. Potential for isolation of officers via independent use of the system rather than colleagues' and the information intermediation service.	system from the field.

Personas in Uniform: Police Officers and Information Technology - (Borglund & Nuldén 2006)

Study overview	Research methods/theoretical perceptive	Findings	Interaction	Information flows
An analysis of police practice and the use of information technology via the development of four types or 'personas' (hypothetical archetypes of actual users) within Sweden.	Longitudinal ethnographic study. Qualitative data methods such as interviews, observations and notes. Analysis via unspecified coding process using categories.	Finds form categories of work that need supporting by information systems – proactive and period planning (officers plan for a period of time such as a week or a month), proactive and rolling schedule (officers work to a set shift pattern such as morning shift), reactive and rolling schedule, reactive and period planning. These different temporal structures require different levels of support. Technology leads to centralisation; there is a need to develop decentralisation technology to support the work of different officers in the field.	Officers who have separate duties and shifts may be drawn together by operational needs.	No changes to information flow, as paper is exploring where technology could be implemented. The paper notes that the demands of paperwork and the local of mobile Technology leads officers to spend much of their time in the station. Duplication of information between forms is a common occurrence.

On mobile technology in context: exploring police work - (Sørensen & Pica 2005)

Study overview	Research methods/theoretical perceptive	Findings	Interaction	Information flows
Study explores the use of MDT units by traffic officers within a UK police organisation.	Application of the theory of virtualisation as a means to characterise the use of mobile technologies for policing.	As the use of the technology increases so does the decontextualisation that the individual feels from the physical environment. Mobile technologies must be 'pocketable', the user is able to remove them from use instantly and also have them available as needed. Identifies five actions or activity types as they relate to police officers within the case (who are travelling via police cars). Those are: Standing-by (before incident), Driving to incident, taking action at the incident, driving from the incident, standing-by (after incident).	Modalisation occurs – one sense, such as the eye or the ear, will dominate over the other. Officers switch between the virtual and physical spaces as they make use of the devices to gather information. When interacting with the public, officers for safety reasons will fall back on existing information intermediation services.	Information flows between individuals with the situated interaction (voice) and also between information system and the individuals (Data and voice).

Information on the move: the use of mobile information systems by UK police forces - (Allen et al. 2008)

Study overview	Research methods/theoretical perceptive	Findings	Interaction	Information flows
Summary of multiple studies carried out across UK police forces over a number of years.	Conceptual framework provided by Activity Theory approach based on multiple studies using qualitative data analysis techniques	Police organisations attempt to introduce mobile technology as a tool rather than considering the impact on work practices and relationships. Straight forward activities or where information is available in the environment to confirm identity or other relevant facts results in a reduced need to make use of existing information channels.	The performance of tasks is significantly influenced by the experience level of the officer. Officers see the technology as complementary rather than as a replacement for existing information channels. Interaction with the public is partly determined by the role, community officers more likely to take less aggressive action.	Local knowledge perceived as being important to policing role. Tasks such as Stop and Search involve constant passing of information between the officer and the information intermediation service provided by the call-handlers. Flow of information closely related to task, officers not able to separate out information from task. Officers make much use of force intelligence systems before

	engaging in planned encounters with members of the public.

Table 4: Summary of operational studies of mobile technology in policing

2.7.2 Organisation

The introduction of mobile technology within policing, and the narratives and concerns that arise out of these studies, can be seen as blending together many of the issues that arise both out of the general mobility literature and the police and criminology specific literature. As with the mobility literature discussed above, the introduction of mobile technology is seen as an attempt to allow police officers as mobile workers to communicate with each other, with the organisation and with disparate information sources across a range of geographic and temporal boundaries. This empowerment is one that creates suspicion and concern within the existing police culture, where the bureaucratic desire for accountability, auditing and control is constantly set against the principle of officer discretion at the scene of an incident. The introduction of mobile technology creates the potential for transgression of existing rules, norms and to subvert or avoid official means of communication and record keeping. Manning (1996) perceives the use of mobile phones as both increasing the discretion of the officers' increase at the local level, and allowing them to undertake activities and acts that would otherwise be monitored or performed via communication channels that are logged and audited. Manning argues that the introduction of mobile phones for officers in Texas allows for the use of the technology in unintended ways; officers communicating directly to each other and the public without having to make use of the traditional intermediation service, making those activities invisible to the traditional managers of officers time, that of the command and control environment and 'to call friends, avoid supervision, reduce work by handing complaints by phone, and more generally, avoid work when possible' (Manning 1996, 59). This exemplifies the idea that the mobile worker may be operating in both a local context and an organisational context. Within their local situational context, the use of the phone, can be used to overcome the organisation – very simply, work can be avoided by simply claiming not to have received a telephone call because of poor local reception (Axtell et al. 2008). Allen and Wilson (2005) note that one of the ambiguities arising from the introduction of the technology was the fear expressed by supervisors that they would have more limited control over the actions and activities of their officers because of the shift of information requests from the over the air radio channels, thus instigating fears that officers would become invisible to the organisation. Within the information seeking literature, Johnson (2003) notes that the provision of information directly to individuals is often destabilising to organisations as it is seen by management

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figures as symbolizing loss of control. Manning notes that these types of concerns are part of attempts to reconstruct and maintain existing organisational structures in new ways and that 'management make efforts to embed the new technology within current authority patterns and organisations aims while those subject to the technology work their own response to such efforts' (Manning 1992, p.8).

The implications of information flows and verbal communication being shifted to 'silent' data based requests were possible negative ramifications for the safety of officers and their relationships with other officers. Even when an officer is not making requests or updating their status, they will hear a continuous stream of information about the requests and activities of other officers via their personal radios. If an officer is asking control for assistance, a fellow officer may hear this and inform the call handlers that they are in the area and can respond, if they are requesting a name check about a stopped individual, an officer may hear this request and have some relevant background or local knowledge that is not present on the PNC or other information systems. This continuous background activity on the organisation radio network provides a level of shared awareness and a shared knowledge of the major events and twists of the day.

This information is also keenly listened to by sergeants and other supervisors as they attempt to track of the activities and whereabouts of their officers. This study also highlighted another tension between the occupational and management cultures, while police organisations are keen to keep officers out of stations and visible for longer and longer periods of time, the immediate supervisors of those officers were concerned that officers could become isolated and that continuous distance from the organisation and their fellow team members. However, a counterpoint raised by Norman and Allen (2005) was that the provision of mobile technologies allowed inexperienced officers to formulate and perform information searches to overcome gaps in their knowledge. This was seem an opportunity to improve their performance and confidence in the field without asking questions to call handlers or fellow officers that were perceived as being stupid. In that study, the example was provided, of the Police Legal National Database (PLND), an electronic guide to police powers and the laws relating to powers to arrest in different circumstances.

The majority of the studies were based around the exploration of a single occupational role, for example, the uniformed patrol officer, the detective or the community support officer (a type of policeman with limited powers). Where the technologies were introduced to two different occupational roles, the sub-cultures of these roles were seen to impact on the willingness for officers to integrate the technologies into their work processes. Similar, when exploring the role of ambiguity, Allen and Wilson's (2005) study noted that the same technology was accepted by one group of officers, the detectives, while rejected by community support officers. In the studies where the technology is rejected, there is an undercurrent of what Manning (1996) describes as counter symbolisation, where a technology is undervalued by others, often not those directly involved in the technology. Indeed, the studies highlight the tension between counter symbolisation (undervaluing of the technology) by the uniformed officer role and counter delegation (overvaluing of the technology to change work processes) by the management or project teams.

The introduction of mobile technologies has been attributed as one of the causes for the blurring between 'work time' and 'home time', with the ability of individuals to be able to receive and send information in multiple contexts and situations morphing into an expectation that they will do so (Allen & Shoard 2005). There is no evidence from the studies that the occupational culture of the uniformed officers has seen such a shift and the traditional modes of on-duty and off-duty have been maintained by that occupational culture. However, the roles of plain clothed detectives and the activities of senior managers both are highlighted as roles that are seeing this increasing blurring of the home and the workspace across home time and work time. Norman and Allen (2005) note that many detectives who were on call or had on-going cases found that the devices allowed them to update files or check for changes to the status of the case or an on-going incident from home. Similarly, within Allen and Shoard's (2005) study, concerns about the use of mobile technologies blurring the divide between the work and socials spaces of the work/life balance were not seen as prevalent. The culture of this occupational group was one in which it had long been accepted that such a neat spilt between work/home could not be achieved or was at least an accepted part of the everyday.

2.7.3 Contextual constraints

In accordance with the general mobility literature, the papers indicate that as the user's environment becomes more heterogeneous, then the difficulties in using mobile technologies increase. Moreover, the complexity of the activities that they try and undertake will have an impact on the decision of officers to make use of mobile technologies or revert back to traditional communication channels and ways of working. Pica & Sørensen' s (2004) study notes that mobile devices are not an over-arching solution and in some situations their usage is inappropriate and that the best way to communicate in time critical situations is via the use of the existing radio channels. The issue of modularisation, the domination of one sense – the eye or the ear is raised as reason for this, the use of the device. The Pica & Sørensen argue that mobile work 'can be generally divided into two distinct categories: structured –one which requires a high degree of routine steps and a low degree of complexity – and unstructured – one which requires a high degree of improvisation' (2004, p.294) The Sørensen & Pica's (2005) study only makes a passing reference to the use of hand-held mobile technologies but states that the officers had concerns about using such devices because they would remove their concentration from the environmental content and the potentially dangerous individual they are dealing with. The study also suggests that some forms of technology may be inherently unsuitable for policing due to the dangers presented by decontextualisation, the drawing of the officers into the virtual world but does not provide any strong statements or findings to support this view.

2.7.4 Information/task performance

In regards to the performance of activities, all of the studies that consider this question suggest that as the level of heterogeneity in the environment or tasks increases so will the difficulties of using mobile technologies, Allen et al. (2008) further note that 'the complexity of the information tasks undertaken will vary considerably with the complexity of the activities' (Para 7). Within the general mobility literature, the notion that the provision of information 'just in time' to provide benefit is proposed, within the policing specific literature it is noted that this often occurs during slow time situations. Tying in with the true nature of policing, that of administration and bureaucratic burdens, the introduction of mobile technologies is seen to change those periods of time where the officer is not directly tasked by the organisation or interacting with the public. During

these slow or 'dead' times, it was observed that the introduction of the technology would change the temporal and spatial location of tasks, with officers able to reschedule tasks because they were able to send and receive information without invoking an information intermediary. Again, this related back to the commentary and thematic issues arising out of the general discussion of mobility and mobile technologies – that individuals can engage in both monochronistic and polychronistic behaviour (Kakihara & Sørensen 2001; Kakihara & Sørensen 2002; Bardram & Bossen 2005) and that the provision of such mobile technologies gives the officers 'the choice of multitasking where appropriate and also allowing them to follow a job through where this is appropriate' (Norman & Allen 2005, p.211). The implication being that the scheduling of tasks becomes more geographically dispersed. Officers rather than completing tasks on return to their station are able to complete from the field. Indeed, choice to remain in the field to complete tasks and as a result subtly changed their overall routines and rhythms and periods of busyness (Agarwal & Karahanna 2000).

2.7.5 Task level analysis

The concept of task analysis, of course, depends on where the research wishes to fix the boundaries of where the initiation and conclusion of a task are drawn. If the Stop and Search task is analysed at the highest level, it can be considered monochronistic in nature, the officer is attempted to complete *the* task but when broken down into sub-tasks, it is clear that the work task is far more complex, subject to many variations and multiple interpretations of how it should be performed. It also varies significantly because of the environment, the visual cues of the individual, the information that the officers can glee from questioning. None of the studies have a level of analysis that is the completion of the single task, that is to say that none of the studies highlighted in the table take the approach of this study which is examine a single work task in detail via its performance, instead they take a more general everyday behaviour approach, and exploring actions across a range of situations and contexts. For example, Sørensen and Pica (2005), using a mixture of ethnographic observation and informal interview across a three month period explored the use of mobile technologies by operational police officers within two setting within a single force. During this study they also identified a number of different activity types, broadly defined as 'waiting in the car', 'travelling', 'engaging with the scene' of an incident to understand what was occurring rather than any in-detailed investigation of any one task. Similarly, Manning (1996) considers the wider implications of the introduction of

mobile phones rather than the specific impact on individuals tasks or the information flows and needs when trying to complete a task.

Allen el al. (2008) does explore the Stop and Search task as one of a number of work tasks and activities that it considers within the policing context. Using activity theory as a means of analysis, the authors note that it 'reveals complex information types and information flows that are involved in the stop. Some of this information is available as the officer's personal knowledge of the law and of the procedures to be followed in a stop; some is garnered from the suspect' (Para 8). The study also links the performance of the task to the setting in which it occurs and notes that the officer will make use of visual information from the scene although it is unclear if this means behavioural cues, environmental cues or a mixture of the two. The study also argues that the use of hand held technologies such as the PDT described in Chapter 5 can be used to speed up the work task by providing direct access to key information sources and therefore assist in the confirmation of identity and a quick conclusion to the Stop and Search task. However, this process will become more complex if the stopped individual provides incorrect or misleading information. As with other studies, the consideration of the Stop and Search task is at the highest level of abstract, the overall task. Although the example provided does offer some examples of where information is sought from the information intermediation service, there is no clear timeline of how the different sub-tasks that make up the Stop and Search (such as the search) are constituted, and how information is used in each of those constitute parts. Moreover, information flows are generally glossed over so they are also considered at this higher level of abstract – that is to say, it is acknowledged that the introduction of the mobile technology will change the flow of information from an officer to the organization or may change the exiting information process.

Chapter 3 – Methodology

3.1 Introduction

This thesis is within the interpretive tradition of information sciences literature and follows a case approach coupled with a variation of grounded theory, which being used in a contingent rather than absolute manner as a method for the analysis of the field research. The use of grounded theory in this way has been described as being 'partial' (Bamford 2008) and the decision to utilise it as a tool for inductive analysis rather than as a total methodology is discussed and situated within the information sciences. The practical stages of the research are considered and decisions relating to site selection, data capture, and informed consent are considered. Denzin & Lincoln's (2000) text on qualitative research identifies the stages that should be outlined in research studies as the researcher's views and traditions, the theoretical paradigms and perspectives, the strategies of inquiry, the methods of data collection and analysis and the art of interpretation and presentation. This chapter broadly follows that structure to provide a guide to explain the research design and its application within this work.

3.1.1 Purpose statement

Creswell (2003) notes that the purpose statement is 'the most important statement in an entire research study, it orients the reader to the central intent of the study, and from it, all other aspects of the research follow' (p. 93) but that it is not strongly emphasised in research schools and often ignored in training for research students. With this admonishment in mind, this methodology chapter begins with short statement of the purpose for this study:

> This thesis describes a qualitative study of a change to routine police work task arising from the introduction of handheld computers and hoe it impacted on 90 officers across two research sites. The overall aim of the study was to explore how it altered the performance of a common task and the information behaviour of the officers. The study can be seen as explorative, inductive and generative.

3.2 Paradigms and perceptions

3.2.1 Philosophical perceptive

The research makes use of multiple data collection methods, but is predominantly qualitative with some minor use of quantitative data for the purposes of orientation and as a guide to possible areas of investigation at the start of the study and also to highlight new issues as the trial progressed. For example, the project team's statistical data indicated that people who were not registered as trial participants were making use of the devices, this information opened up an avenue of question and enquiry that provides a richer understanding of the different uses of the device (this finding is discussed in detail in chapter 7). Quantitative data was treated as sensitising rather than indicative. The work here is of the sub-group identified within the IS literature as using non-economic behavioural and social science methods as opposed to macro-economic or engineering approaches (Markus 1997). When considering if the study was one that was within the qualitative tradition, Creswell's (1994) examination of the broad differences between studies was used as a point of reference and is outlined in Table 5.

Philosophical foundations	Qualitative Research Designs	Quantitative Research Designs
ONTOLOGY (Perceptions of Reality)	Researchers assume that multiple, subjectively derived relative worlds can be coexisting.	Researchers assume that a single, objective world exists.
EPISTEMOLOGY (Roles for the researcher)	Researchers commonly assume that they must interact with their studied phenomena.	Researchers assume that they are independent from the variables under study.
AXIOLOGY (Researchers' Values)	Researchers overtly act in a value-laden and biased fashion.	Researchers overtly act in a value-free and unbiased manner.
RHETORIC (Language styles)	Researchers often use personalised, informal and context-laden language.	Researchers most often use impersonal, formal, and rule-based text.
METHODOLOGY (Approaches to research)	Researchers tend to apply induction, multivariate, and multi-process interactions, following context-laden language.	Researchers tend to apply deduction, limited cause-and-effect relationships, with context-free methods.

Table 5: Summary of qualitative and quantitative research design (adapted from Creswell 1994)

These differences are indicative and are not treated as hard boundaries as many studies will appropriate research methods from both traditions in a minor way to avoiding broader issues of paradigm incommensurability. Rather than approaching these points in a discursive manner, with an explanation of the foundations followed by repetition when discussing their application or meaning in this study, the philosophical foundations are considered in an integrated manner within the rest of this chapter.

The researcher places himself within the interpretative tradition, and this means that the research strategies/tools, and the data collection methods arise from consideration of that position. This is a position that has been wrongly treated as a synonym for 'qualitative'; research may be conducted that is qualitative but not interpretative depending on the philosophical assumptions of the researcher (Myers 1999; Klein & Myers 1999). An interpretative based study, within the information sciences field, is one that is 'aimed at producing an understanding of the context of the information system, and the process whereby the information system influences and is influenced by the context' (Walsham 1993, p.4-5). It is not enough to understand and describe a situation, the researcher must provide an interpretation of 'what it *means*, as well as what it *is*' (McNabb 2004, p.344). The perception of involved parties or stakeholders is acknowledged as an important part of this type of field work (Guba & Y. S. Lincoln 2001; Walsham 1995; Klein & Myers 1999), as is the fact that organisations and the people within the organisations are not static and as such, this approach is seen as an investigation of a 'moving target' (Klein & Myers 1999, p.73). Contextualisation in interpretative approaches requires that the researcher places themselves and the subject in an historical context, rather than treating it as isolated phenomena (Klein & Myers 1999; Myers 1999). This is highlighted within the study in a number of different ways. In the introduction, the historical context of communications within policing was explored, the social and culture failings of policing and questions of power, violence and authority were discussed in the literature review (chapter 2). The performance of the Stop and Search task has a question of power and authority at its core – that a stopped unnamed person may be a criminal and therefore needs to be caught and/or arrested. Across the thesis, the case been placed the case not only within the organisational culture, but within the wider historical and social culture of the land, for example, why the Stop and Search work task is considered controversial. Furthermore

many of the confrontational situations described in chapters 7 and 8 arise out of the attempts of the officers to manage their environment and the people within it.

The use of interpretative research methods, within information systems research, has grown significantly since the 1980s and is seen as a 'valid and important approach to information systems research' (Klein & Myers 1999, p.87). Its emergence has been accredited to Walsham's (1995) advocacy in his paper 'Interpretive case studies in IS research: nature and method' and other important works such as Klein & Myer's (1999) 'A Set of Principles for Conducting and Evaluating Interpretive Field Studies in Information Systems'. This movement was strengthen by a number of special issues in top IS journals discussing and illustrating the development and application of this approach (Pozzebon 2004). For example a special issue of the *Journal of information Technology* edited by Myer highlighted a number of operational studies and discussions of the development of the approach within the IS field. This included Komito's (1998) widely cited ethnographic study of how the adoption of an electronic records system met resistance from the workforce because of the perceived information richness of paper documents, while Sayer (1998) explored how a change process was undermined by the middle management of an organisation. Other have papers explored the use of an interpretative approach to understand the social construction of systems (L. Heaton 1998), the need for a Foucauldian critical perception to be integrated into interpretative approaches (Doolin 1998) and the relationship between positivist and interpretive researchers (Fitzgerald & Howcroft 1998).

Within the information sciences, key to the interpretive position is the stance that the implementation and evaluation of information systems are not treated simply as technical or systems problems, but ones that must be explored with a focus on social activity, and the political-social-historical basis of the organisation and must take account of the multiple social contexts that exists together in any given situation (Hirschheim & Smithson 1988; Burke 2007). Klein and Myers note that that the interpretive research approach is particular helpful when trying to understand the use of information systems in social and organisation contents and has the potential to produce 'deep insights' (1999, p.67) and that such research is based around a focus on human complexity in emerging situations and where shared meanings are important. An example of this is discussed in chapter 7 where the call handlers and the uniformed officers possessed a shared meaning of objective time, the minutes and hours of the day, and a different understand of the

temporal schema that exists within the organisation. The officers worked in tens of minutes and the call handlers were concerned about the passage of *a* minute. Moreover, an Interpretative approach is appropriate because of the need to understand how the interaction between the uniformed officers and members of public is changed by the presence of the hand held devices (Walsham 1995; Walsham & Waema 1994).

Klein & Myers (1999) provide seven fundamental principles to assist researchers in conducting and evaluating interpretative research studies. These principles are considered in table 6 below with some indicative examples of how they have been applied and considered within this study.

Principle	Examples of application
The hermeneutic Circle **All human understanding is achieved by the process of iteration between the interdependent meanings of the parts and the whole. By moving between the two, a greater understanding develops.**	The analysis of the Stop and Search task revealed four sub-tasks that have interdependences both within the performance of the task and with the activities that the officers would undertake with other uniformed officers and the call handlers in the command and control environment (Chapters 4,5, 6, 7,8). The identification of the different uses of the term *officer safety* within the organisation. For the officers, a subjective and broad term relating to personal safety, for the organisation, an objective term relating to a specific training process. This was an important stage in developing the key thematic issue of 'perception of risk' (Chapters 4,5,6,7,8).
Contextualisation **Critical analysis of the social and historical background of the research setting, so the reader can see how the situation has emerged.**	Discussion of the historical role of policing within the UK and the development of communications methods has lead to the current situation and work practices (chapters 1, 2, 4). The historical context of the Stop and Search work task (Chapters 1, 5).

Interaction between the researchers and the subjects	The interviews encouraged the researcher to reconsider the idea that the Stop and Search task was static in terms of the spatial dimension when being performed. Even movements of a few feet (getting two suspects to stand apart) were important in understanding the information behaviour of the officers when they were performing the Stop and Search work task.
Information is not inherent in the situation; it requires critical reflection on how the research material was socially constructed through the interaction between the researchers and participants.	
Abstractions and generalisation	The impact of the personal data terminals on the completion of the Stop and Search task and existing theories of the process of completing tasks (Chapters 6,7, 8).

The attempts of the officers to configure their environments spatially are related to the concepts of spatial mobility (Chapter 7). |
The relationship of data and its interpretation to theoretical, general concepts that describe the nature of human understanding and social action	
Dialogical reasoning	Use of a grounded theory approach for analysis and concept generation to ensure that the theoretical position was arrived at inductively rather than logio-deductively.
The researcher considers their assumptions and is sensitive to possible preconceptions guiding the research design and actual finding with cycles of revisions	
Multiple interpretations	The trial participants looked at the introduction of the devices as having an impact on officer safety and risk, while the project team saw it as being about performance and measurement (chapter 6, 7).

The trial participants operated to a different temporal schema than the call handlers who managed the intermediation process (chapter 6).

The use of the literature review to identify and discuss similar studies in the past (chapter 2). |
The research is compared to other historical and situational contexts and the researcher is sensitive to possible differences in interpretations amongst the participants of how an event or sequence of events occurred.	
The principle of suspicion	A short web survey conducted at the start of the trial indicated that the trial participants were happy with the speed
Requires sensitivity to possible biases and	

distortions in the narratives collected from the participants.	of the devices and their ability to confirm the identities of individuals they had stopped as part of the Stop and Search process. This was significantly different from the accounts given by the uniformed officers in conversation and interview and the two had to be reconciled. As the researcher became more trusted by the trial participants, the answers became more frank and truthful.

Table 6: Application of principles for interpretive field research (adapted from Klein & Myers 1999)

3.3 Strategy of inquiry

3.3.1 Case study approach

A *case* can be an individual, a group of people, an organisation or a larger unit such as a city (Gillham 2000; Scholz & Tietje 2002; Stake 1995; Yin 2002). Here, the case could have been the uniformed officer, the project team or some other aspect of the wider organisation, alternatively, the change could have been explored from the perceptive of the members of the public that the officers engage with when performing the Stop and Search task. The uniformed officer was chosen as the most appropriate focus for being the case as they can be seen as a node upon which all the other interactions rely. This allowed for a consideration of the existing and changed interaction with the other officers, the wider organisation and the public as the unit of analysis. The case has been identified as a suitable instrument within an interpretative approach or paradigm (Walsham 1995; Klein & Myers 1999; Yin 2002). A case *study* is an in-depth account of a single example or case and the level of analysis can vary greatly depending on the area under enquiry – from the focus being an event, process or some other situational context, with the intention to illustrate a general principle (Rossman & Rallis 2003; Stake 1995; Whitman & Woszczynski 2003). The use of a case study approach is considered a strategy rather than a genre of research, it is an attempt to provide an understanding of a larger phenomenon via the intensive examination of one specific instance (Eisenhardt 1989; Bamford 2008; McCutcheon & Meredith 1993; Orlikowski 1993). Klein & Myers (1999) note that there are

no clear boundaries between the case and ethnographic approaches, but that the latter is longitudinal in nature and more immersive for the researcher.

The use of the case research strategy requires the investigation of a phenomenon within its real life context (Yin 2002; Miles & Huberman 1994; Stake 1995) and it is useful to understand 'activities within important circumstances' (Stake 1995, p.xi). Furthermore, the use of a case study approach is seen by Yin as the 'method of choice' (2002, p.4) where it is unclear if and how the phenomenon under study is distinguishable from the context and where issues of temporality and spatiality are expected to be important. Similarly, Benbasat et al. (1987) note that, within the information sciences, the use of the case approach as a research strategy is useful for problems where 'research and theory are at their formative stages' (p. 369). This should be not be taken to mean that the researcher was 'naive' (this is an important point in the use of grounded theory and is discussed later in the chapter) and had no understanding of the police use of information systems. At the time, the researcher was engaged in other projects where uniformed police officers were making use of mobile information systems. This experience was useful as part of the orientation process, because the culture and terminology of policing was somewhat familiar and allowed a broad direction for the study to be set and the case to be identified. It also meant that, an initial broad question was able to be determined (Eisenhardt 1989). The reporting of cases has varied significantly and they may be either full length or illustrative in style, and include or exclude quotes from the participants (M. L. King & Applegate 1997). Here the use of quotations has been quite extensive, as they allow the perception of the police officers on the trial to be fully realised and provides a richer narrative for the reader (Macpherson et al. 2000). Moreover, they are a useful tool in allowing the reader to see how the different environment contexts experienced by the officer influenced their decision not make use of the devices during their work (Cohen et al. 2003; Yin 2002; Gillham 2000).

3.4 Methods of data collection

3.4.1 Research methods

This thesis makes use of three data collection methods: Observations, interviews and document analysis. This was considered the most suitable combination to allow for both formal and informal information to be collected and considered and for data triangulation.

The study employed an ethnographic approach towards data collection. The collection methods included participant observation, semi-structured interviews, unstructured interviews, and artefact and document analysis. Internal documents included memos, e-mails, business plans, IT plans, project manuals and Implementation audits, external reports included annual reports, organization charts, and business trade reports. The use of a semi-structured interview protocol was used at the start of the trial to provide orientation and to elicit as much data as possible about the possible outcomes from the implementation of mobile data and its effects on information-seeking behaviour; this was followed up by unstructured detailed questioning about areas. Often the detailed questioning would follow or respond from an officer providing an example or demonstrate how he would act in a certain situation. To ensure the confidentiality of subjects the name of case sites, respondents and specific interview dates are not be used in the narrative. While this may provide a limiting factor on the richness of the narrative provided, it is vital to ensure the validity of the replies and the ability of subjects to answer honestly. Based on interviews and documents, detailed case descriptions were provided to participants and feedback was. Unlike other traditional quantitative studies where data collection sequentially precedes data analysis, with-in the use of a grounded theory approach, the two stages happen on a simultaneous basis in accord with the methodological guidelines provided (Strauss and Corbin 1990).

3.4.2 Site access

Research was conducted in conjunction with the host organisation – a large metropolitan police force in the United Kingdom. There was a requirement that the sites were in places that were easy to access. This is because uniformed policing in the organisation was based around three shifts or 'turns'. The first shift or 'early turn' starts at 6am and the researcher wanted an opportunity to approach officers for questioning and to arrange questioning at the start of their shift and also wanted to spend some time on each shift pattern to try and observe how and if those shifts differed. What was also advantageous for the researcher was independent access to living accommodation in the local area and this meant that the sites could be visited as required and as questions posed themselves to the researcher – rather than having to travel three hours from the researcher's home to the city in which the trials were hosted.

3.4.3 Preparatory work and general notes on approach

Before the trial started, the researcher interviewed five officers holding the rank of police constable about the stop and search process and where they saw the potential of the devices for changing their work and how they interacted with the public. In addition, a series of meetings and interviews were held with project team members about their aims and objectives for the trial and to understand the organisational context and the influences that had formed the basis of the trial. The project team supplied useful contextual information about the aims and objectives of the trial and also where they saw the devices providing benefits for other members of the organisations beyond the uniformed officers (Appendix item X shows where the project team saw the data being collected from the devices being used).

Two weeks before the official start of the trial, interviews were conducted with a further eight police officers holding the rank of police constable. Those officers had received training on how to use the PDTs and been giving a briefing on how the introduction of the devices was intended to change how they conducted Stops and Stop and Search interactions with members of the public. Those interviews, each lasting between forty-five minutes and one hour, were used to understand what concerns the officers had with the introduction of the devices. In addition, officers were questioned about problems with the existing process and where they saw areas for improvement via the use of handheld devices such as the PDTs. As the study progressed and categories emerged from the coding, this approach became less important as officers were asked more and more to describe very specific aspects of their work – for example, they were asked to role-play and show how they would separate two individuals or were asked to describe how they would make use of local environments know to both the officers and the researcher. The recording of interviews was digital in nature, this is to provide both a more accurate written account and to allowed for better collation and organisation of data sources.

Parallel to this work, interviews were also conducted with members of the project team overseeing and managing the implementation. These interviews were combined with attendance at project meetings in the run-up to the beginning of the trial. Again, these interviews were used to gain a greater perceptive of the objectives of the trial and how the flow of information around the organisation was intended to change. In particular, the project team were interrogated about how they saw the change to an electronic system

altering the established relationship between the call handlers and the officers[3] on the trial, rather than technical issues. Interviews were also conducted with senior management figures who acted as organisational and technology champions for the project team and the overview project. These interviews were used to provide background context and colour to the project and to provide a greater understanding of how this small implementation (90 individuals in an organisation numbering 50,000) was intended to have a wider impact in organisational information systems development that simply providing an electronic mechanism for the Stop and Search process.

Once the trial implementation commenced, the researcher was embedded into the trial site (a police station) where the majority of officers were based for a period of six weeks during the trial. The researcher had free access to areas where the trial participants would congregate, take their breaks and receive briefs from superior officers. This access to the canteen was seen as particular important, as the canteen culture has been identified in the policing literature as one of the key places where officers work through and determines cultural norms, moreover it is a place where they give meaning and purpose to occupational situations that are troubling them (Waddington 1999). Access here allowed the researcher to see and engage officers who were talking about the best use of the devices and the problems they were experiencing and also get a more general sense of the wider culture. This free and continuous access also allowed the trial participants to become accustomed to the presence of the researcher, his purpose and methods, and his character. The character of an individual is of course highly subjective, but officers considered their ability to judge the intentions, truthfulness and integrity of an individual as key to their interaction with that person. The Stop and Search process is one that has become highly political and it was important to communicate to the participants that this was not this was not the focus, and that the researcher was not interested in who they stopped but how they stopped them and how the technology changed that interaction.

On days, where there were no interviews or observation, the researcher still attended the station and worked there on this research project and other work related projects. Depending on the time of day, the researcher alternated between the integrated borough ops room, an administrative function where the devices were stored and located, and the

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[3] This relationship, the role of the call-handler and the flow of information between these two groups of actors, is discussed in detail in the descriptive case-study in Chapter 4.

canteen where officers would take their break. This provided the researcher with an opportunity for chance encounters where officers could relate and recollect facts and perspectives about the devices, their interactions with the public and the changed process. This type of encounter was also useful for obtaining fragments of information that only became important during the analysis process or for providing further areas of interest and questioning informing the questioning process. , as areas arose from the previous conversations, the researcher could built on those in finer detail – for example, asking officers how they phrased their questions to stopped individuals and what types of questions would get the best responses.

3.4.4 Data collection methods

As part of the orientation process, the research study also made use of a web survey to quickly capture information about the issues that had arisen from the officers' use of the devices during the first three weeks of the trial. The researcher was not interested in deriving statistics from this information, but rather was concerned with getting an understanding of any stand out issues or concerns that arose from this first period of general usage and use the point for triangulation and to information questioning. The web survey was started by 48 people and completed by 33 (68%). One key point that was raised by the survey and later became important to understanding what was occurring was that 38% of those completing the survey noted that they carried the devices when using their cars. The survey was also useful in that it provided some interesting contractions with what the officers were relaying via interview and conversation. In the survey, 18% of respondents indicated that it the device was excellent and 35% felt it was good, while 35% said it was adequate. This raised the question that if the officers felt this way about the PDTs, why did they indicate in the interviews and conversation that they were unwilling to make use of the service.

The main body of written information used in this study came from interviews with officers who participated on the trial. The research schedules were not static but evolved over the course of the implementation as observations were performed and the researchers understanding of the impact of the technology became clear. In addition, further questions were added on the basis of information provided by the project team. A critical piece of information provided by the project team was that their internal records indicated that many of the Stop and Searches were performed by officers who were not on

the trial. This information opened up a line of enquiry around the performance of the stop as a group task that was in the stark contrast to the experiences and changes to information related actions undertaken by officers who were using the devices as lone workers. This in turn led to important revelations of the changed role of the PDT user in a group context. All interviews that were conducted due to prior arrangement with officers were digitally recorded and those formed the basis of the transcripts used in the analysis process. Interviews that occurred on an opportunistic basis or where the environment did not allow for the use of an audio recorder were captured using short-hand. In total, 30 of the 90 trial members were interviewed for periods of 30 minutes to an hour via arrangement. However, the embedded nature of the researcher also allowed for information to obtained on an "as and when" basis when the opportunity presented itself.

Both of these methods generated large amounts of transcript materials. To increase accuracy and allow analysis to take place in a manageable timeframe, the author used Atlas-TI program during each cycle of iteration - following the hermeneutic circle principle outlined by Klein and Myer (1999) and discussed above. - Interview data was transcribed and was analysed using Atlas-Ti software, following a process of coding and explanation building. Glaser (2002) contents that a large part of the grounded theory approach is that of 'passive listening' and much valuable data was collected about the process of policing by simply working in the station and listening to the conversations of the officers.

To extend understanding of the changes to the Stop and Search process, the researcher watched officers perform the task, the observation were useful not only in observing the changes to the Stop and Search process, but in gaining a better understand of the ebbs and flows of activity in this dynamic work context and to give the researcher a much more nuanced understanding of Stop and Search within the context of a typical shift or 'tour of duty'. The length of those observations meant that Interactions were observed between a number of different actors – between groups of officers, between officers and call-handlers and finally between officers and stopped members of the public. Using an ethnographic approach, both written and verbal notes were taken during those observations. The researcher's own use of a hand-held device meant that it was possible to rapidly switch between written notes, make a drawing or recording a verbal memo to self. Those notes were used both to record key points of the interaction, but to also provide prompts for further desk research or to amend or extend the question set used in

interviews with officers. As the observations occurred in live situations, they allowed the researcher to compare and contrast the descriptive accounts given by officers and to note down where those accounts did not reflect the richness of the actual interactions with the public, other officers and the call-handlers. The approach also provided an opportunity to ask the officers questions about their feelings and reactions in the immediate aftermath of a successful Stop and Search process, be it with an individual who was free to leave or being detained for further questioning back at the station. More observations were planned but a change to the health and safety regulations of the organisation presented this. To overcome this problem, when more questions were raised about the procedure, the officers were asked to engage in simulations and intend how they would react in certain circumstances, for example, how they would react to the movements of an individual in small space and how they would use surfaces such as walls to control those movements. In addition, as the researcher was working on a parallel project with another force exploring the use of Stop and Search, and had free access for observation was able to use this observation to guide his questions at the case sites. Over the life of the trial, and as it became apparent that the call handlers who worked within the command and control environment and provided the traditional information intermediation service were important, two days were spent within this environment observing their routines and seeing how they assisted and interacted with the officers in the field. Moreover, as the officers were working within areas with a heavy concentration of closed-circuit television (CCTV), in many of those situations, the officers themselves could be observed interacting with the public via the control room. Conversations with this group were useful in helping to understand their occupational role and how it relates to the work of the officer and the broader organisational culture. In addition, direction observation of this group, allowed Stop and Search encounters to be seen from 'the other side' that of the Call-handlers and comments from the officers about the poor standard of information they received could more carefully considered. As part of this process, 5 call-handlers were interviewed about their work.

3.4.6 Miscellaneous

Other documents became relevant during the pilot and were significant in developing a true picture of what had occurred. One critical document was that of the PDT sign-out sheet as show below in figure 11.

Figure 11: The PDT sign-out sheet used on the trial.

At the outset of the project, this form seemed insignificant because it was simply a record of when the officers were signing in and out the devices. However, it quickly became clear that the initial accounts of frequent usage of the devices did not match with the sign-out sheets and the officers' accounts were incomplete in some way. When asking officers about this discrepancy, great care was taken to make it clear to the officers that their comments would never be attributed to them in any form and that the sole interest of the researcher was in discovering why or why not they were making use of the devices.

3.4.7 Informed consent

Participants were provided with written information about the aims and objectives of the research study in the weeks leading to the official start of the implementation of the PDTs. This information was provided in a cover letter supplied via email and also handed out during the training events. The letter provided biographical information about the researcher and assurances about data confidentiality. The researcher also attended a training event to provide further context to officers and to answer any further questions they may have about the purpose of the study and the use of collected data. It was made explicitly clear that the researcher was not interested in *whom* they stopped but how the

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Stops were performed. This was considered vital due to the sensitive political nature of the process and the fracturing nature of media reporting on its use (see chapter 4 for more information about this aspect of the trial). The participants were made aware than none of the raw research information such as audio tapes and transcripts would be provided to any other member of their organisation or other outside agency. In addition, officers were offered the opportunity to be provided with an audio copy and/or a transcript of their interviews on request. When coding, the names of individuals were randomly assigned numbers and this number was combined with a coding system that provided basic information when reading the comments and quotations by giving information about rank, role and gender - '10 PC R M' represents officer 10, the rank of police constable (PC), the role of response officer (R) and that the officer was male. Within the thesis this was simplified to 'Officer 10, Officer 12'.

3.4.8 Study boundaries

This study does not attempt to explore every aspect of the Stop and Search process, or the stated aims of the project team. A very important political and organisational objective of the project was the drive to introduce robust auditing and accountability to the Stop and Search process. This was in response to wider political and social concerns about 'disproportionality'– the stopping of a disproportional number of members of the ethnic minorities of the United Kingdom. During usage, the PDT devices made use of radio telecommunications to instantly record all ethnic and demographic information and sent this information to a centrally held database. This information was then analysed in regards to this central question of disproportionality. The officers on this trial, while aware of this function of the devices, has no control over this and no access to this information was provided by the organisation to the researcher. The boundaries for the case were clear, activities investigated had to involve changes to the information behaviour of one of the actors (police officers, call-handlers, members of the police) who participate in the stop and search process. The audit process is discussed within the two analysis chapter but from our a perceptive of how the users uses of the devices in unanticipated ways created

3.5 Methods of analysis

3.5.1 Grounded Theory overview

The original iteration of grounded theory developed by the sociologists Barney Glaser and Anselm Strauss and detailed in *Discovery of Grounded Theory: Strategies for Qualitative Research* was a response to a perceived overemphasis on the validation or verification of existing theory. In the introduction to their first work, they noted that that the problem they were trying to address was 'how the discover of theory from data – systematically obtained and analysed in social research – can be furthered' (Glaser & Strauss 1967, p.1) and to this end they devised a research methodology emerging out of the symbolic interactionist school (Coyne & Cowley 2006; Creswell 2003; Denzin & Lincoln 2000; Goulding 2002; Locke 2001; Glaser & Strauss 1967). The name arises from its stance on the generation of theories and theoretical frameworks, theories being generated from the ground upwards, and the sociological world being studied (in this case, policing), rather than ones imposed from outside or above and is an approach where 'theory emerges from, and is grounded in, the data' (Parry 1998, p.85). According to Glaser it is a way of 'resolving a main concern' (2001) and is useful for exposing patterns that the participants do not fully understand or may not even be aware of whilst also providing an avenue to see the connections between 'local worlds and larger social structures' (Charmaz 2006, p.133). It has been claimed that grounded theory represents the most widely used interpretative framework in the social sciences today (Denzin & D. Y. Lincoln 2000) and that it is used and has been used extensively in the information sciences, health care, education, psychology and management studies (Locke 2001).

The inductive, rather than logico-deductive, approach of grounded theory means that the researcher does not begin with theory and then seek a confirmation or denial of this theory but rather collects and analyses data in a general area of study and allows theory generation to grow from this. Orlikowski (1993) argues that grounded theory is an approach that provides a useful means to produce a 'thick' in-depth analysis and narrative to describe complex interactional situations, while Baskerville and Pries-Heje argue that the use of an inductive approach is useful because it mitigates '...problems inherent in "ex post facto hypothesizing" by an analysis process that continuously validates theoretical concepts against newly collected empirical data' (1999, p.5). On this basis, grounded theory tools and techniques provides for a selection of specific inductive techniques for both the theoretical sampling and the analysis of case material (McCutcheon & Meredith 1993; Parkhe 1993). Moreover, a ground theory approach is suitable for understanding the

multiplicity of interactions and perceptive that produce variations in a process (Heath & Cowley 2004). This was seen as a strength for its use in the analysis of the data, something that is of benefit here, where at the outset it was unclear how the introduction of the technology would impact upon the relationships between people, the environment, objects and the exchange of symbols (such as items that identify an individual) and the GT approach provides various levels of analysis as key elements of the process. Hunt and Ropa (1995) argue that the use of grounded theory is well suited to investigations that concern temporality and wish to explore it as process. This allows the researcher to '...Systematically follow through a concrete reorganization process and/or use retrospective data to draw processual inferences. In contrast, if addressed at all in a mainstream approach, temporality more like would be addressed in a comparative static fashion...' (p. 406).

The process itself begins with the examining of something contextual and detailed (perhaps a narrative); this is then used to establish what theoretical avenues would be interesting to explore in further detail. In the preliminary stages of the grounded theory process, the researcher examines cases or participants that share a number of common attributes or traits, as the research goes on, the emphasis shifts to identify concepts and categories that are heterogeneous in nature (Weed 2009). There is a constant movement backwards and forwards between the generation of codes and categories and the collection of further data for analysis (Glaser and Strauss 1967; Frankfort-Nachmias and Nachmias 1992; Glaser 1992; Hunt and Ropo 1998). The use of those coding techniques allows the researcher to identify rich concepts and dynamic relationships between those concepts. This process of constantly comparing the existing data with other instances of data to see where and if the categories fit and are workable, continues until category saturation occurs (Goulding 2002). The grounded theory approach is one that can be described as processual in nature, where the researcher is trying to compare additional material/information to existing categories, immersion and familiarity with the data is therefore essential (Morse & Field 1995). One important element in the grounded theory is the relationship between substantive and formal theory generation. Users of grounded theory believe that the development of a substantive theory is an important stage in the development of formal theories. Glaser and Strauss argue that the development of the latter is only given direction by the development of the former as it allows an initial direction for relevant categories, properties and methods for integration (Glaser and

Strauss 1967). In turn, the grounded theory derived from limited specific case may be used to develop more formal theory by re-examining via the lens of a more general context, generalising from the specific (Miner 2005).

3.5.3 Variations in grounded theory

The intervening years between the original and later initiations have seen the development of different schools of grounded theory, each with their own interpretations and variations of how key components (theoretical sampling, constant comparative analysis and theoretical saturation) should be applied. Three dominant approaches for the use of grounded theory and its associated techniques within the academic community can be identified: emerging design advocated by Glaser (1992); Systematic design as espoused by Strauss and Corbin (1990; 1998) and the work of Charmaz (2000; 2006; 2001) who uses grounded theory within a constructivist paradigm[4]. The Straussian variation or version of ground theory is the most common within the social sciences (Goulding 2002). The difference between the two can be summarised as being a difference of rigor or rigidity depending on which camp the researcher places himself within. Glaser's approach relies on an open attitude which means the theory generation arises directly from the data, while Strauss's approach is more structured and is content with the application of existing ideas and insight where appropriate (1998 p.33). This was seen by Glaser as being dogmatic, and he stresses the emergence of the theory from the data, while Strauss and Corbin's approach relies more on conditions and context as embedded in rigour coding (Goulding 2002; Stern 1994). Strauss & Corbin's (1990) work has the constant comparative method becomes more event-oriented than group-oriented in turn making the theoretical sampling process more event-oriented than subject-oriented. This approach has been criticized by Glaser for transforming grounded theory into a rigid process with an over emphasis on the coding process and notes that the Straussian model has 'so many rules, strictures, dictums and models to follow one can get lost in trying to figure it out' (1992, p. 104). The difference in the approaches to coding that have emerged from the two models can be seen below in table 9.

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[4] Glasser's (2002) *Constructivst Grounded Theory?* is scathing about this approach and notes that it is an attempt to 'avoid the work of confronting researcher bias', and argues that Charmaz's approach is a result of a mental block enforced by too much quantitative data set analysis and that 'only people who can conceptualize should do GT' (para. 5).

Stage	Strauss and Corbin	Glaser
Initial coding	*Open coding* Use of analytic technique.	*Substantive coding* Data dependent.
Intermediation phase	*Axis coding* Reduction and clustering of categories (paradigm model).	Continuous with previous phrase Comparisons with focus on data become more abstract, categories refitted, emerging frameworks.
Final development	*Selective coding* Detailed development of categories, selection of core, integration of categories.	*Theoretical sampling* Refitting and refinement of categories which integrated around an emerging core.
Theory	Detailed and dense process fully described.	Parsimony, scope and modifiability.

Table 7: Straussian and Glaserian coding compared (Adapted from Health & Cowley 2004)

Weaknesses in the application of a grounded theory approach can be seen in three main areas: the lack of explicit acknowledge of variation in the development of grounded theory, a tendency to 'pick and mix' the aspects and tools that suit the study in an ad-hoc fashion; and a complete absence or failure to acknowledge the researcher's ontological and epistemological foundations (Greckhamer & Koro-Ljungberg 2005; Heath & Cowley 2004; Goulding 2002; Selden 2005; Weed 2009). Weed (2009), in an analysis of grounded theory studies published within sports and exercise psychology, summaries those concerns by noting that 'only two of the 12 studies discuss the ontological and/or epistemological assumptions that underpin their use of the grounded theory, and more astonishingly, only one of the 12 explicitly acknowledges there are several variants of the ground theory approach' (p. 508). Many works do not acknowledge or simply ignore that the original concept has splintered into a number of different approaches that may have an aspect of ontological and epistemological incommensurability. They treat grounded theory as monolithic approach based upon readings of the Glaser and Strauss's (1967) original text

and as the end point of any ontological and epistemological examination of both the process and the framework that underpins it (Heath & Cowley 2004). This problem of variation is so prevalent in the area of nursing studies that it is generally required that researchers explicitly explain which variation they are following (Skodol-Wilson & Ambler-Hutchinson 1996). Tied to this, grounded theory is treated as a complete in itself and no attempt is made to elucidate the epistemological or ontology base of the researchers or how it underpins their activities and theoretical generation (Greckhamer & Koro-Ljungberg 2005; Selden 2005; Weed 2009). Within the information systems field, it is similarly noted that there is confusion about what constitutes grounded theory because the researcher's approach and methods are regularly concealed during publication (Gasson 2009).

Even where researchers are aware of the variations and strains that have been developed, it has been argued that novice researchers are still unclear about how this to engage in grounded theory work (Heath & Cowley 2004). Further, the terminology used in the grounded theory approach has been described as 'esoteric' and difficult to grasp for novice researchers (Coyne & Cowley 2006, p.1), while others have noted that the use of terminology problematical because they elicit images of quantitative processes (Goulding 2002). The coding process has been described as representing 'nothing more than an enlightening rule of thumb' (Urquhart 2001, p.108) and it has been argued that it is not uncommon for researchers to 'force interpretations from inadequate data' (Goulding 2002, p.156) and that there is often a disconnect between the analytical work performed during the initial stages of coding and the later generation of theory (Charmaz 2006). It has also been noted in the literature that there is a lack of practical examples of the use of grounded theory, that 'those procedures *seem* well sign-posted – until the researcher ends up wrestling with such practical issues as whether the data item in front of them as a property, dimension or category… or how to write up their analysis' (Urquhart 2001, p.111). What makes the situation even more confusing for the novice researcher is that even, that when examining what researchers *did* when conducting grounded research, that people still seemed to use grounded theory as a 'pick and mix' method and appropriated techniques from one school across to another. MacDonald (2001), for example, when discussing their use of Straussian grounded theory within nursing notes that 'I am more comfortable with the neutral questions that Glaser asks during coding' (p. 131) and that 'I did not find all of Strauss's and Corbin's procedures useful' (p. 136).

3.5.4 The use of grounded theory as tool

The application and discussion of grounded theory as a conceptual tool rather than a 'total methodology' (Weed 2009, p.9) within the information sciences field is well established from Orkikowski (1993) onwards, Matavire & Brown's (2008) systematic review of the top 50 Information Systems-centric journals from 1985 to 2007 found that within the IS literature that four approaches to the use and application of grounded theory were prevalent. Those were the Glaserian method, the Straussian method, application as part of a mixed methodology and the application of grounded theory techniques for data analysis purposes within broader interpretative frameworks, with the last being the most popular and the approach taken in this study. Similarly, work discussing the use of a grounded theory approach such as that of Pidgeon et al. (1991), Hughes & Howcroft (2000) and Hughes & Jones (2004) argue that such studies have become increasingly popular with the information sciences because it is useful when developed in situations where context-based process-oriented descriptions and explanations are required. As with other discussions on the use of grounded theory, the case can be made for any of these positions. Greckhamer and Koro-Ljungberg argue that 'a set of techniques or procedures designed to produce a certain kind of knowledge' (2005, p.729) while Weed (2009) claims that grounded theory represents a 'total methodology' (p. 504) in that once the variation to be used has been identified and decided upon, that that it must followed in all areas to provide a sufficient basis to claim that a study is grounded and that studies that have not follow all steps of the process should be rejected on this basis. On the question of a rigid approach to its application as a full or total methodology, these authors argue that interpretative research must arise out of the situation and practical application of methods and conclude that it is possible to use grounded theory to provide assistance in the production of theory in rich contexts. Others studies within the information sciences that follow this adaptive approach include its use as analysis tools to overcome the perceived weaknesses of action research for theory generation by adding rigor to problem-solving tasks (Wastell 2001). It also greater diversification from the original concept in their use of grounded theory coding techniques by making use of 'seed categories', such as Fitzgerald's (1997) study of systems methodologies and the action research based work of Hughes & Wood-Harper (1999). These are particularly interesting developments because it is counter to the idea that the concepts and categories must emerge from the data rather than being identified *a priori* to the data collection and coding process. This, in turn, has resulted in

some later studies conducting grounded theory work on the misunderstanding that that those seed categories have always been part of the grounded process; for example, Crafford & Roode's (2000) study of socio-economic development in rural communities uses Hofstede's four dimensions of culture[5] as seed categories on this basis. In a reflection on their use of grounded theory, Hughes & Jones (2004) concluded that the use of seed categories fits both with grounded theory and the need to illustrate that the work was drawing upon previous work and knowledge.

The use of grounded theory in this manner, as a tool for conceptual analysis, does raise the question of previous knowledge or the domain expertise of the researcher. Many have taken the application of grounded theory to require a 'naive' researcher who has not conducted a review of literature and should have limited knowledge of existing theories or concepts. While on epistemological grounds this is impossible for most researchers, the researcher cannot unknown what he already knows; it is directly addressed by Glaser and Strauss (1967) where they argue that 'of course the researcher does not approach reality as a tabula rasa. He must have a perception that will help see relevant data and abstract significant categories from the security of the data' (p. 3). Indeed, the original work does not note that a sociologist should have any understanding of theory but simply that their theoretical sensitivity is lost when they become 'doctrinaire' (p. 46) and adopted preconceived theoretical perceptions. MacDonald (2001) in exploring the differences between the Straussian and Glaserian schools puts an emphasis on the 'personal characteristics' (p. 145) of the researcher, with the Straussian school also putting an emphasis on personal and professional experience, hardly a 'naive' researcher in the way that some have interpreted the term. Pace (2004), in his study of web users seems to suffer from this confusion, noting that that the conceptual model he has developed differs significantly from one he has demonstrated previously in a conference paper and he asserts that he has managed to 'suspend their knowledge' (p. 333). This seems to be a fundamental misunderstanding of what was being stated, both variations of the grounded theory process require that the researcher is trained (implying they have domain expertise) and that they understood the theoretical foundations of their domain, providing the basis of their theoretical sensitivity. Without this training or experience or simply orientation provided by previous understandings, the task of making sense of the data is

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[5] Low vs High power distance, Individualism vs. Collectivism, Masculinity vs. Femininity, Low vs. high uncertainty avoidance

impossible (Pidgeon 1996). Glaser's later work does seem to take a more hard-line approach when he suggests that 'there is a need not to review any of the literature in the substantive area under study' (1992, p. 31) but, as Hughes & Jones (2004) argue, if the researcher is already working in the area, this injunction is quite impossible. At the time this research work was being undertaken, the researcher was engaged in a number of other projects in the area of the police use of mobile information systems, and a review of the literature in this area and prior knowledge was unavoidable. Moreover, on a practical level, the experience gained from previous studies was useful in establishing an understanding of policing as a practice and the terminology and jargon used within this culture.

The inductive nature of a grounded theory approach coupled with this dearth of previous work from an information perspective in this area indicated the suitability of this approach. One where there is little or no previous examination of the phenomenon, it was felt that theoretical generation characteristics of a grounded theory approach can help in the development of a theoretical account (Eisenhardt 1989;Pidgeon 1996). At identified in the literature review, while there had been some work around the use of use of in-car mobile information systems, at the time the research was being conducted, the literature on the use of hand-held technology was scarce and predominately concentrated on technical matters and analysis of future and potential applications.

3.5.5 Coding process

Coding is the centre process by which data is broken down and 'put back together in different ways' (Flick 2006, p.296). In this study, the analysis was performed as soon as possible, in many cases, this was at the scene or immediately after an interview or an encounter as the researcher has access to both his computer and office space to work in. This also meant that where the data was an interview, that transcription could occur while the encounter was still fresh in the mind of the researcher. Where this was not possible and an opportunity arose for more data collection, the researcher would draw up the key themes of the previous encounter and use those to guide them to the next encounter.

It is important to note that the process of coding is not one that occurred in a linear fashion but rather is one that occurred in an overlapping fashion that reflects the movement between theory generation and data collection which is the basis of grounded theory. Moreover, the process of theoretical sampling means that data collection was

constant across both the research site or situation and the literature, and this evolved over the course of the research and in turn shaped the direction of the research. In this study, the importance of the spatial control of the environment only became clear after the project team had noted officers who were not registered as being on the trial were being recorded on the auditing and monitoring database. Authors such as Weed (2009) have suggested that the rigid adherence to the coding strategy detailed within Strauss and Corbin's (1990) text is an misunderstanding of their preference being an example rather than an instruction and that the methodology strategy for this stage may include 'some or all' (p. 506) of their suggestions rather than must include all. Indeed, even the idea of doing micro-based word by word coding as suggested by many advocates of this method has been disregarded by many as a cause of information overload and instead work on a line by line basis. Hughes and Jones (2004) note that micro-based analysis '...is such an overhead that it is suggested that many researchers may chose to by-pass this level of attention' (p. 6), either method forces the researcher to interact with and consider the data carefully (Charmaz 2008).

Many of the changes described in the case study in this thesis are driven by wider political and social changes rather than organisational necessity. As the study progressed and data was analysed and considered as part of the inductive process, it became clear that issues around temporality were, as anticipated, a central theme in the exploration and explanation of what had occurred at the research site and the changes to the Stop and Search process. One final note about the descriptions that follow, while the steps here are outlined as 'open', 'axial' and 'selective' coding, they are not processual in that they have clear boundaries and divisions between the stages, nor are they temporal in that the research finishes one stage and moves to the next, with open coding dominating at the start of the process and selective coding dominating towards the end (Flick 2006).

Theoretical sampling

An important related part of the data-collection and coding process is that of theoretical sampling, Miles and Huberman (1994) explain that theoretical sampling is related to the 'Choice of informants, episodes and interactions are driven by a conceptual question, not by a concern for "representativeness". To get to the construct, we need to see different instances of it, at different moments, in different places, with different people' (p. 29). More simply, for Glaser and Strauss (1967), it is the point at which the researcher asks

himself, 'who do I need to speak to next?' It is where the researcher identifies and collects data from other grounds than those they identified at the start of the study. While the *case* was the uniformed officers on the trial, talking to the project team and others helped to establish a better understanding of the emerging concepts. As the trial participants were spilt over two sites, there were already two higher level sub-groups but the research could determine no noticeable difference in how they approach the use of the technology or significant variation on how they believed the Stop and Search work task should be performed. Moreover, the researcher discussed issues around officer safety with others with the organisation, such as the project team, the staff officers and other officers he would encounter such as plain-clothes police officers.

Open coding

The first stage of dealing with the data and of conceptual analysis is that of open coding, the process of identifying categories and properties within the data by labelling them. The purpose of this stage is to generate abstract concept categories (Strauss & Corbin 1990; Punch 2005; Urquhart 2001), the key question for Strauss & Corbin is 'what is the piece of data an example of?' (1990, p.62). The research at this stage has 'maximum flexibility' (Pidgeon 1996, p.77) and could go in many directions. The qualitative data collected is collated and categories, properties (sub-categories) identified.

The stages of open coding can be described as:

- Inductive development of provisional categories;
- Ongoing testing of categories using conceptual analysis and comparison of categories with data that is already coded; and
- Adjustment of existing categories as other ones are created or eliminated.

The researcher can make use of *in vivo* (member categories) that are a direct précis of the data or more general theoretical ideas (researcher categories) (Breakwell et al. 2006). The initial coding here was a mixture of the two as the researcher got to grips with both the idea of grounded theory research and more than once was struck by the relevant of Urquhart's comment on performing grounded research analysis that the coding process itself represents 'nothing more than an enlightening rule of thumb' (Urquhart 2001, p.108). Over times, some codes moved between the categories, for example, the idea of 'focus' was originally a word that was used by a number of officers to describe their use of the devices and their concentration on the devices and later because a researcher

category. The researcher struggled with many questions, for example - was focus a property of immersion or was immersion was a category of disassociation and so on. Categories and properties are abstractions in that they represent the remarks of many respondents not simply a single narrative account. In addition, some pieces of data had multiple codes and the codes themselves were considered provisional at this stage as recommended (Punch 2005). As discussed above, the decision was made to follow the process of line by line coding rather than micro word-by-word and this was perform within Atlas Ti. An example of this is provided below in as with other authors, there 'anxiety as to whether my interpretations were at all plausible' (Urquhart 2001, p.111).
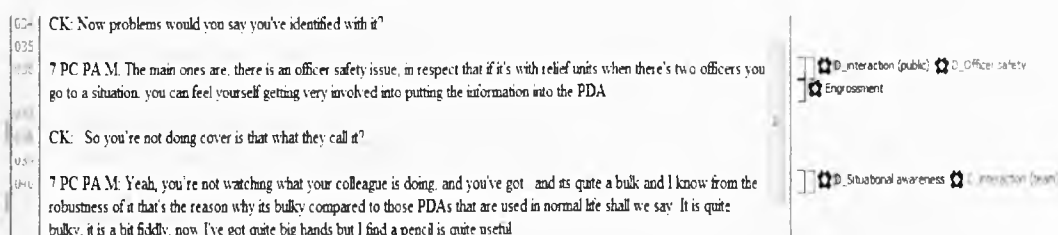
Figure 12: Example of line by Line coding with Atlas Ti

At this stage, an attempt was made to develop analytical rather than descriptive codes and this lead to the development of area references, prefixes that were attached to some of the descriptive codes to try and provide some structure. Figure 13 shows the codings for **D_** which is the prefix for 'disadvantage', the officer made a statement that indicated a disadvantage with the use of the devices.

- D_ Harness impractical
- D_Device Focus
- D_device log-on slow
- D_Device network speed
- D_device size
- D_device speed of data entry
- D_device support
- D_email very slow
- D_error codes are not understandable
- D_Harness impractical
- D_information collected (fragmentation)
- D_information collected (level of detail)
- D_interaction (public)
- D_interaction speed (Public)
- D_network logon slow
- D_no out of hours support
- D_Officer safety
- D_passwork cascading logout
- D_passwork lockout
- D_poor support by tech services
- D_situation awareness of other officers
- D_Situational awareness
- D_speed of access to information
- D_tension (public)

Figure 13: Codes for the area reference of D_

Axis coding

This leads to the second stage of the analysis – Axial coding. At this point, the researcher establishes the relationships that exist between the central phenomenon of interest, the casual conditions that relate to the phenomenon, the context in which the phenomena exists, and any strategies or consequences that arise from the emerging phenomena (Breakwell et al. 2006). Table 8 provides examples of the area descriptors that were established and provides a description and exemplar of each area.

Area Reference	Area reference description	Exemplar
A_	An *advantage* from the actual use of the device.	'It can be much quicker to do a check on the PDT'
BP_	A reference to the behaviour of the public	"They get very tense if it takes too long"
C_	A description or reference of a	'Before I had to wait on

	change to an existing way of working or interaction	the radio'
D_	An example of an *disadvantage* from the actual use of the device	'You get drawn into the device and lose concentration on the individual'
DU_	An example of the *direct use* of the device	"I check an individual's address on it.
HITOTG_	*Heard it on the grapevine* – the individual is describing something he has heard about the change or the use of the device	'I heard it was guicci [Good] kit'.
N_	The officer is describing something *new* they did because of the device.	"I used to check a row of cars on the PNC"
OS_	The description is connected to *Officer safety*	'I would not use that device unless there were three of us, it's not safe'
PRP_	The *public reaction* to the police	"They like us because we can lock them up"
PRT_	The *Police reaction* to the *technology*	The password system is silly"
RiD_	*Risk Descriptor*	'You want to be waned if this person could harm you'
RD_	Role descriptor	"I am a response car driver'
SC	Spatial change	So I lean against a wall when I use it
SK_	**Skill descriptor**	**I have experience with**

		PDAs
Se_	A reference to the *Season*	When it's freezing cold I don't want to use it.
SQ_	An officer is making a reference to the *Status quo*	'You are suppose to update at the end of a job'
SP_	The *Self-perception* of the officers	'The job is about being aggressive with people, so of the young officers don't have that'
SPT_	*Spatial reference*	'By the bus stop'
RP_	Role perception	'The role of the pro-active crime team is to actively seek out criminals and disrupt their activities'
IWO	Information with organisation	'I told the PDT support team I could not hang around'
IWT	Information with team	'You ask another officer to check their back'
IWP	Information with public	'The first thing I do is ask them their name'
TW_	Teamwork	'You cover each other for officer safety reasons'
TF	Time faster	'It certainly seems quicker'
TS	Time slower	'I think it's slower'
TR_	Temporal reference	'The pace for us call-handlers is quite face'

Table 8: Example Code families arising from initial coding

Selective coding

This stage can be considered a continuation of the axial coding, the researcher then attempts to develop a narrative (selective coding) that incorporates the results of the axial coding (Kumar & Crook 1999). Others have described the selective coding stage of being one that helps to define the 'story' of the central phenomena under study. At this stage, the researcher is attempting to the linkage between examples and relevant categories. It is here that the 'story of the case' should emerge (Flick 2006, p.313) and that beyond the central narrative, a central phenomenon or category that all other categories can be related to should emerge. Many of the sub-codes that were developed within the coding areas discussed in table 8 were merged at this stage.

Core category

The purpose of the central concept is neatly summarised by Struass & Corbin who note that 'the core category must be the sun, standing in orderly systematic relationships to its planets.' (1990, p.124). In actuality, two core categories, those of *perception of risk* and *performance* were identified, and it was not entirely clear until more data was collected and further questioning of the officers was attempted that the relationship between the two became to emerge from the data. What was particularly problematic was that the category of *perception of risk* seemed to be recessive when consider in the group situations and the category of *performance* seemed to be dominate. This raised another question in that it could be argued that as the officers moved between single and group use that the research was actually describing two similar but not the same situations – in effect, two *cases* with similar constitutional elements (officers, use of technology, the intermediation process) but different levels of analysis (the solitary officer, the collective of officers). If it was a matter of two cases, then the use of a single category was limited in its descriptive power and simplified what has actually occurred. Turning to the literature, it became clear that, as with many aspects of grounded theory, that a number of positions could be taken. Exploring views of the role of the core category within the information sciences literature, Pries-Heje (1992), in an investigation of software tools, notes the difficulty of arriving at a single core category and the frustrating process of generating multiple theoretical models while struggling with this question. Similarly, Dey (1999) argues that while finding a single core category may allow boundaries or limits to be placed on the research, community interaction and collaboration may not be fully

expressed by such an approach. Gasson notes in regards to this issue, that too detailed an analysis may be a problem, and therefore the conceptualisation relies upon 'puzzling over what 'your multiple "core categories" have in common' (2009, p.48) or simply that an approach that generates a meta-core category might be more suitable. In the end, the position was taken that while undertaking the Stop and Search task that the issue of performance is secondary to ensuring safety and preventing the flight of the stopped individual. Critically, performance is something that the officers considered more carefully over a long period of time than the immediacy of the moment by describing their desire to demonstrate their competency when they returned to the station and file their Stop forms or by their immediate supervisor's check of their activity at the end of period of time.

Another issue that caused much vexation was that while the *performance* category emerged and was largely unchanged, the *perception of risk category* went through a number of versions, moving from *risk* to *danger* back to *risk*/danger and then to *potential of risk* to finally *perception of risk*. This is because the term potential signals that the officers were engaged in some form of measurement process, they were trying to assess the potential of something. This would overemphasise the officers' descriptions, which were a more vague sense or feeling of risk from a number of different interactional and environment cues rather than something that they could articulate clearly. Moreover, this perception arose not out of their immediate performance of the task, but also from their training and from the constant reinforcement in canteen culture and other organisational spaces. On re-examine the data, it was noted, that in very few of their descriptions were they recounting situations where that risk has been actual. Their descriptions of attacks with knifes were tales of 'what might happen if I am not careful' not descriptive accounts of 'what happened when I was not careful'.

Chapter 4 – Thematic Core Categories

4.1 Introduction

In the previous chapter, the data collection process, the research methods and the underlying methodology were described and the emergence of core categories from the axial coding process identified and highlighted. The data analysis revealed four categories, those of *Risk, use of force, cover, and intermediation/disintermediation* that are core to the experience of the officers on the trial. While the significance of these core categories in the analysis of the PDT trial is contextualised in chapters 6, 7, and 8, here the aim is to provide an academic and theoretical foundation to the application of these terms within this work.

4.2 Risk

Risk is an individual's calculation of the potential harm, to themselves or others, against the likelihood that harm will occur. What constitutes harm will be considered on a situational basis but it represents some negative physical, economic or social outcomes from following a particular course of action. The complexity of the calculation is increased by the related concept of benefit, a positive outcome that can be derived from taking a course of action; a true assessment of risk is an individual's assessment of the potential benefits of a course of action weighted against the potential harm (Barnbaum 2002; Dorn & Brown 2003; Lupton 1999). Within policing literature, the concept of risk has been addressed across a range of roles and common situations. Police officers are part of an occupational culture that is rooted in the isolation of its members from others; as a result of this, they are 'preoccupied with the danger and violence that surrounds them, always anticipating both' (Paoline 2003 p. 201). Burrows (2007) in his exploration of police firearms officers argues that 'an officer's response to an unfolding incident is a combination of personal and professional experience, training, and subjective assessment of imminent threats' (p. 277); the determination of potential risk is therefore a mixture of cultural factors reinforced by procedure, training and doctrine. What makes the police

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assessment of risk different to that of other occupational groups is that, almost uniquely, they may be asked to increase the threat of physical harm to themselves in an attempt to migrate or reduce the overall risk for the communities that they serve.

Dorn and Brown (2007) in their work on the behaviours of traffic officers argue that the police are 'active managers of risk' (p. 851) combining environmental information and the actions of other drivers to compare the benefits of speed against the possible risks to themselves and other members of the public. If it is felt that a pursuit will compromise the safety of the public or indeed the person being chased, a police officer will discontinue or consider alternative strategies; the possible benefits of catching a criminal are outweighed by the risk of injury to other members of the public. The management of, and response to, risk has also featured heavily in studies of response officers (the subject group in this thesis); Flin et al. (2007) in their study of how officers discriminate between operational situations suggest that along with familiarity with the type of incident, that the possible risk to themselves is the key factor in how they decide on what action to take. Other work has focused on this idea of experiential knowledge and argues that it allows officers to make good decisions and minimising risk by better managing the complexity of the situations they face based on their previous reactions to such incidents (Archbold 2005; Bradford et al. 2009; Burrows 2007; Crawford & Burns 2008). The influence of experiential knowledge is however not without issue and may skew an officer's calculation and perception of risk. A common trait of officers irrespective of occupational role is that, as a group, they perceive themselves as highly competent in calculating and managing the possible risks to themselves or others that may arise in the course of their daily activities. This positive appraisal of their skills as risk managers is tied to their view of the general public as a chaotic 'them' who have a low understanding of risk and are unpredictable in their behaviour and decision making. The assumption of competence can have a detrimental impact on the decisions of officers as they may underestimate the possible risks to themselves or others because of their belief in their superior ability to deal with problems that arise (Dorn and Brown 2003).

Within a policing context, risk can therefore be seen as a super-ordinate category in the decision making processes of officers (Waddington 2007), one of immediacy rather than as part of a ponderous 'slow time' decision-making process. In critical or 'quick-time' incidents the time available to an officer might be fractional, often in the milliseconds, not

bourn from clinical detachment and cool analysis but rather from an urgent moment. Thus, rather than relying on their judgement and their ability to rationally consider their options, an officer may take action to resolve a threat in an almost sub-conscious fashion with the assessment and the response occurring in an almost simultaneous timeframe rather than by slow calculated deliberation. As Lord Diplock (cf. Burrows 2007) noted when considering the threat of possible harm and the use of firearms noted that:

> 'the postulated balancing of risk against risk, harm against harm, by the reasonable man is not undertaken in the calm analytical atmosphere of the courtroom after counsel with the benefit of hindsight have expounded at length the reason for and against the kind and degree of force that was used by the accused; but in the brief second or two which the accused had to decide whether to shoot or not under all the stresses to which he was exposed' (p.200)

Much of police training is to ensure that an officer does not freeze in a difficult situation and instead will rely on a 'trained response' (Burrows 2007, p. 275) to carry them through a moment of danger. Indeed, this is part of the key contradictions within modern policing, individual officers have wide latitude to act, but this is within a context of strict hierarchical control and oversight and a need to show that their course of action was fit, proper and lawful and was not reckless in nature. If the trained response is one that lends itself to violence or the use of physical force then the officer has to, in a fraction of a second, decide on the appropriate level of force and hope that it is both sufficient to deal with the problem but remains lawful. The category of risk was most strongly and closely associated with the ideas of violence or within the policing lexicon, the use of force, the next category to emerge from the data.

4.3 Use of force

The orthodox view of policing is one that accepts that police officers have a legitimate and enshrined right to make use of violence on their fellow citizens as agents of the state. As Bittner notes, policing is 'a mechanism for the distribution of situationally justified force in society' (1979, p.9), it is a means of forcing compliance from those who might seem to threaten the integrity of society via their criminal activities. Indeed, the possession of this coercive power is seen as part of the overall masculine occupational culture and the macho portrayal of policing within the media (Herbert 1998). It is accepted that the use of force, or more obliquely violence can be seen as a 'ubiquitous prospect' (Waddington 2007, p.7) in the daily interactions of officers within the communities they serve. The

likelihood that an officer will have to make use of force is something that increases over time, that is to say that the more contact they have with the public, the greater the chances that force will be needed (McElvain & Kposowa 2004). The execution of this right is one that affects the public's attitude and relationship towards both the police and the state the central question around the police use of force is not *if* but rather centred upon *why*; critically because the use of force is often seen as the most common form for the abuse of power by officers (Schuck 2004).

Central to the legality of the application of violence is that it must be used in a proportional manner to the situation that the officer finds themselves within. The determination of what is proportional is poorly defined within the legal statues, something that has lead to much debate about what justification is needed for differing levels of response (Rappert 2007) or what consists 'excessive force' (Lersch & Mieczkowski 2004). There is a range of force available to officers, but the majority of situations consists are what Macdonald et al. (2009) terms as low-level and involves 'grabbing, pushing or shoving' (p. 120) rather than the use of weapons such as truncheons, CS gas or lethal means such as the use of firearms. Force can be seen to exist along a continuum with 'legitimate' force at one end and 'excessive' force or police brutality at the other, the most minimum example of force being simply the presence of the officer and unlawful death at the other extreme (McElvain & Kposowa 2004). A significant element of police training is ensuring that officers are guided in what levels of force are appropriate for the interactions they have with the public, and writers such as Klockars (1996), Crank and Caldero (1999) have defined excessive force as the level at beyond what a skilled and well-trained officer should find necessary to use to control a situation.

Understanding why officers make use of force requires an understanding of the process of interaction with the public and how that guides their actions. The Binder/Scharf model (Binder & Scharf 1980; Fridell & Binder 1992; Helsen & Starkes 1999) suggests that interactions between the public and police officers move through four stages: (1) *anticipation,* where the officer considers what they may encounter as the result of a request to attend an incident or by direct observation; (2) *entry* into the physical scene and a more clearer determination of the actual situation and the risk to themselves; (3) a period of *Information exchange*, which may be short or long in duration and includes verbal information gathering, assessment of the environment and the prediction and

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projection of future states (Paoline 2003; Reuss-Ianni 1993); and (4) a *final decision* where an officer decided if physical force or an arrest is needed. The decision by the officer to make use of force will be determined by a number of factors at each stage but the most critical of these is the information exchange stage. Binder and Scharf (1980) note that their model should be considered a 'developmental process' (p. 111) and that successive decisions by both parties (officer and member of the public) make violence more or less likely. This information exchange can be seen to have two elements to it, this first part is that of situational assessment, the process of deciding 'what is the problem?'; The second being the consideration of what meaningful action to undertaken, 'what are I going to do about this problem?'(Womack 2002).

In the case-study described in the rest of this thesis, the police procedure of Stop and Search is one that is most often initiated by random or semi-random chance. The officer stops an individual because they feel that there is something in their demeanour or behaviour that is odd, or simply that, depending on the location that their physical presence demands inquiry – for example, an individual hanging around parked cars in a quiet side-street. Here we can see that there is no clear divide between *Anticipation* and *Entry* as defined in the Binder/Scharf model, and that the linkage between the two can be blurred as the officer receives information either in the form of visual observation or via their radio handset or indeed, can be influenced by a lack of information about what is occurring. Based on what happens during the information exchange process (which may also include additional information over an officer's radio), officers must be able to use their judgement to rapidly assess a situation and determine if the use of force, a need to withdrawal or call for assistance is required. Every encounter with a member of the public and the decision or even opportunity to make use of violence is a perfect example of the level of discretionary decision making powers enjoyed by the rank and file police officers (2003). However, as Helsen and Starkes (1999) note society no longer expects its policemen to simply be the 'strong-arm' of the law but also to be effective communicators with 'mediation skills capable of dealing with potentially very dangerous situations' (p. 396). Officers are therefore expected to use the information exchange phase of an encounter to try and avoid using force if possible. The aim of the officer at all times is to ensure that there is a peaceful resolution to the interaction although they often relate on low-level coercion and or threats to arrest stopped individuals (Eckardt 2007).

The decision to abandon conversation (or simply by-pass information exchange entirely) and turn to force is 'strongly based on the perception of risk' (Terrill & Mastrofski 2002); subject to a mixture of internal factors such as their emotional state, experiential knowledge and state of mind, and external factors such as time pressure and the environment context (Brown et al. 2009). The expectations of the officers in regards to the possible behaviour of stopped individuals is also informed by their previous experience and this will shape both their interaction with an individual and their decision on where and when to use force or as Ericson (1982) terms it an officer's 'recipe of rules' (p. 25), an individual's own personal style developed over time for how they deal with and interact with the public. In these situations, officers often make use of non-verbal cues such as speech disruptions (stuttering, gaps) to help them determine the appropriate response (Cooper 1997).

Beyond obvious threats of violence to themselves or other members of the public, a variety of other reasons, some highly controversial, have been suggested for why officers make use of force. The role of race in the decision process is highly disputed, studies in both the USA and the United Kingdom claim that an officer is more likely to make use of or initiate violence if the stopped individual is male, non-white, poor or young (Banbury & Tremblay 2004). Others such as McElvain and Kposowa (2004) find no such link. Another suggested reason for the use of force is if an officer feels that a stopped individual is behaving in a manner they deem 'disrespectful' (Johnson 2004; Johnson 2006; Klinger 1994) or more simply that the officer has a 'hunch' that an individual is suspicious or lacks moral character. In his study of officers, Van Maanen (1995) found that using force was considered an appropriate way to deal with 'assholes' (people who challenged the authority of police officers). Flin et al. (2007) note that an individual may accept unjust treatment and less confrontation if they perceive they have been subject to proper procedure; the officer following the rules and makes these rules clear to the public. Indeed as Wells (2007) argues, this perception of following the rules is a key factor in how an encounter will progress or escalate into the use of force.

4.4 Officer cover

To police officers, risk and violence are issues that are closely interwoven with the doctrine of 'officer cover', the process where one officer provides assistance to another when

interacting with or arresting members of the public. The attitudes of officers to risk and their consideration of, how and when, to apply forces are modified in a number of ways by the presence of additional officers. In a situation where the officer is alone, the possible danger to themselves when dealing with the public in common situations such as the Stop and Search process outlined in the cases-study comes to the forefront of their conversations and frames their interaction with the public. Simply, their focus is on their safety and possible danger rather than primarily on eliciting and collecting information. The interaction with the public and the officer's assessment of risk is modified by the presence of other officers at the scene of an incident and their ability to assist if needed. Within policing, the presence of another officer to assist is generally referred to as 'officer cover'. The wider area of Officer safety can be seen as actions that are taken to ensure their safety, for example, an officer may search a vehicle for the presence of knifes or other weapons before questioning a stopped individual.

'Cover' is not simply a matter of the presence of another officer (or officers) it is an established process that involves the officers making use of well practices and established routines. The training processes of officers emphasises the need for an officer to protect themselves first, then attend to the safety of fellow officers to ensure that they are able to deal with any threat and also protect members of the public. There is also a direct connection between the police's ability and right to apply violence to control a situation and manage the behaviour of members of the public. Moreover, the idea that an officer should protect his 'brother' officers is an accepted part of the occupational culture within policing and with its strong emphasis on loyalty between officers 'Watch out for your partner first and then the rest of the guys working that tour [work shift]' (Chircu et al. 2007). The principle of officer cover as not only correct practice but also an expression of loyalty is a nature outcome, along with social isolation, of police occupational culture (Boon et al. 2008). This need to stand by brother officers also extends into how officers will react; while as discussed in the previous section, officers will be trained to make use of the minimum force required to subdue rather than injury members of the public, in reality their idea of 'normal' force can deviate quite significantly. An officer may be seen to make a grave mistake in the eyes of their colleagues if they are thought to be hesitant to use force to protect each other, better to be seen to be too keen to use excessive force rather than not enough (Micucci & Gomme 2005). Critical to the practice of 'cover' is the placement of the additional officer(s) in relation to the member of the public being

questioned and the officer engaged in information enquiry activities. A typical deployment will involve the second officer standing to the side and slightly behind the questioned individual, forcing him to split his concentration between the two officers and also to allow better control if the situation escalates into violence or the individual attempts to abscond from the scene. This is a technique that is intended to control the behaviour of the individual and also their physical movements within a small physical area. The technique, as well as ensuring the physical safety of the officers and acquiescence of the individual, allows the officer who is engaged in the informational exchange process and may be noting down information, not to have to keep his attention fully on the body language or actions of the individual.

4.5 Disintermediation

The introduction of direct remote access or 'self-service' for officers trying to obtain information about a stopped individual was the most radical change to the work task and traditional working practices. These changes removed the existing intermediation service provided by the command and control environment from the information enquiry aspects of the work task. The concept of intermediation has been covered within a number of different bodies of literature and while there is some variation in the discussions of the term and its application, there is much commonality in the thematic issues that are raised and which apply directly to this thesis. Intermediation is a relationship between three parties, the consumer[6], the intermediary and the producer (Womack 2002). An information intermediary is one that collects, organises and distributes information to clients (2005). Here the uniformed officers (consumer), the command and control environment embodied by the call-hander (intermediary) and information services such as the Police National Computer managed by the National Police Improvement Agency (producer).

Common to descriptions of the relationship between these parties is an acknowledgement that the introduction or use of intermediation service has a economic component; the intermediary obtains or collates information for the client from the producer and all parties consider the advantages or 'added value' this relationship provides against the cost

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[6] The use of 'consumer' here is in reference to the term as used in economic consumer theory, rather than the more general usage.

of the transactions required to pass the information amongst themselves. This added value can take many forms, from the speed of access, the filtering of extraneous data sources, the cost associated with providing the information and other factors such as reducing uncertainty about the validity of the information provided (1998, p.79). Moreover, one of the core reasons for adopting an intermediation service is that, as an information function, it enhances the movement of information between the producer and the client group and therefore increases the level of satisfaction for both parties (Lee & Liebenau 2000a; Tuttle 1997). For the client, of particular importance, is the ability of the intermediary entity to prioritise, organise and successfully transmit the information in a format that is suitable for their intended use (2000). Information intermediaries as opposed to transaction intermediaries are not engaged in other aspects of completing a transaction such as assigning an economic cost to the activity (O'Conner 2005, p.15). On this basis, an information intermediary can be seen as any system that provides mediation between the producers and consumers of information and their primary role is to select, collate and disseminate the information to the consumer according to their needs (2003). Leo and Cho (2007) define these types of services as 'a human or non-human party designed to assist consumers in information processing' (p.96), while Rose offers the following definition 'An information intermediary is an independent, profit maximizing economic information processing system performing its activities (information acquisition, processing, and dissemination) on behalf of other agents' information needs' (2003).

This thesis accepts and uses these definitions of an intermediation service but with a very limited consideration and emphasis on the economic aspects of the process in terms of measuring the transaction or other financial *costs* as an element of the added value perceived or provided by the service. The relationship between the client group and the intermediation services described in the case-study has the intermediary (the command and control environment embodied in the Call-handler) acting in a purely informational role, acting as it does, to gather, sort and arrange information to match the needs of the client group, that of the uniformed officers. It is undeniable that there is an economic transaction cost incurred by the organisation from the employment of the call-handler staff to manage the information needs of the uniformed officer but the consideration of those costs and the overall cost of the intermediation service provided by the command and control environment is something that is not managed or discussed at the operational level, it is managed at the corporate level as part of the overall performance management

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of the organisation. Moreover, the officer does not consider the cost of using his radio to ask for an identity check to be performed, neither do they consider alternative intermediation sources, instead they consider the *time* such a check will take given the information they can provide to the call-handler and also how busy the command and control environment is likely to be given the time of day or other such environment factors that may increase demand for the service. However the ramifications of these decisions do manifest in a way that can be related to the aims of this study and the organisational use of information. The performance of call-handlers is measured by their ability to deal with requests for information within a set amount of time and therefore their conceptualisation of their performance is not one of cost, it is also a function of time and their temporal context as defined by clock time, their role and their need to meet a deadline (2004). Therefore where applicable, the discussion and analysis that follows highlights cost as being managed by the officers and the call-handlers as a function of time, in the same way that time can be perceived as a cost in the economic concept of opportunity cost.

Another determinant of clients selecting a specific information intermediary service is that of reputation or 'brand'; their previous experience with the service and those of others within their client group will lead them to expect that the service will deliver the results they require. Here there is a distinction between intermediaries in the situation described in the case study and other situations where information is managed in an analogical context (that of a service sector call-centre environment). Whereas in other sectors the client or client group may have the opportunity to collect information direct from a variety of primary producers and the intermediary must therefore provide added value to compete, in this situation, the information that the officers wish to access is only available from specific producers and via those internal organisational intermediaries. For example, the most commonly used source, that of PNC, is the canonical source of information on previous criminal histories of individuals and no alternative exists. For many of the officers on the trial, this exclusivity is a restriction of physical location and geographical presence as they have received specialist training so that they can directly access PNC via specialist terminals within police buildings.

4.6 Interrelation of categories

It is clear from the interview transcripts and the direct observations of the officers that the four categories identified via the grounded theory analysis are closely intertwined with each other and that separating out where one concept starts and another ends is quite difficult. Equally, it is clearly significant that the officers do not consider these categories as separate but as an interconnected messy hold; at the heart of each is the question of information, be the ability to gain information from conversation, direct observation and via the provision of information before and during an encounter via the intermediation channels. The changes described in the case-study (cover in detail in the following chapters), from information provided from the central (the police control room) via intermediation to disintermediation and direct access via the use of handheld devices can therefore to be seen as highly disruptive to how these core categories interact and overlap with each other.

Chapter 5 – The Trial Implementation

5.1 - Introduction

This case study describes the trial implementation, over a period of four months, of a technological solution to information and organisational management problems within the large urban police force, one with an operational strength of over 25,000 officers. While the influences on the project were a mixture of the technical, operational and political, the explicit primary objective of the trial was to trial the use of mobile information systems to provide a technical solution to recurring problems with the management and monitoring of a specific process: the police power to 'stop and search'[vii]. This legal power to stop, question and search members of the public had been the subject of much debate within British society and was perceived as a tool of harassment. The secondary objective of the trial was to provide empirical data about the costs, benefits and possible impacts of mobile access to information systems to operational police officers. The use of a time limited implementation within a single Basic Command Unit (BCU)[viii] was seen as an effective method for gathering data in a controlled setting. As the planning progressed, it was decided to provide some units to a second site in more limited numbers.

5.1.2 – Influences on the trial

The relationship between the different influences on the trial implementation are difficult to understand when considered as discreet entities (technological, political, organisational) and a more comprehensive and understandable narrative is provided by tracing the trajectory of the external and societal and their impact on the internal and organisational. The 1990s saw the UK become embroiled in an ongoing cultural debate about the systemic failures of the policing model. The case of Stephen Lawrence, who in 1993 was murdered in a racially motivated act of violence, was seen as the quintessential

example of the problems of the day. The death of this young man touched a nerve within society and the case became cause célèbre driving the discussion and providing a rallying point for those calling for change to the provision of policing and other public services. A series of failed prosecutions against those considered to be responsible for the murder led to two internal enquires by the Metropolitan Police Service (MPS) to examine its investigative procedures and any failures or misconduct on the part of the investigating officers. In addition, the internal investigations considered how officers interacted with both victims of crime and possible perpetrators and where changes should be made. Both enquires found that there was no cause for concern with general organisational activities or with the conduct of serving officers.

Unsatisfied with the internal enquires, in 1997, the UK Home Secretary Jack Straw asked Sir William Macpherson to conduct a public enquiry with the aim of establishing how public sector organisations were serving the increasingly ethnic diverse population of the United Kingdom. While Macpherson's remit was wider than just the MPS, it was this organisation, and the practice of policing that the public and media commentators focused their attention on. On release in 1999, The Stephen Lawrence Inquiry Report made a damning case against the MPS, describing it as "institutionally racist", and failing in its duty to its employees and the communities who relied on the provision of "protective services[ix]"(Home Office and Macpherson 1999). The report made 70 recommendations across a number of areas but it is only Recommendations 61 (R61) and 62 (R62) that are integral to this case study. R61 proposed that the power for police officers to stop, question and search members of the public should come under greater scrutiny and be subject to more checks and balances[x]. Tied to this, Recommendation 62 stated that records of stop and searches should be monitored by police authorities and released to the public on a regular basis to ensure greater transparency. It was decided that, to achieve this aim, methods to closely monitor stops and stop and search actions would have to be implemented.

This increased transparency and accountability was also perceived as a way to more strictly control and regulate[xi] the activities of UK police forces and help to foster a more reflective culture by forcing them to consider how they interacted with diverse ethnic

communities and to ensure that use of their legal powers did not represent disproportionality[xii]. Indeed, both internal audits[xiii] and external studies had illustrated that disproportionate numbers of individuals ethnic communities were being targeted by the stop and search process (Waddington, Stenson et al. 2003; Foster, Newburn et al. 2005; Bowling and Phillips 2007; Qureshi 2007). This recommendation was accepted by the Home Office and from April 2005, it was to be made a statutory requirement for all UK Police Forces to provide a record (the receipt of the interaction is kept by the officer) of a stop or stop and search to the questioned member of the public. Those records had to document the location, time, date, the reason why the officer questioned the individual, name and address of individual stopped, the officer conducting the stop, details of any notable items found and any follow-up action (Home Office 2005). In anticipation of the deadline, the Home Office provided funding to eight Police Forces to conduct proof-of-concept trials to explore multiple approaches for providing a record for the stopped individual and a receipt for the officer. The trials were also intended to provide guidance for the development of systems for auditing and monitoring the high volume of stops performed on a daily basis. The trials were a mixture of electronic and paper-based systems and the considered opinions of stakeholders was that none of the technological solutions was suitable for field usage. As part of the trials, the urban police forces were expected to run a trial implementation during September 2003. However, this did not occur due to problems with the selection of applications and technology and the organisation was criticised for its failure to proceed.

5.1.3 - Organisational context

With the failure of the Home Office trials to illuminate a clear path to a technical solution for stops, the majority of UK forces turned their attention to developing paper-based solutions. Parallel to this activity, the MPS was already engaged in a radical change to its underlying information systems architecture. It was viewed by the organisation as an opportunity to modernise its core technological infrastructure and redesign the underlying business processes. Central to this was a desire to change how information was received, catalogued and disseminated to operational resources by the command and control function. The aim was to ensure that operational functions and those in the management

structure were better equipped to take appropriate action and deal with incidents[xiv] by providing them with as much information, as possible, as quickly as possible. The Command and control function is the central mechanism by which members of the pubic make connect with and provide information to police forces. It is the primary intermediary[xv] between the public and the organisation and the place where most of the data entities in the information systems used by police officers are created. This first contact determines how information is used, the pre-determined response that will be initiated by the call and when that response will occur. This process is split into two phases – contact management and incident management.

Customer call/demand	Initial call capture	Handling and decision		Grading and deployment	Resolution and feedback
Phase 1 – CONTACT MANAGEMENT				Phase 2 – INCIDENT MANAGEMENT	
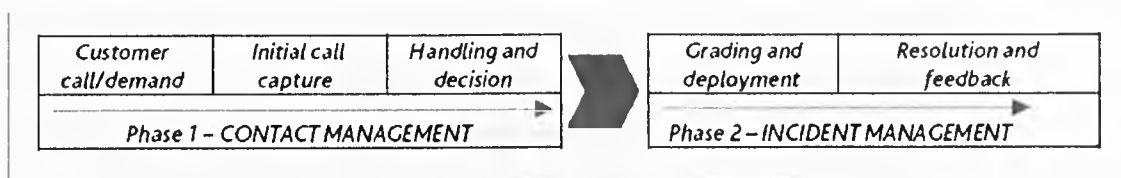
Figure 14: The two phases of Call-handling when 999 has been used to contact the police

In the first phase, that of contact management, when a call is received from a member of public, a trained call handler interrogates the caller for information about the incident, the location and the current level of physical risk to the caller. Using this information, the call handler will then grade the call and either schedules it for follow-up at a later time[xvi] or request an immediate response from available operational police officers[xvii]. The call handler will also open an incident log which will be the central record of this call and the action taken by the organisation. All follow-up actions will take the form of amendments to this log. If an immediate response is required, the call handler will query the system to see the status of officers who are available for dispatch ('available to deal') in the geographical area and are most qualified to deal with the situation as described. Once they have confirmed their availability to attend the incident, the call handler will provide them with as much relevant context as possible about the incident by radio. This represent an evolving synthesis of information sources, from the account provided by the reporting member(s) of the public to checks of what is already held on police and other relevant

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databases such as the police national computer[xviii] (PNC) and local hosted databases of criminals and criminality[xix] such as the force's intelligence system.

Just as the call handler (and by extension the command and control process) acts as an intermediary between the public and their access to service, the call handler acts as an intermediary between the mobile workforce represented by the police officer, and their access to both public and restricted information sources. The call handler will check the systems and will try and establish relevant details about the address or named individuals by reading, analysing and filtering the information provided, the interrogation of systems will be informed by further questioning of the public and questions by the officers. Furthermore, an address or an individual (also known as a 'nominal') may be listed on the PNC or other local databases with 'markers'. A marker is a short text description on a file that indicate that a person or the person listed as resident at an address is known to carry a knife or is known to the police for some other criminal related reason (commonly referred to as 'having form'). For both sets of actors, the call handlers and the officers, there are time constraints that affect this process and inhibit the level of granularity that can be achieved when trying to establish a complete picture of the situation. For the officers, the period of time from when they are dispatched to an incident to their time of arrival can be, depending on distance, only a few minutes. As they arrive at a situation, it is vital that they are aware of, and can assess the risk presented, by the individuals they will interact with. This is a relationship of profound trust; the police officer relies on the skills of the call handler as to not only provide them with contextual information but to provide them with a qualified assessment of the level of risk that they will be exposed to.

While the officers will give their full attention to this rapidly shifting situation, call handler are time constrained as they try to balance the demands of providing the attending officers with as much relevant information as possible against dealing with the others calls that have come in and/or requests for information from officers engaged in ongoing, often tense, situations (S. Wilson & Zhao 2008). This in turn means that, once officers feel that have sufficient information, any further requests for information, such as wanting PNC checks performed upon individuals at the scene, will not be to the same call handler but to whoever is the next available. A significant volume of requests for information are from

officers conducting a Stop and Search procedure and who wish to establish the identity and possible criminal history of an individual. This is done by the officer providing, in short radio bursts, some information about the individual such as name, address, date of birth and then the call handler confirming that the details are correct and checking them on available databases. If no individual is found, then they are assumed to have no criminal record or alternative search strategies are attempted. At peak times, an officer may wait for five minutes or so for a non-urgent request for information because of the demands presented by other officers attending or about to attend incidents. The optimal means to deal with these routine calls for information and free up call handlers and capacity in the system for other more labour intensive tasks has been the subject of significant debate within the policing community. Some advocate improving the process of call handling and training for call handlers to alleviate congestion problems, while proponents of mobile data feel that proving officers with direct access to information systems such as PNC via mobile devices is the most cost-effective and operationally effective way to proceed (Home Office 2005, p.4).

The changed process altered the organisation managed calls in a number of different ways. The primary change was that the "central communications control unit" was to be spilt across three purpose-built centres and calls were to be distributed amongst those sites based upon the overall demand on the system. This represented a significant change to the previous system where calls were distributed to local control rooms for assessment, grading and action. As well as providing an overall cost saving, the force hoped to gain a number of advantages from this change in terms of management of information and the ability of the force to react to demand. The force recognised that the desired goal of increased productivity and response times from better call handling and the management of information could not be achieved by improvements to large fixed infrastructure alone but must be done in parallel to an increased capability for operational officers to quickly access information as and when they needed it.

The force had already made a significant financial investment in mobile data terminals (henceforth MDT[xx]) allowing officers to access a range of information services such as PNC, local intelligence databases, address databases etc. However, the expanded use of MDT

only provided support for officers who have access to vehicles. A significant number of officers within the force work on foot, either alone or with a colleague. Moreover, even when the officer was making use of a vehicle, many situations would require them to deal with members of the public in their homes, public spaces and other contexts. There was concern that the full potential of the changes to the command and control system would be bottle-necked by the inability of those officers to access the most recent and up-to data information as and when they needed it. It was decided that the *political* need for the force to trial an electronic stop and search application could also serve as a mechanism to collect more general data about the positive and negative impacts that could arise from the provisions of mobile information systems. To this meet this goal, research was undertaken by the Directorate of Emerging Technologies to look for a suitable device and suite of software applications.

5.2 Overview of the trial

5.2.1 Key aims of the trial

The primary aim of the trial was to investigate technical solutions for the operational performance and organisational management of the Stops process. The force had spent over £500,000 developing and implementing a stops database, but it was bottlenecked by the need for paper stop receipts to be collected, transcribed and entered into the system. It could take a number of weeks for the force to have sufficient data to analysis the racial distribution of Stops against the geographical location and take corrective action at the operational level. Furthermore, the power to Stop and Search was seen as a useful operational tool for supporting local community policing[xxi] priorities such as reducing street crime or anti-social behaviour and also for providing data about the effectiveness of police actions on the ground. Data was needed from this system to answer the question, "are we stopping enough people and are we stopping enough of the right people?' The use of an electronic stops application was seen as an important step in solving both of those problems, with the stop information being transmitted directed to the database for analysis (for crime management purposes) and auditing (for monitoring of the ethnic breakdown of stops). It was also envisaged that that the trial would provide more general

indicators, experiences and lessons about the use of mobile devices and how their use would support the evolving information systems infrastructure in the organisation and the need for better management of information. In particular the organisation was interested to know, if the widespread use of personal mobile data terminals would alter how and where an officer spent his time on duty.

One of the perennial concerns of policing and a constant source of tension between officers, management and the general public is the ratio of time spent in the station to time spent upon the streets[xxii]. The rise of community policing meant that it was both politically and operationally important to extend the time that officers spent outside of the stations. Mobile data and the ability for officers to access and send information as they performed their duties was seen as one way that officers could be compelled to spend more of their own time out of the station. If an officer could complete a form on a mobile device rather than by returning to the station and transferring the information from his notebook, that would help to fulfil a number of objectives. Not only would it reduce the time between data collection and entry (and therefore the availability of information to other resources) but it should also have an impact on the amount of time per shift that the officer was visible to the community.

5.2.2 Technology selected for the trial

The majority of requests for information from officers occur in public spaces or private homes away from a vehicle equipped with a MDT. Related to this, many officers will make use of bicycles or be on foot patrol. On this basis, it was decided that device selection in the trial implementation would be limited to those that an officer could carry on his person without causing any hindrance to his movements or to the performance of his duties and his personal safety. This meant that the device had to be self-contained and able to survive in a number of different urban environments and weather conditions. Furthermore, it was considered essential that the device was capable of continuous usage during a standard shift or tour of duty - a time period of around twelve hours. Using these criteria, a ruggedised Personal Digital Terminal (Henceforth PDT) was selected as the most practical compromise between size, performance and reliability. After evaluating a

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number of devices, the force selected the Panasonic PF1, a device that was being used by other UK forces and mobile workforces such as traffic wardens.
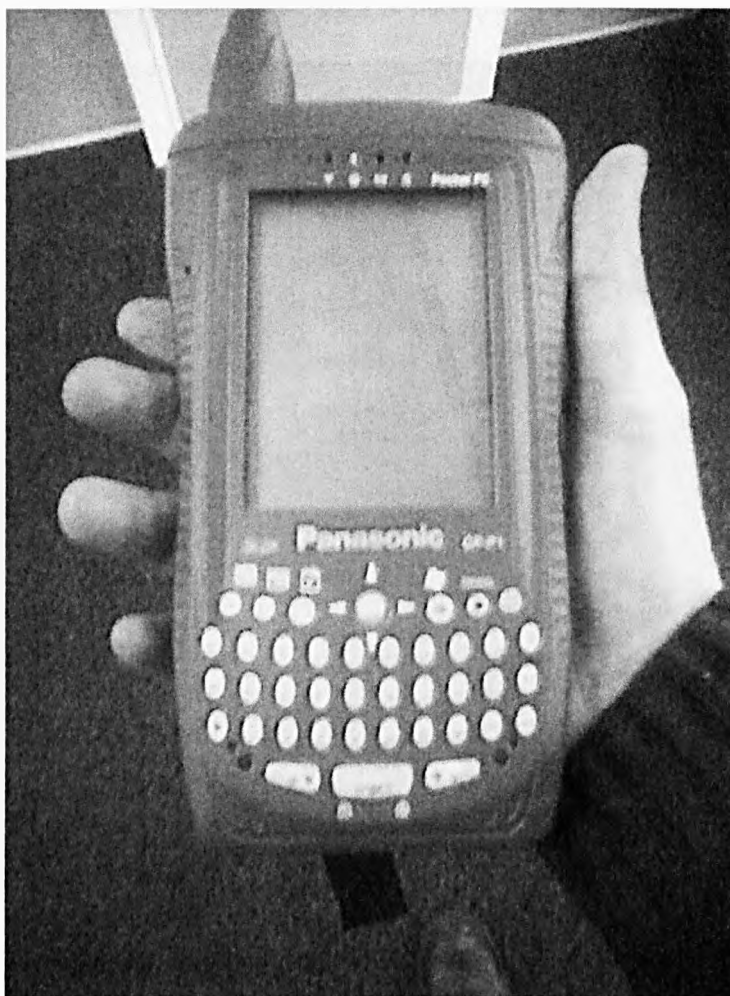
Figure 15: PDT selected for the trial implementation

When using the PDT, the officers were provided with a number of different methods for entering information into the device. On the front of the device, there was a small QWERTY keyboard which the user could enter data using their thumbs. Furthermore, the PDT had a small stylus which allowed for data entry via handwriting recognition software or by the use of a virtual keyboard that could be displayed on the screen of the device. To allow for the rapid input of data, applications also made use of pull-down menus and tick-buttons to allow officers to quickly complete repetitive forms. The PDTs were provided

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with a small laser printer that received information from the device via shortwave radio transmission. The printer allowed the officer to print, for the stopped member of public, a record of the encounter with all of the legally required information.

Figure 16: The PDT with printer and carrying harness

To carry the equipment, the officers were provided with a harness that was to be worn over the top of their protective stab vests but under any larger coat. The harness had straps which attached to the officers belt to prevent any vigorous movement of the equipment and pockets for the PDT and printer that sat parallel to the officer's body.

Figure 17: The PDT in harness being worn by the researcher

5.2.3 Software applications selected for the trial

In addition to the electronic Stop and Search application, the devices were supplied to the officers with a number of other services and applications. Foremost amongst these was the ability for the officer to directly query the Police National Computer (PNC) to check for records on individuals or vehicles. Indeed the provision of PNC was a vital component allowing officers to perform the Stop and Search task in a totally autonomous fashion, as they entered the particulars of an individual in the Stops application, they could link that information with the PNC application and use it to query the system. As well as those providing those policing specific applications, the project team allowed the officers to make use of the personal information management (PIM) applications that were provided by the windows CE operating system. Those included calendar, address book, tasks and

the ability to send and receive email. Any changes on the devices were replicated on the officer's desktop environment.
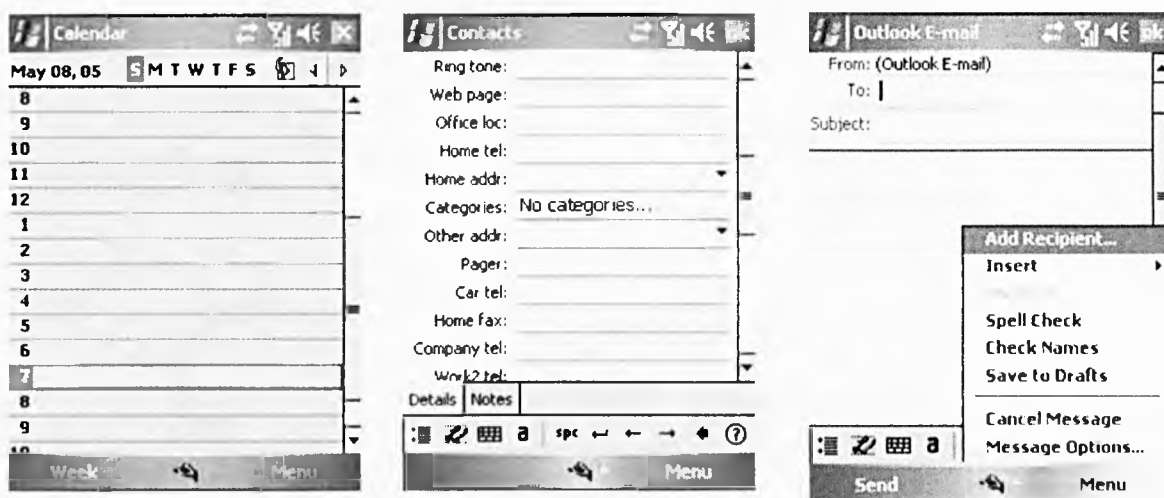
Figure 18: Indicative examples of PDT interface for Personal Information Management applications.

The project team expected that the use of the PIM applications would only occur in times and spaces, public or otherwise, where the officer was not directly interacting with members of the public or where they perceived there not to be a risk to their safety. How an officer interacts with members of the public is influenced by a number of factors such as location[xxiii], experience of the officer, number of individuals being dealt with, number of police officers present. There is also an unspoken, constantly changing, undercurrent that informs the officers' actions and frames the interaction – 'am I safe and is this person a danger to me?' [xxiv]

5.2.4 Changes to the Stop and Search process

The intended differences between the paper based process and the handheld process, *as intended by the project team*, are summarised below. The comparison of the two and identifiable sub-tasks are considered in detail in Chapter 6.

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The original process
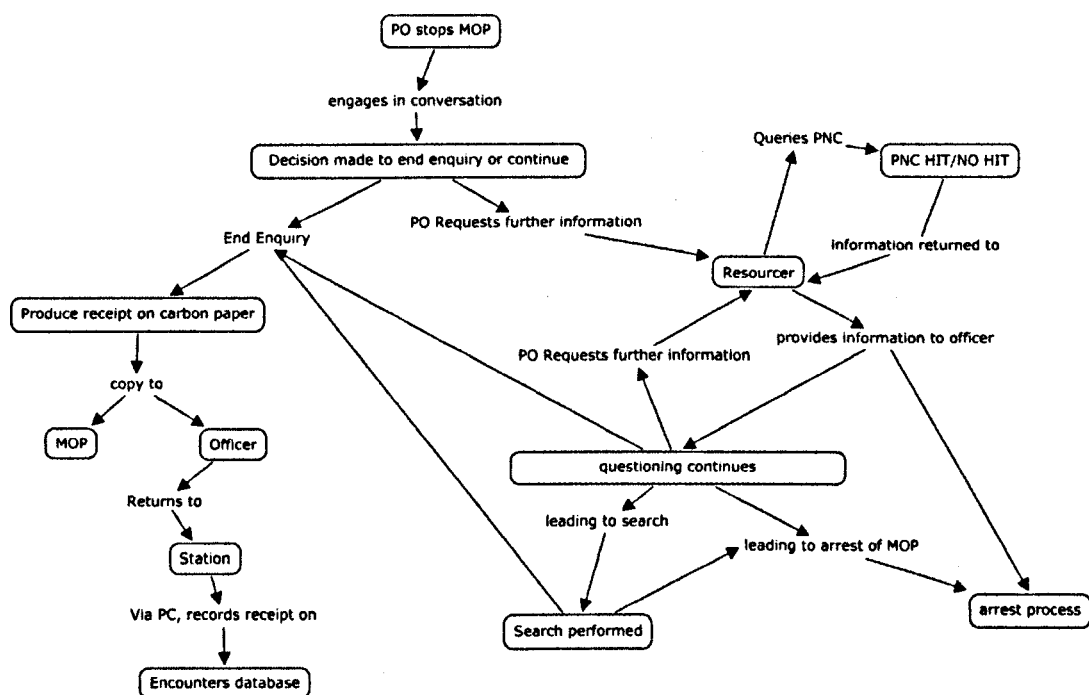
Figure 19: The Stop and Search process when performed via the radio

The Stop or stop and Search would be initiated by an officer approaching a member of the public[xxv]. The officer would introduce themselves, greet the citizen and then try to establish if there are grounds for the Stop to proceed or for it to be escalated to include a search.[xxvi] As the conversation progresses, the officer will use his radio to contact the CNC and ask for confirmation of identity and/or any criminal records. This will be done through short bursts of information to the call handler such as the name, the address, and the date of birth of the stopped individual. While the officer waits for the call handler to query the system, they will continue to question the member of public about their activities and actions. Then, using the information provided by the call handler, the officer will either terminate or continue the interaction. If the result shows that the individual is already wanted for an offence, then the officer will arrest the individual and take them to the station for processing. If no action needs to be taken, the officer will thank the stopped individual for their co-operation and offer to provide them with a record outlining the

reason for the Stop and other relevant information. The citizen is not required to wait for this record to be completed and can leave before it is provided.

During the encounter, the officer will, as a matter of routine, take notation in their pocket book[xxvii]. First and foremost, the information is used for the officer to complete the more detailed receipt of the Stop that must completed and processed, in addition, a policeman's notebook has evidential value in any criminal case. Finally the officer would also evaluate the encounter in terms of its value to the force's intelligence gathering policies. After a careful review, the officer would complete an intelligence form noting new associates, vehicles or behaviours and this will be passed onto the BCU intelligence team[xxviii]. In turn, the intelligent team will assess and grade the information provided and add it to the force intelligence system for dissemination. This information generated by the Stop will be analysed against local tactical priorities to see if the stops 1) targeted offenders and offences, 2) identified hotspots or areas of concern. This information is then used in the planning process to generate alternative strategies to meet local targets on reducing crime and anti-social behaviour (Home Office 2005). Once they have returned to the station, the officers will then use their receipt of the transaction to complete an electronic copy of the form on the stops database. If they have not completed a receipt of the transaction at the scene, many officers use their notebooks to collect the required information, they will complete that first and then copy the information on to the system.

The changed process

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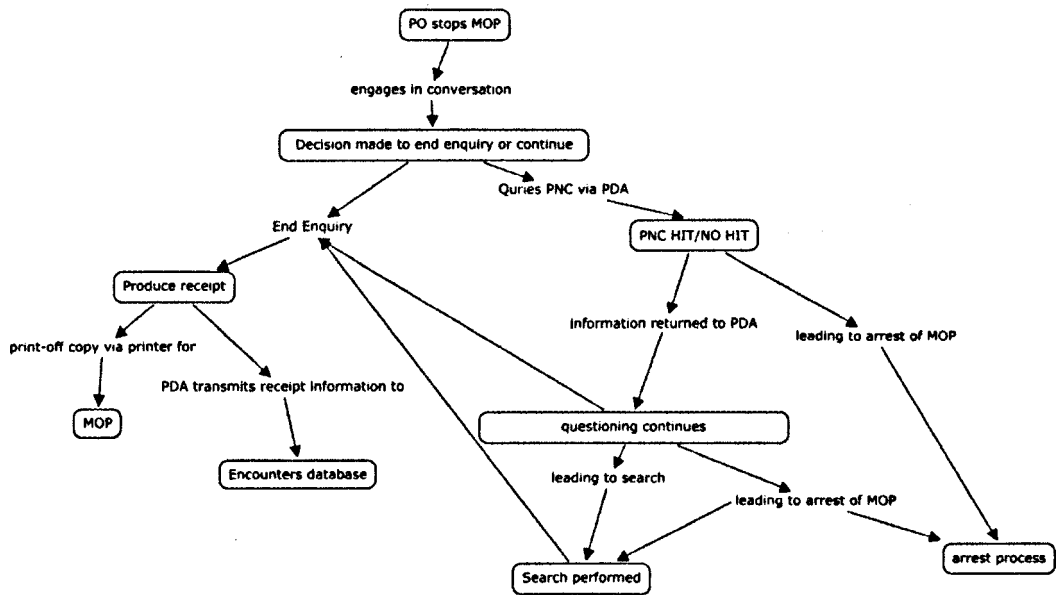
Figure 20: The Stop and Search process when performed via the PDT

As can be seen from a comparison of the diagrams, the most obvious change is to the role of the call handler as an information intermediary. Now the officer formulates his own search strategies and queries to submit directly to the PNC. In addition, the removal of the call handler eliminates another process not indicated on the diagram. In actuality, a call handler will not only obtain results from the PNC but will also act as a filter, providing their own interpretation of the results are and most likely information to correspond to the individual being interviewed by the officer. In turn, this might lead to more detailed questioning of the suspect and further conversations between the officer and the call handler to further narrow or expand the results. In the wider context of using the PNC, the quality of the filtering process is a combination of the experience of the call handler, their skill with the PNC and their ability to communicate information effectively. Lastly, the duplication that is required in terms of completing forms is eliminated. The officer enters the information in the stops application and that provides the basis for the receipt for the officer, a record (via print-off) for the member of public and automatic entry to the centrally held stops database.

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5.3 The experience of the officers on the trial

5.3.1 The groups involved in the trail

The PDTs were given to a cohort of 90 officers, 70 within one BCU in an inner city urban area[xxix]. The other 20 officers were officers who were dispersed geographically across the force's area and making use of local Police Stations as required by their duties and operational activities. The majority of their time is spent on or around the network of trains, buses and public transport services that cover the force's area. All of the officers selected for the trial were intervention or 'beat' officers euphemistically known to the public as a 'beat bobby'. Those officers are considered the frontline of policing and are used to provide to the first response to any emergency or call for attention from members of the public. The nature of their role means that their daily interaction with the public is high and they are also the operational role that conducts the majority of Stop and Searches. Both of these factors were key influences on the project team as it was felt that this grouping provide the project team with sufficient data to assess the relevant successes or failures of the trial. Ten of the officers at the inner city urban BCU, while nominally intervention officers were members of a 'pro-active'[xxx] team targeting low-level crime[xxxi], this type of team is one that targets known criminals and areas of criminality. As Officer 6 noted, their role was to 'disrupt the offenders and the offences'. The officers covered the range of hierarchical operational ranks (from constable to sergeant to Inspector), experience and job roles. The information technology experience and expertise was self-reported by officers as ranged from active users to those who made minimal use of IS facilities[xxxii]. Officers attended a day-long training course on both the use of the PDT and the printer. Issues covered included basic maintenance of the devices, methods of data-entry, security issues and comprehension of outputs from applications. The training material and courses were provided by the MPS but with input from a third party training provider who concentrated on the generic aspects of using a PDT type device rather than any police-centric functions. The project team decided that officers should complete a daily comment form that recorded a range of quantitative and qualitative data. This ranged from questions about battery life, signal strength, speed of applications

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(quantitative), to areas such as public reaction, attitudes of other officers and their feels about the ergonomics of the devices (qualitative).

Approximately 15 units were issued in December to allow technical problems to be identified and resolved, the rest were issued to officers in stages during early January 2004. The trial officially concluded on April 30th 2004 after running for a period of four months.

5.3.2 The Trial

In the inner city unban BCU in the time preceding the official start of the trial; the interest of officers selected for the trail was further heightened by the provision of a specialist area for the charging and storing the PDTs and printers. The geographically dispersed officers on the trial made use of their lockers for storage.

Figure 21: The storage room used for charging the devices at the main trial site

When discussing the potential of the devices, of interest to the officers was not the ability to perform stops electronically, but the facility to directly access the Police National Computer and bypass the call handlers when performing checks on individuals or vehicles. While officers were broadly supportive of the role and actions of call handlers this was tempered by a perception that the quality of the staff was highly variable. Officer 7 noted that 'the standard of staff in calls centres is very low, they are useless. I trust the PDT more than some, not all, members of staff in call centres'. As he described it, 'cutting out the middle man' would be positive because,

> I can see it [the device] so I can make a decision on what I see up in front of me, as opposed to relying on that person in the control room and the information that comes up on their screens. Yes they might be telling me what's on that screen but I've had incidents of where people have told me what's on their screen and I have made decisions based on that and they have been wrong.

This was an observation shared by others on the trial; officer 16 posited that

> 'Some members of staff do not retrieve the correct information because they do not have enough training or they are not up to it, they are not up to passing on information in a clear and concise way to allow the officer to make a decision or they have given me the wrong details.'

Other officers were not as positive about the introduction of the PDTs and were concerned that they were another sign of the changing nature of policing and a mechanism for controlling their actions. Relating it to his everyday activities, Officer 3 noted that the nature of policing had changed and that 'It's a lot more accountable so it's a lot more grief. You have to account for everything you've done. A lot of them sit in the car and pretend they don't see anyone'. An immediate problem was encountered when the majority of the officers decided that the provided carrying harnesses were uncomfortable over their existing equipment belts and protective vests. Officer 1 observed that 'I'm sure there has been a risk assessment done on it and it should be in this harness, however it is the most ridiculous thing ever. I feel like a glorified Tesco's shelf-checker.' The majority of officers, from the start of the trial, decided to use their coat pockets to store the device and printers.

In the first week of operational usage and onwards throughout the life of the trial, many officers found that inexplicable software or hardware problems plagued the devices. Technical support was available for repair and support but this was only provided between 9am and 5pm, Monday to Friday. The twenty-four hour nature of policing meant that this caused considerable frustration for the officers. 6 PC PA M noted that 'If the system goes down on a Friday afternoon, you're dead in the water until at least Monday because there is nothing over the weekend.' In addition, officer 1 recalling his experience of the support services noted that:

> It took about two to three days, because the people I spoke to, had to go and investigate what I was talking about, they didn't seem to be aware, what was wrong with me [Laughts]. So they eventually managed to get it sorted and that was fine. Somebody did ring me and sorted it out for me eventually. But again it was teething problems, I can understand that. I doubt it would be a long-term problem. It may just be that that was the initial problem. However, the next time we took it out, it wouldn't connect and it said the network was unavailable.

Others felt that the support process was convoluted and did not meet the needs of operational officers, Officer 18 explained that

> It took them a week to sort it out. Because when I rung them I up I told them it was my fault I said look, and they said "oh, you have to send an e-mail to these people here" and it took them twice to ring me back and the bloke did not know what he was doing and he said 'It say's on here I've got to give you this code number you then give me another code number to put into this, it's that simple' but he said you have got to send us an e-mail. It took weeks.'

The officers also had ongoing concerns with the convoluted process of accessing the device and the secure services it offered. This officer had to:

- Log on to the device using a password, if the device was inactive for three minutes the user was logged-off;
- Log on to the radio connection, using a separate password, allowing the users to be logged on to the network for 30 minute;
- Access to PNC was via a third password that allowed access for a 45-minute period.

Officer 3 commented that:

> [Demonstrates with device] It's like playing a game of dominos, Once you've logged on to that you've then got to log on to the satellite, and then it takes 10

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> seconds to 2 minutes to log on to satellites. Then it tells you its connected then you have to log on to firewall and the secure network and it tells you it is secure, then you have to log on to the PNC. It's a nightmare.

This problem and the officers' irritation should be seen in the wider problem of information overload regarding security provisions. Officers routinely have nine or ten separate passwords that provide access to various services. As with the device used in the trial, the passwords must be changed on a regular basic. This complex maze of security issues has led many officers to write down all of the passwords in pocketbooks or on pieces of paper. Talking about the same issues, Officer 6 outlined their views on the security problems and the impact on using the device for a stop, stated that 'if it's a long name check, it could take twenty minutes to set the damn thing up. It takes at least ten minutes, at least.'

Officer 7 noted that:

> It is time consuming and can a little bit frustrating. So therefore I'm afraid to say I will get frustrated with it and get back to the radio which even on its own I'm sure its been explained to you we have a lot of problems with the radios because of the traffic, crap operators [call handlers] etc.

The different timing of the passwords meant that officers would try and access PNC but find that the radio connection had terminated, meaning that officers were required to exit the application and attempt a re-connection. For an officer trying to deal with a belligerent suspect in less than optimum conditions (darkness, rain etc.) this also increased the risk due to the level of focus on the devices – 'You're very engrossed in it and your not concentrating on what (is going on around you) but I can certainly see the idea of security risks with all the different passwords.' Even when the application worked perfectly, the officers were divided over the project team's claims that it would speed up the process of performing a stop:

> 'It is meant to cut down stop times by half. It's complete and utter nonsense. It triples it. Yes because you have got put it in and you had to click that page, if you mess up you have to go back, and then you have to print. The thing about the time is nonsense. It's too time consuming. (Officer 3)'

Similarly, Officer 7 when commenting on the speed of the device for checking individuals noted that, 'I want the check done, I want the Stop slip done quickly therefore I can speak

to that person face to face I'm not concentrating on something else. So therefore a) I'm not going to facing an officer safety.'

Another issue raised by the officers on the trial was the impact of the stop application on the granularity of the information they were collecting and therefore diminishing the potential for accurate and useful 'intelligence':

> The Stop and Search, I do not know if I am using it correctly but when we do clothing details you can get away with saying 'it was a black jacket' but when you actually hand write it, well when I do, you would say it was a 'black Lacoste jacket with a white stripe and a rip in the collar'. So you can be very detailed in what you say about something, where as with that I find it easier to say very basic details as the typing takes time. It takes time to say where the brand is or where the rip is on the collar and stuff. It takes time (Officer 2).

Other officers disagreed with this perception and felt that the device simply changed how information was captured rather than the level of detail. Officer 4 talking about his note-taking habits commented that

> I would not say that is the case, not for me anyway. I think you abbreviate it more than when you are doing it by hand, jointed up writing, it does flow a bit better, But when you are doing it on a keyboard, shorthand more to a certain degree, unlike when you are writing when it tends to flow better.

These problems were focused upon by officers in their feedback to the project team as critical in limiting the situation and contexts under which they would use the devices. They considered the usefulness of the device to be outweighed by the usability problems that they experienced in trying to access functions. The officers reported that the use of the device to complete a stop form or to perform a PNC check on an individual encouraged 'Tunnel vision' (officer 8) and that 'You're very engrossed in it and you're not concentrating on what is going on around you' (officer 19). Expanding on this, officer 2 outlined a typical day:

> 'In my work we may do ten stops but that may be over an eight or twelve-hour period so it depends on what you're doing and you can't, it's very dangerous to use it if you are with two people. It cannot be done with two people because the idea of when you stop someone is that two people stop someone and one person deals with them and the other person is looking at the other two so you must have three people to use this because you're... fixed on this, you're not looking at what the other person is doing.'

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Officer 8 also noted a change in their own behaviour when using the PDT and commented 'when I'm using it (and every individual officer is different) I will look up occasionally but if I was dealing without the PDT I would be focusing on them all the time, because I'd be on the radio.' Officer 7 also commented on this change in focus: 'you can feel yourself getting very involved into putting the information into the PDT.' In relation to this change, officer 2 argued that the use of the device increased the number of officers needed for a stops interaction and that:

> ...with this [PDT] you must have three, because the person using the machine is not looking at the person or what is happening around you. You are very fixed on that. One to use the machine, one to deal with the person, one to cover the other two. It is called covering officers, that what we called it.

The perception that officer safety was compromised by the devices became a common theme amongst the officers on the trial. Officer 9 noted that 'usually when you stop people it's not usually one it two or three at a time and so your always covering the other officer. When you're stopping a group of people you need to have critical vision around everyone, not just one officer looking at you.' Tied to this, Officer 4 noted that such concerns had led them to revert to doing checks via the call handlers, 'I prefer to do it in that respect [over the radio], to keep my eyes, because of the officer safety issue.' Similarly, Officer 7 commented that:

> ...because it draws you in, where as if you were writing it, it doesn't draw you in as much. Because the officers are concentrating on getting the right thing in the right box, so you lose focus. With a pencil, I can scrawl but still keep the eye on someone but I will still have all the details.

These issues of engrossment and tunnel vision and the associated fears about safety were amplified by other concerns about how the increased time need for checks could alter the tone of the interactions.Describing a tense encounter, Officer 6 notes that:

> Yeah the worst one was twenty minutes wasn't it? [colleague agrees] and it logged out halfway through and of course when your doing it on this [PDT] you can't be writing in your pocket book as well so you have all the information on this [PDT] if it logs you out you have to go back into the firewall and log back in again, and the PNC as well and your like 'Sorry mate what's your name again?'

We're not name checking some old lady on the street we're name checking people like burglars and all we're getting is, excuse my language 'I've just given you my fucking name' and we've had that a couple of times.

Officer 2 describing an encounter recounted that:

When you have someone who is very anti-police with you, em... the last thing you want to do is wait for five minutes. You want to get it done as soon as you can because of officer safety issues and the fact that it is making them more angry because you're sitting there or standing there and you're keeping them longer[xxxiii] than they want to be kept for.

Describing a similar situation, Officer 6 noted that the possible drop-out of reception increased the level of tension:

Yeah and that's when you have a good connection but most of the time your 'Sorry about this mate wait a minute', if the name check takes any more than four minutes it automatically shuts you off and you have to go back and start it again. We were with this bloke for fifteen minutes and I had to say to him again, and you haven't the faintest and it's getting tense 'sorry mate can I take your details?

Officer 5 outlined a situation where focus on inputting the correct information into the Stop application had resulted in a dramatic outcome when dealing with two individuals that had been stopped with a colleague –

My colleague is saying can you come over here and I'm like 'Hang on a second'. And then I hear "oh mate, wait!" and then "oh fuck!" and he's [the second individual] off.

Linking the use of the devices back to the issues of the harnesses 6 PC PA F commented that when situations became confrontation, that 'I'm stood there looking like a tool because there is nothing I can do. They haven't even... the simplest, simplest thing; put a belt clip on it. Because you can't wear your harness.', while others noted that '...if you have to run after someone which you invariably have to, I have to you have to try and put this piece of equipment back in here as you do it... it just ridiculous' (officer 16)

Officers also felt that the devices were problematic when they were paired with young, inexperienced officers,

'It a big issue, I mean there are some officers who are training this who are new in the job and because of that there not as proactive anymore. They spend their time talking to people, where you can have a lot of rough ones and they want to hang back. The way I put it is that they are apprehensive against confrontations against people in the street and you have to have confrontations to do your job. When you have confrontations you can't have these handheld things in your hand. (Officer 9)

Some officers' usage of the devices remained high but further investigation indicated that this pattern of behaviour was related to their access to a vehicle. Officer 4 noted that the advantage was that '...you don't have to carry [the device] around with you really, there are the facilities for carrying it around with you if you want, but I just put it in the glove box and leave it at that.' The lack of physical link between the device and the printer was cited by the officers as another advantage of car usage. The device could be used near the car without the need to carry the printer. Officers who did not have access to vehicles also commented on how that would be their preferred usage scenario. Officer 6 commented that:

I mean this kind of thing would be brilliant in cars. You would have it loaded up and you get the person sat in the back seat you could do it in the car, brilliant. It's hugely impractical when you're getting out of cars it's just, if it was quicker it would be fine but it's not.

These comments were echoed by other officers, Officer 3 remarked that

If I was, to be, honest if I was on foot patrol I wouldn't take it with me because you have got nowhere to keep it. If you have got it in a vehicle then it's handy or if you are going to be near a vehicle it's handy that way but I certainly would not use it on a foot patrol.

As the trial progressed and the project team were able to collate and analyse a critical mass of information and metrics from the PDTs, and it became clear that clusters of Stops were being performed by, or at least assigned on the system to, officers who were not participants on the trial. This led to concern that officers who had not been properly trained for the devices were making use of them on an ad-hoc basis. A more detailed analysis of the Stops database highlighted some common factors of those clusters which were noted with further analysis; first, the majority of these types of stops were being performed by people who were on the pro-active crime teams or officers working in

teams and, secondly, a significant number of the procedures were being conducted near or in transport hubs such as bus or railway stations. Officer 7 commented that in a situation where they had been making stops at a bus station that 'I've done it while a colleague is talking to the person I'm putting the information in for the stop slip but it's them that is doing the searching, well, it's like a conveyor belt or maybe a ticket office, where people wait their turn to be checked'. Similarly, the officers from the second site also described situations where this type of behaviour has occurred. In a series of Stops where the officers had been working at as a group at a train station, Officer 18 noted that:

> So we are stopping a huge amount of people every day, we're stopping 20-23 and searching them. I've done it while a colleague is talking to the person I'm putting the information in for the stop slip but it's them that is doing the searching. They either bring them past me or I walked around doing the checks as needed.

Another officer notes that the use of the devices in times were particular useful when they had access to a police van as they were able to process individuals they had arrested and were handcuffed in the back. At peak time, this allowed them to do this without having to use the radio channel.

5.3.3 Conclusion of the trial

By the end of the trial, the problems raised by issues of engrossment, officer safety and the long gaps between uses caused by faults, created a sense of disconnection between the trial and officers every-day policing activities. The use of the devices started to decline[xxxiv] and by the end of the trial, less than a third of the officers were using the devices on a regular basis, with the majority ceasing to use the device by the half-way point of the trial. As Officer 10 noted that 'to begin I was using it loads, but I don't use it that much lately partly because it's not working, I wanted to show commitment[xxxv] to the project but it was hard with all of the problems'. At the end of the trial, the devices were redrawn from general service, with a small number remaining in use to allow for further research and data collection to occur at a later date.

vii Section 1(2) of the Police and Crime Evidence Act (1984) states that: A constable may (a) search (i) any person or vehicle; (ii) anything which is in or on a vehicle, for stolen or prohibited articles; and (b) may detail a person or vehicle for the purpose of such a search. To do so the officer has to have 'reasonable grounds for suspecting' that they will find stolen articles under s.139 of the Criminal Justice Act 1988. These powers were extended further by the Criminal Justice Act 2003 to allow officers to search persons for items that might be or were intended for, criminal damage.

viii A Basic Command Unit is the lowest geographical level within a police force which can co-ordinate a 24 hour service to the public. These were previously referred to as "divisions" and many officers and indeed force documents will describe them as such – see National Criminal Intelligence Service (Stop and Search Action Team 2005).

ix Protective services are defined by the police National Intelligence Model as 'Level 1 – local criminality that can be managed within a Basic Command Unit (BCU), Level 2 – cross border issues, usually of organised criminals, major incident affecting more than one BCU, Level 3 – Serious crime, terrorism operating at a national or international level' (Waddington et al. 2003, p.891).

x Waddington et al (Her Majesty's Inspectorate of Constabulary 2007, p.30) argue that 'it should be recognised that the issue of stop and search played no more than a peripheral part of the MacPherson inquiry' and that the 'inquiry relied on crude national statistics' (p.890). In spite of this, the investigation created the perception of a problem that had to be seen to be dealt with.

xi The tension between the control of operational police officers by management and their ability to use their discretion has been much discussed within criminology literature – see Rowe (Dorset Police Authority 2005, p.3). Management use of IT to curtail this discretion by making them follow set auditable procedures has also been a recurring theme in the police/criminology literature, see Chan (Her Majesty's Inspectorate of Constabulary 2007, p.15) and Allinson (Bichard 2004, p.15).

xii Disproportionality is calculated by examining the number of Stop and Searches performed, broken down by ethnicity, and comparing those to the census figures on the resident population (Norman & Allen 2005).

xiii Audits which in themselves may not fully represent the problem, 'it is quintessentially a 'low visibility decision, immune to effective accountability mechanisms, for if, officers do not record stops, then they are unlikely to come to light' (Her Majesty's Inspectorate of Constabulary 2007).

xiv 'The two most important technological enablers for incident management are the command and control system – to aid incident logging, grading and resource allocation – and the radio.' (2008).

xv 'The Police Service currently receives 69 million calls each year, of which 11 million are 999 calls. Combined, they generate in excess of 33 million incident logs' (ibid, p. 90).

xvi Using Dorset Police Force as an exemplar of process, the police authority site notes that 'all first contact is recorded on call taking (+CT) & incident logs and electronic crime reports. Where

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incidents are not dealt with during the tour of duty [a working shift] of the control room software allows them to be monitored whilst awaiting action (+AWA).For example crime recording decisions must take place within 72 hours, non-crime incidents must be placed on electronic 'For Action' folders (+DFA) within 4 days to ensure accountability and an audit trail' (2003).

[xvii] 'Police forces currently deal with around 33 million incidents per year. Of these, on average 17 per cent are classified as emergencies requiring an 'immediate' response and another 20 per cent as requiring a 'priority' response – ie within one hour. A further 31 per cent receive a scheduled response – that is, where the police and the caller agree that the police will attend at a mutually agreeable time – some 25 per cent are resolved without deploying officers and 7 per cent are referred to other agencies.' (2001).

[xviii] The Police National Computer is a national system 'accessible to all police forces and gives details about an offender's criminal record, including information about his modus operandi, (that is, his way of operating), associates and aliases' (2008).

[xix] In additional to national systems such as the PNC, forces over time have developed and maintained locally held databases of information or 'intelligence'. Central to these are a 'Criminal Intelligence System' which is 'structured around and could be searched against the names of Individuals. It held information about people who came to the attention of the police in connection with criminal activity or alleged criminal activity' (ibid, p. 15).

[xx] A mobile data terminal is a fixed in-vehicle computer that provides police officers with the ability to share and receive information, such as their status, with and from the command centre. They also offer additional services such as access to the address databases and electronic mapping. Through the use of the Global Positioning System (GPS), these terminals also allow the control room staff to see the location and availability of all police response vehicles at any time.

[xxi] Community policing is a form of policing that places an emphasis on building social cohesion with communities via local partnerships with stakeholders on matters such as crime and disorder, see Wilson and Zhao (Areh et al. 2007). Its use is also seen as a mechanism for providing legitimacy for policing by the building of positive relations as noted in Hawdon et al. (2004).

[xxii] *Diary of a police officer* (2003) is considered one of most significant documents for raising the awareness of officer activities and providing an impetus for change. This home office commissioned study found that 'In total, 57% of officers' time was spent outside the station; 56% in the community (1% was with other criminal justice agencies). 66% of time was spent outside the station on night shift which compares to only 50% on early shift. Three-quarters of officers available are outside the station for only four hours in the day. For five hours a day over 50% of the shift are in the police station (p. 23).

[xxiii] Crawford and Burn (2006) note in a study of the interaction of time and space and the use of force by police officers that 'This concern for safety resulted in a change of tactics and the view that some practices are appropriate for a given area based on how the location was defined by the officers' (p. 14).

[xxiv] 'On any given day, police officers are asked to perform a wide range of tasks that often expose them to dangerous persons and unpredictable situations. Though the vast majority of police

encounters with the public are peaceful, some incidents result in officers being assaulted or even injured' (Verfaillie & Vander Beken 2008) .

[xxv] An officer needs to have reasonable suspicion to Stop a member of the public under the various acts of parliament mentioned in this case study, it must be based upon an objective reason such as accurate and current information on an area or situation or if an officer 'encounters someone on the street at night who is obviously trying to hide something, the officer may (depending on the other surrounding circumstances) base such suspicion on the fact that this kind of behaviour is often linked to stolen or prohibited articles being carried' (Stop and Search Action Team 2005, p.8).

[xxvi] Officers are taught a number of techniques to assist in their interpersonal communications with the public, the most common of those is known as verbal judo. The aim is to ensure that the encounter is trouble free and while the officer collects the information they require, the member of public feels that they have been treated fairly (Waddington 2001).

[xxvii] The police pocket or note book is an accepted form of evidence in criminal proceedings and the information within is often the canonical narrative of the trajectory of an event. Great importance is placed on the officer capturing the nature of the interaction either immediately or as soon as is practical and using standard forms of notations. See Allinson (1982) for an account of an attempt to produce an electronic notebook that has many parallels with this case study.

[xxviii] Ratcliffe (Hinkle & Weisburd 2008) defines intelligence-led (or drive) policing as being fundamentally an information organising process and "...the application of criminal intelligence analysis as an objective decision-making tool in order to facilitate crime reduction and prevention through effective policing and external partnership projects drawn from an evidential base". Also see Maguire and John (2008) which similarly argues that intelligence led policing is focused around the identification and analysis of persistent problems. In essence, it is future-oriented rather than reactive (Barton 2003, p.350). In turn, the Home Office defines intelligence as 'the result of gathering and collating of information from a variety of sources to assist police officers in the prevention, reduction and detection of crime and other incidents (2002, p.182). In this context, the Stops process is seen as an important tool for both collecting information about an area and tackling local crime problems.

[xxix] A technical trial of hardware and software was conducted, in the previous year, at the same geographic location over a time period of two months with six officers. The aim of the POC was to provide data about the physical robustness of the devices selected and the ability for the devices to make a reliable and secure connection with the telecommunications network and the network connections in adverse conditions, no information usage or changes to patterns of behaviour from the user community was collected.

[xxx] Ponsaers (2007) argues that the descriptions of policing models and associated activities are a 'terminological mess' (p. 470), a line of thought that matches the research experience in this case. Therefore, the description of officers of their roles and the terms they use to describe their roles such as 'pro-active', 'intelligence led' often does not match the official definitions. As this case study is based around the operational activities of the officers their descriptions take primacy in the narrative presented here.

[xxxi] This use of this method is based upon the 'broken windows' theory of policing as proposed in Wilson and Kelling (Sheeran et al. 2003; Skolnick & Fyfe 1993; Waddington 1999; Wilson 2000; Reuss-Ianni 1993; Culnan 1985), which suggests that by targeting minor offensives and offenders, that the fear of crime in an area decreases and eventually the overall levels of crime will decrease. While the theory is disputed within the academic literature, it is an accepted 'effective' part of the modern strategy management of crime and disorder (Crawford & Burns 2008; Ericson & Haggerty 1997b; Flin et al. 2007; Hawdon et al. 2003; Manning 2003).

[xxxii] It is interesting to note that while the self-assessed technical expertise of officers varied greatly, as outlined in the literature review, that their ability to effectively access and assimilate information as an aspect of basis competence is undisputed in the literature see Berg et al. (Waddington 1999).

[xxxiv] 'Police officers exist within a particular social subsystem where they learn from one another's work habits, strengths, weaknesses and preferences. Loyalty and solidarity provide the cultural foundations for the social identity of the police as they interact with other social groups' (Flin et al. 2007).

[xxxv] 'To confirm and secure a reputation as a 'good police officer', there is a need to demonstrate commitment, both in terms of time (long hours, availability) and space (visibility, unquestioning identification with the organisation). Having a 'good reputation' is seen as essential for effective day-to-day policing as well as career progression' (2007).

Chapter 6 – The Stop and Search Task

6.1 Introduction

The previous chapter provided a descriptive case study and that considered the organisation, people, process and objects involved in the change process. In this chapter, the failure of the change is analysed and the Stop and Search work task is broken down into sub-tasks and it is explored in terms of the four different elements that make it up. The role of intermediation in the existing process is investigated, along with the changes to this process by the introduction of the hand held devices.

6.2 The aims of the trial

At the operational level, that of the trial participants/uniformed officer, the trial introduced two changes to the Stop and Search work task. First the officers were to use electronic versions of the Stop and Search form on the Personal Digital Terminals (Henceforth PDTs) to capture information about the reason for, and outcome of, the work task, along with personal and ethnic identity data about the individual being questioned. In addition, the officers were to use the PDTs to directly query police information systems for the purposes of the identification of any stopped individual and to establish if they had a criminal record. It was hoped by the project team and their organisational sponsors that direct remote access to the Police National Computer (Henceforth PNC) and other key databases would produce a small but measurable downward shift in demand for routine enquiries using existing telephony methods of communication. In turn, this would allow suppressed demand for longer more complex information enquiries to be better managed by the organisation's call-handing and incident management processes. If successful, the user experience, and qualitative and quantitative data from this trial would be used to re-engineer other common police work tasks, to capitalise on, and expand, organisational information resources and capabilities.

That the trial failed in its explicit objective of providing an acceptable alternative path for the officers to perform the specific elements of the Stop and Search process is clear and unambiguous. Observations, interviews, organisational documentation and the data collected by the researcher and the project team were conclusive; only sporadic patterns of usages by the officers were measured during the trial. The statistical data collected via project team questionnaires, research team questionnaires and analysis of the sign-out sheet[7] indicated that the chosen interface tool[xxxvi] for the project, the PDT, did not change practice and most officers on the trial reverted back to traditional ways of working – the extensive use of paper for note-taking and information gathering, and frequent verbal contact with the call-handlers via their traditional interface of personal issue radios. It is clear from direct questioning and observation, that for many officers, the technology did not disrupt existing routines or provide any challenge to the status quo beyond providing a momentary distraction that was quickly placed back in a storage room and forgotten about.

6.3 The relationship between the technical issues raised by officers and cultural concerns

Across the duration of the trial, officers identified a number of technical issues related to the PDT and associated peripherals that inhibited adoption of the devices and the changed Stop and Search work task; those included difficulties with harnesses provided for the devices, the laborious password system employed, and numerous disconnection problems when trying to access organisational information systems. The range of technical issues were discussed in the descriptive case study (Chapter 5) and are not therefore explored again here in any detail; this is not a study of technology, the problems are therefore treated as hygiene issues associated with the specific hardware and software decisions made by the project team. However, the frequent references to these types of issues in user interviews and observations provided insight about the culture of the organisation, the sub-culture of the uniformed officers and their daily concerns and tribulations. The coding and analysis of the trial transcripts indicates that when articulating those problems

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[7] As noted in the case study, in the location where the majority of trial participants were logged, the devices were stored in a locked storage room. The officers had to obtain a key and sign out the device. The researcher was able to obtain copies of those forms and by comparing those to the officers on-duty was able to independently confirm the lack of take-up and also identify via collar numbers who was making the most use of the devices.

within the context of their daily experience of policing, the same thematic issues were raised by officers, regardless of their age, rank or experience. At the highest level, officers seem to frequently consider their day to day behaviour and possible actions as being related specifically to *perception of risk* or *performance* and those emerged from the analysis as the core categories – with the *perception of risk* being the dominating category controlling their actions and decision making when performing the work task.

That officers are heavily concerned about danger and risk is not a novel finding and is well established in the literature looking at policing as a culture (Chircu et al. 2007). In particular, the fears and concerns and fears of individual officers who are engaging with members of the public in situations that might be conflicted and confrontational in nature(Boon et al. 2008). Danger is, along with authority, 'one of the twin essentials' (p. 297) of front-line policing (Eckardt 2007). However, it has also been that the decision making processes of officers in tense situations is little understood at the operational level but that when trying to categorise the risk of an interaction to themselves, that the amount of time available to take decisions might, along with risk and familiarity of the individual or the situation, be a 'super-ordinate' categories. That is to say, of high importance (Womack 2002).

When considering the impact of *perception of risk* on their behaviour, the narrative accounts of officers were not consistent with the concepts discussed within the literature review when considering the 'risk aversion' ascribed to policing culture due to the impact of the new public management and performance targets. They were more concerned with the real and very tangible sense of possible immediate physical danger highlighted by the officers' culture, their training and doctrine, and borne out by experience. This rational fear of violence or other physical danger was paramount in the minds of the officers, not simply as a possible outcome of interaction, but also as a variable that they constantly considered using their previous experience of such situations and their evolving knowledge of their current situational context. The expression of these fears was linked to the term of 'officer safety', this along with 'cover' (the process under which a colleague watches you and the individual you are interacting with as discussed in chapter 5), was mentioned frequently when discussing the range of activities that might expose the officer to danger or the threat of physical harm and helped to demonstrate the dominance of that concept/concern in the minds of officers as individuals and officers as a culture. Buttle

(2005) provides a detailed overview of the idea of officer safety and how the 1990s and 2000s saw the establishment and expansion of systematic programmes of training to instruct officers in how to defend themselves and to resolve conflict with violence if necessary. While the analysis and his general conclusion that officer safety is the 'name given to the update of self-defence training' (p. 168) is accepted, it is clearly from the various ways in which the officers use the term that are relating it to their ability to defend themselves, that the term is one that is used more broadly catch-all term to describe any action or activity that may impinge on their safety and ability to defend themselves. A more operational summary of the concept is often expressed at the training programmes themselves, as one trainer noted "What's the most important thing on the streets?" a trainer would ask. "You are. Your safety is the most important thing. Then it's your partners. And then it's the public. If you're hurt, you can't help anyone.' (1998, p.79). As an indicator of how loosely the term is used, officers would also use it to describe the equipment that they were carrying and equipped with – their stab proof vest was their 'officer safety vest'. When asked to describe further how the PDT got in the way of their 'officer safety equipment', officer 11 put his baton and CS spray on the table – safety provided by the ability to apply violence. These descriptions and discussions of officer safety situations indicate that it is a concept very much related to self and then team members, the protection of the body via the stab vest or the use of the body offensively by using the baton to subdue someone. In their discussion of each of the identified technical problems, the officers would frequently return to the perceived negative impact that the device was having on their own safety or their ability to 'cover' or provide support to other officers who were interacting with members of the public. This idea of *perception of risk* emerged as a core category relatively early in the coding process simply because of its predominance in conversation – directly in the interviews, when the officers were discussing the use of the devices amongst themselves and in the training sections.

The second thematic issue that emerged out of the quantitative data analysis was that of *performance,* or rather the potential impact on their performance, as measured by the organisation. Unlike risk, this anxiety can be seen as a reflection of the modern police culture, which has developed over the last two decades, a culture where officers wrestle with merging the concept of 'nicking criminals' with clear-up targets imposed from the top and pushed down and across the organisation. Some of the officers also saw the introduction of the devices as part of the overall cultural shift in policing that is

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represented by the new public management, itself an extension of the early military traditions that policing was constructed upon (H. Lee & Liebenau 2000a; Tuttle 1997). Using the analysis of the interwoven thematic issues as a basis, it could be argued that technical issues around the reliability of the PDTs had a detrimental effect on the trial and are the primary reason for the low usage of the devices and the rejection of the changed process by the trial participants. Such a finding would not be atypical when considered in conjunction with extant explanations of why users when confronted with less than functional technology disregard it. The application of a construct such as Technology Adoption Model (TAM) would suggest that these problems have diminished the perceived usefulness of those devices to a level where they are discarded by the users on that basis and that the failure has a social influence that discourages other on the trial from using the technology. However, even with officers who expressed satisfaction with the technical and software performance of the PDTs, usage was still sporadic and low. This indicated that more complex factors around the interaction between actors, the situational context and the chosen technology influencing the actions of the officers than simply technical failure.

6.4 The role of intermediation in the Stop and Search work task

The introduction of direct remote access or 'self-service' for officers trying to obtain information about a stopped individual was the most radical change to the work task and traditional working practices. These changes removed the existing intermediation service provided by the command and control environment from the information enquiry aspects of the work task. The concept of intermediation has been covered within a number of different bodies of literature and while there is some variation in the discussions of the term and its application, there is much commonality in the thematic issues that are raised and which apply directly to this thesis. Intermediation is a relationship between three parties, the consumer[8], the intermediary and the producer (Burrows & Lewis 1988, p.1); here the uniformed officers (Consumer), the command and control environment embodied by the call-hander (intermediary), and information services such as the Police National Computer managed by the National Police Improvement Agency (Producer).

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[8] The use of 'consumer' here is in reference to the term as used in economic consumer theory, rather than the more general usage.

Common to descriptions of the relationship between these parties is an acknowledgement that the introduction or use of intermediation service has a economic component; the intermediary obtains or collates information for the client from the producer and all parties consider the advantages or 'added value' this relationship provides against the cost of the transactions required to pass the information amongst themselves. This added value can take many forms, from the speed of access, the filtering of extraneous data sources, the cost associated with providing the information and other factors such as reducing uncertainty about the validity of the information provided (Gruber 2005). Moreover, one of the core reasons for adopting an intermediation service is that, as an information function, it enhances the movement of information between the producer and the client group and therefore increases the level of satisfaction for both parties (Allen et al. 2008). For the client, of particular importance, is the ability of the intermediary entity to prioritise, organise and successfully transmit the information in a format that is suitable for their intended use (Byström & Järvelin 1995). Information intermediaries as opposed to transaction intermediaries are not engaged in other aspects of completing a transaction such as assigning an economic cost to the activity (Byström & P. Hansen 2005, p.1055). On this basis, an information intermediary can be seen as any system that provides mediation between the producers and consumers of information and their primary role is to select, collate and disseminate the information to the consumer according to their needs (Byström & P. Hansen 2005; Vakkari 2003). Leo and Cho (Vakkari 2003; Vakkari 1999; Byström & P. Hansen 2005) define these types of services as 'a human or non-human party designed to assist consumers in information processing' (p.96), while Rose offers the following definition 'An information intermediary is an independent, profit maximizing economic information processing system performing its activities (information acquisition, processing, and dissemination) on behalf of other agents' information needs' (2008).

This thesis accepts and uses these definitions of an intermediation service but with a very limited consideration and emphasis on the economic aspects of the process in terms of measuring the transaction or other financial *costs* as an element of the added value perceived or provided by the service. The relationship between the client group and the intermediation services described in the case-study has the intermediary (the command and control environment embodied in the Call-handler) acting in a purely informational role, acting as it does, to gather, sort and arrange information to match the needs of the client group, that of the uniformed officers. It is undeniable to say that there is an

economic transaction cost incurred by the organisation from the employment of the call-handler staff to manage the information needs of the uniformed officer but the consideration of those costs and the overall cost of the intermediation service provided by the command and control environment is something that is not managed or discussed at the operational level, it is managed at the corporate level as part of the overall performance management of the organisation. Moreover, the officer does not consider the cost of using his radio to ask for an identity check to be performed, neither do they consider alternative intermediation sources (because of exclusivity, see below), instead they consider the *time* such a check will take given the information they can provide to the call-handler and also how busy the command and control environment is likely to be given the time of day or other such environment factors that may increase demand for the service. However the ramifications of these decisions do manifest in a way that can be related to the aims of this study and the organisational use of information. The performance of call-handlers is measured by their ability to deal with requests for information within a set amount of time and therefore their conceptualisation of their performance is not one of cost, it is also a function of time and their temporal context as defined by clock time, their role and their need to meet a deadline (Spring, p.115). Therefore where applicable, the discussion and analysis that follows highlights cost as being managed by the officers and the call-handlers as a function of time, in the same way that time can be perceived as a cost in the economic concept of opportunity cost.

Another determinant of clients selecting a specific information intermediary service is that of reputation or 'brand'; their previous experience with the service and those of others within their client group will lead them to expect that the service will deliver the results they require. Here there is a distinction between intermediaries in the situation described in the case study and other situations where information is managed in an analogical context (that of a service sector call-centre environment). Whereas in other sectors the client or client group may have the opportunity to collect information direct from a variety of primary producers and the intermediary must therefore provide added value to compete, in this situation, the information that the officers wish to access is only available from specific producers and via those internal organisational intermediaries. For example, the most commonly used source, that of PNC, is the canonical source of information on previous criminal histories of individuals and no alternative exists. For many of the officers on the trial, this exclusivity is a restriction of physical location and geographical presence

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as they have received specialist training so that they can directly access PNC via specialist terminals within police buildings.

6.5 The changes to the intermediation process in the Stop and Search work task

In the existing work task explored within the case study, the command and control function, acts as an intermediary between the officers and access to data held both locally by the organisation, such as the local intelligence system and externally by independent producers, but most notably the PNC which is managed by the National Police Improvement Agency (NPIA). During a Stop, at the point where an officer wishes to confirm the identity or possible criminal past of a stopped individual, they will make use of the intermediation service. Figure 22 illustrates the relationship of the client group (uniformed officers) to the producer (National Police Improvement Agency) when accessing the PNC via this service.

Network Gateway (Interface)   Personal radio (Interface)

NPIA   Call-handler   Police officer
(Producer)   (Intermediary)   (Client)
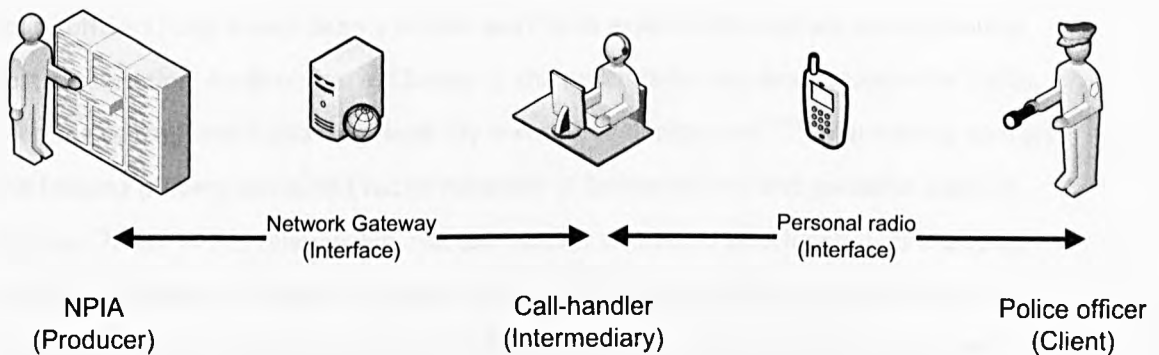
Figure 22: The information intermediation process before the introduction of the PDT

The uniformed officer (the client) makes use of the radio (an interface) to contact the command and control centre; the call-handler (intermediary) and uniformed officer then engaged in short bursts of conversation over the radio system so that the call-handler obtains the minimum information they need to formulate a successful search query. A process of elimination is then used to narrow the possible identity of a stopped individual or to indicate that no record exists against that person. The call-handler asks questions to elicit information about the context of the user's request and during the interaction to try and limit the number of possible returns. The name 'Fred Jones' would return a number of

individuals with criminal records while the addition of an address would further filter results as would such information as a date of birth , or distinguishing tattoos. In situations where an individual may give the name and address of a different individual in an attempt to elude detection, this verbal interaction and constant questioning to obtaining increasingly granulated levels of information will guide the formulation of search strings. As the call-handler and the officer interact, the call-handler makes use of a secure internet based gateway on their workstation (another form of interface) to connect to the systems of the NPIA, the government organisation that maintains and manages the PNC[9]. This continues until the officer is happy that he has sufficient information to assist in his decision-making process – shall they make an arrest or not? An enquiry providing no information can be as interesting to the officers as a positive result as it indicates that the stopped individual either has no record or is providing incorrect or false details. It then becomes a matter of judgement for the officer to decide, from their interaction with the individual and a search of their possessions, if they wish to detain the individual for further questioning or if no offense has been committed, thus conclude the interaction.

Police officers have always been a mobile workforce expected to operate away from the host organisation. As discussed in Chapter 1, the police radio has, since at least the 1960s, been the central tool in allowing flexibility in resource deployment[xxxvii], maintaining contact and keeping officers connected to the networks of fellow officers and specialist support services (2008). In this relationship, the call-handler takes on a vital function as the voice of the organisation, the lifeline that will summon assistance and aid when officers call out in need, it is 'handy for getting back-up' (Officer 12). Their constant monitoring of the status or whereabouts of officers means that they are also the ears of the organisation, constantly listening out for a pause that lasts too long or a status update that has not be made. The intermediation they offer in those circumstances is often one of the utmost need, requiring speed of thought and action. The removal of this radio contact was cited in previous studies into policing and mobility as a matter for concern for officers because of safety concerns (2000). In the changed process (see figure 23), not only is the intermediary removed from the process, but one of the key artefacts of policing, that of

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[9] The most commonly used information source in the case-study is that of the Police National Computer (PNC), a nationally maintained system that holds information on convicted criminals, stolen goods and warrants for arrests and it is for this reason that it is used for the exemplar diagrams.

the radio, is removed, and the intended disintermediation, direct access to the producer, relies on the officer using the PDT to directly the PNC. One of the expected benefits of this process, is that if the officer finds that a stopped individual has a record on the PNC, details such as name, date of birth and address, the application will copy those details into the Stop record that needs to be completed at the end of the work task, thus reducing the need for duplication and the number of keystrokes required.

PDA
(Interface)

NPIA
(Producer)

Police officer
(Client)
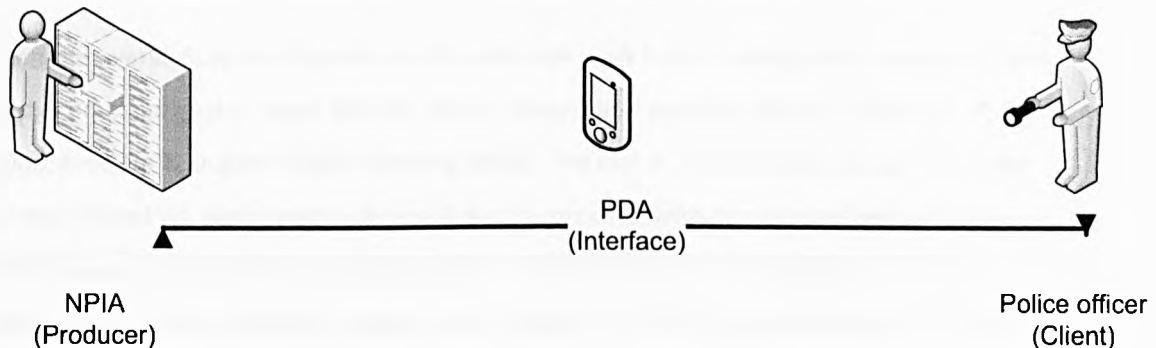
Figure 23: The information intermediation after the introduction of the PDT

6.6 Stop and Search – task or tasks?

To understand why this disintermediation process failed, it is useful to consider in more detail, the Stop and Search process, both in terms of the flow of information between actors and its constitution as a task. By understanding the context, the possible goals and the flow of information to and from officers, as described in their interviews, the points of failure can be examined, and where changes were expected to occur and why they did not. The intention is to examine the work task, the information seeking task, and the information retrieval task and to consider the relationship between these elements as the officer performs both in the original and the changed task. Even after the changes from a process based around the use of the personal radio and paper forms to electronic forms and remote direct access to information, the initiation of the task and the conclusion available to the officer remained unchanged. The start of the work task must be initiated by the officer seeing something or possessing other information that gives him the legal grounds to ask a member of the public to account for his action. The conclusion between the officer and the member of public only has two possible outcomes – the officer detains/arrests the individual or he allows them to go about their lawful business after

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taking no further action or issuing a citation or seizing goods[xxxviii]. Accepting that the work task must be initiated and concluded by the officer, it can be established there are four separate but interwoven sub-tasks within the work, with each focusing on a particular aspect of the overall Stop and Search process – the *stop (initiation)*, the *confirmation of identity*, *the Search* and the *conclusion*. In line with other studies exploring changes to the performance of tasks, this study takes the four identified and distinct tasks to be smaller parts of the overall Stop and Search work task, they are tasks within a task (2005).

Both the overall Stop and Search and the sub-task work have a recognisable beginning and end, a practical goal or result and all have a 'meaningful purpose (reason)' (Burnett et al. 2008; Brodeur & Dupont 2006; Manning 2008). The task in each of those cases is defined or manifested via performance during the work process; with overall goal being for the officer being to determine criminal activity or intent (Liberman et al. 2002). For the individual, a task (at whatever level) can be a rather abstract construction; this is due to personal and subjective preferences on how best to progress towards their perceived goal or objective. The officer, via a combination of experience, training and the repetition of routine, has an idea of his goal, and his rational actions can be seen as being 'in-order-to'. They have a (expressible) meaning in trying to solve the most immediate and concrete problem – that of the determining the action to be taken towards a stopped individual (Ciborra 1999). While there is still individual variation between the officers, a typical set of actions or markers can discern and be employed as a basis for comparison between the old process and the new. In this situation, there is a level of direction imposed by external agencies, leading to a compulsion to act in a certain way due to legal proscription and repeated training on how to proceed to ensure that the Stop is performed in a legal manner and that the risk to the officer is minimised. This means that while the task is initiated by the task performer, the task and the best way to complete it, and the possible order of sub-ordinate tasks, has some element of agency imposed by the organisation and legal instruments.

This combined with the experience gained from regular performance of the work task means there is a some element of *a priori* determinability of tasks outcomes, process and information requirements (Anderson et al. 2002). This decision to initiate a Stop also has a level of determinability because, if an arrest was made further or a complaint was made, the officer would have to be able to explain *why* the Stop and therefore must ensure they

can provide sufficient legal evidence to warrant his use of his Stop and Search powers. The following is an example of a typical stop:

An officer notices that a member of the public seems to be agitated by his presence and suddenly changes the direction in which he is walking. The officer approaches the man and asked him to account for his action, the officer is unhappy when the individual says that he does not know his date of birth or his address as he is new to the area. On searching the individual's backpack, he finds that he in possession of several mobile phones. The individual claims that they are his but is unable to articulate a reason why he would need to carry so many phones on a daily basis. As the individual was a foreign national, no information was found about the individual via either PNC or other checks such as the voters register or the local intelligence system. Unhappy with the lack of explanation from the individual, and his inability to confirm either his ownership of the phones or his identity, the officer arrests him on suspicion of theft. After arranging for a police van to come up and take the prisoner (as he now is), the officer returns to the station where he will process the individual into custody and have the IMEI (a unique identification number) of each phone checked to see if they have been reported stolen.

Note how that prior to the Stop, the officer cannot determine what might be in the bag or that he will need to conduct further information tasks related to the determination of the rightful ownership of the mobile phones. Indeed, not all information sources and outcomes can be determined *a priori* to initiating the stop and the officers' investigative instincts are key in shaping the information seeking process and what might seem to be trivial or inconsequential in other circumstances can drive and shape the interactions and ultimately determine if an individual is arrested or detained for further questioning. The role of the sandwich box as a source of information in the following encounter provides a useful example:

> *The officer is returning to the station after an uneventful morning of following up on existing enquiries and cases by visiting local residents for more information about specific incidents. He is surprised to see an individual crossing the street carry a tool bag and wearing a balaclava. On approaching and stopping the individual, the man tells him that he has been working on a near-by building site, high-up and the balaclava is for the protection of his face from the elements. He has been wearing the balaclava all day and has forgotten to take it off. On searching his tool bag, the officer finds a number of tools and a construction site identification pass. Crucially for the satisfaction of the officer, he is also carrying a sandwich box ('robbers don't carry sandwiches). Taken together, the officer was happy with these disparate pieces of information and the general co-operative nature of the stopped individual and did not proceed with a confirmation of identity check via the PNC.*

The stop and search work task, being performed over and over within short time intervals between occurrences is an example of a repeat behaviour. That is to say that the experience gained in the performance of the task provides information about future possible outcomes and the optimal way to proceed and is carried over from performance to performance (Venkatesh, Maruping et al. 2006). This is evidenced not only by the descriptive accounts of the officers, but also by the body of literature available that explores police officer behaviour and the factors in their decision making (Kiely and Peek 2002; Frewin, Stephens et al. 2006; Johnson 2006; Ericson 2007; Flin, Pender et al. 2007; Rowe 2007; Crawford and Burns 2008). Unlike episodic behaviour, for example, a terrorist incident, police officers enter a Stop and Search process with some level of certainty of how it will proceed. Certainty that will be tempered by environmental concerns (time of day, location) and their perception of the behaviour cues being provided by the stopped individuals, so the determinability is not simply a matter of information need but also the possible behavioural outcomes that they may anticipate from any individuals involved in the interaction that is needed to complete the work task. The increase in complexity that arises from performing both the information search and enquiry tasks therefore impacts on their ability to concentrate on or anticipate certain behaviours or outcomes. This poses an element of risk to them or flight on the part of the stopped individual.

Only *the Stop (initiation)* and *the conclusion* are required tasks as an officer might decide to conclude an interaction without performing the *confirmation of identity* or performing the *search*. In other circumstances, the individual may have documentation that identifies themselves or their purpose sufficiently to an officer, so that there is no need to engage the intermediation service or make use of the PDT devices. In an alternative scenario, an officer might perform *the stop (initiation)* and *confirmation of identity* but without performing *the search*. *The conclusion* has to occur last because it is the task that ends the interaction, but may lead to other work tasks for the officers. For example, if the Stop results in an arrest, the officer will have to return to the police station and process the stopped individual and their belongings. Table 9 outlines the requirements, meaningful purpose and practical goals of each of these tasks.

	Task 1: the Stop (initiation)	Task 2: Confirmation of identity	Task 3: the Search	Task 4: The conclusion
Start	The officer decides that an individual's behaviour is suspicious[xxxix]and that a legal basis can be made to perform a Stop.	The officer will ask the stopped individual to provide information about their identity. This will include full name, date of birth, home address.	The officer will search the individual for illegal or stolen items.	The officer on the basis of the results of tasks 1, 2 and 3 will move to conclude the work task.
Requirements	The officer must have legal grounds to ask an individual to account for their actions.	The stopped individual must provide information about their name or address.		
Meaningful purpose (reason)	To meet local crime priorities. To meet ward targets. To prevent crime.	To identify the Stopped individual as either someone with a criminal history or as having no record on available police systems.	To establish if illegal or stolen artefacts are held by Stopped individual or to help establish the identity of an individual prior to arrest and where no information has been provided.	To bring the work task to a meaningful conclusion.
Practical goal (result)	The officer determines the intent of the Stopped individual or establishes that they are already wanted for further questioning or	To confirm the identity of the individual that is being questioned.	The officer determines if the Stopped individual is carrying prescribed or stolen goods or items or is able to identify	The officer has reached a decision about the action that needs to be taken.

	arrest.	them.	
End	The officer arrests, detains or release the individual.	The officer establishes the identity of the individual or confirms that there is no record of the individual on their systems.	The officer finds stolen items or other objects of interest such as drugs or weapons/the officer finds nothing of interest.	The officer can take any number of courses of actions to conclude the work task, those include: • no further action; • arrest the individual; • ASB (Anti-social behaviour) warning; • ASB Dispersal • order; • Cautioned/ Warning • seizure of alcohol; • Seizure of cigarettes; • On-going Enquiry.

Table 9: The Stop and Search task and sub-tasks

It should be noted that while *the stop (initiation)* has to occur first, that the information acquisition process ("what's your name?") required for the *confirmation of identity* might occur before, after or even parallel to a physical search of an individual or their belongings. This is because even where (as is the case here) aspects of a process are mandated and have an objective basis they can be the starting point for a series of subjective decisions, for instance, the importance of the order of the tasks as perceived by the individual officers. Many officers indicated that they would conduct *the search* before engaging in

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the *confirmation of identity* to try and ensure that no weapons or other items that might present a hazard are present. In addition, the whole work task will move to *the conclusion* if the officer feels they need to arrest the individual immediately because of the threat of violence or some other unforeseen contingencies. The information seeking tasks are therefore treated as information focused sub-tasks of those sub-tasks; they are subordinate to the goal of the main sub-task and the overall work task rather than an endpoint in themselves. The officer is interested in the information that he obtains to fulfil one of the possible outcomes discussed above, outcomes that always conclude with the arrest or release of the stopped individual and the conclusion of the work task. Something to note at this point is that the information-seeking process can be argued as occurring earlier than the start of the task, the opening as defined by Ellis (1989) and Kuhlthau (1993) could be seen as occurring when the officer decided that an individual or individuals should be stopped and that the gap or uncertainty reduction is determining if a criminal offense has been committed. However, this study treats that decision as a state of orientation and the Stop and Search work task is where the active seeking of information occurs.

6.7 The important of the confirmation of identity task in negative attitudes towards the call-handlers

From its predominance in the comments of officers, it is the performance of the *confirmation of identity* task that is the critical junction at which the call-handlers as intermediaries have an opportunity to demonstrate the 'added value' provided by their service by taking the raw products of information providers and skilfully filtering the results provided and relaying them to officers in a relative and timely fashion. Moreover, when the identity of an individual is disputed or still in doubt, they can use the information resources at their disposal to guide the officer in the formulation of questioning, in effect they assist and take part in the information acquisition process.

An important point to note here is that a stopped individual is under no legal compulsion to provide their name or address unless they are being arrested or issued a warning or fine. While, it might be presumed that this would provide additional problems for officers, in all of the situations described and observed, individuals would provide their details (or what they hoped were convincing sounding false details) generally without question. The

public assumes that they have to provide this information and therefore do so. In the rare situations where an individual would refuse to provide their name or address, officers would simply take this as confirmation that the stopped individual had something to hide and this would lead to further questioning and a more intensive desire to find out this information. Official guidance offered by every police force in the United Kingdom states that 'it makes sense to co-operate. If you are innocent you have nothing to fear'[xl]. An officer on the trial noted that in those situations where the individual would not provide any information but they thought a crime had been committed 'we nick em (sic) for what we think it the offense is and work it out later back at the station'.

However, the officers on the trial expressed a range negative views about how much added value was actually being provided by the existing information intermediation service. It is clear that the officers saw the introduction of direct remote access to sources such as PNC as empowering as it allowed them, from the field, to overcome their perceived and actual issues with the intermediation service. This was attributed to existing perspectives concerning the variable quality of call handlers and their skill in interpreting and acting upon information requests from officers. It often resulted in perceived sub-optimal performance in the Search enquiry process. Officer 7 articulated a common sentiment from the officers on the trial 'Standard of staff in calls centres are very low, they are useless'. Figure 24 outlines some of the key issues that officers associated with the existing intermediation process when conducting the Stop and Search work task. For these reasons, there was great enthusiasm on the part of the trial participants to directly access the PNC and other information sources themselves because of the perceived failings of individual call-handlers in correctly collating and filtering relevant information and the wider call handling processes in providing this information in a timely fashion.
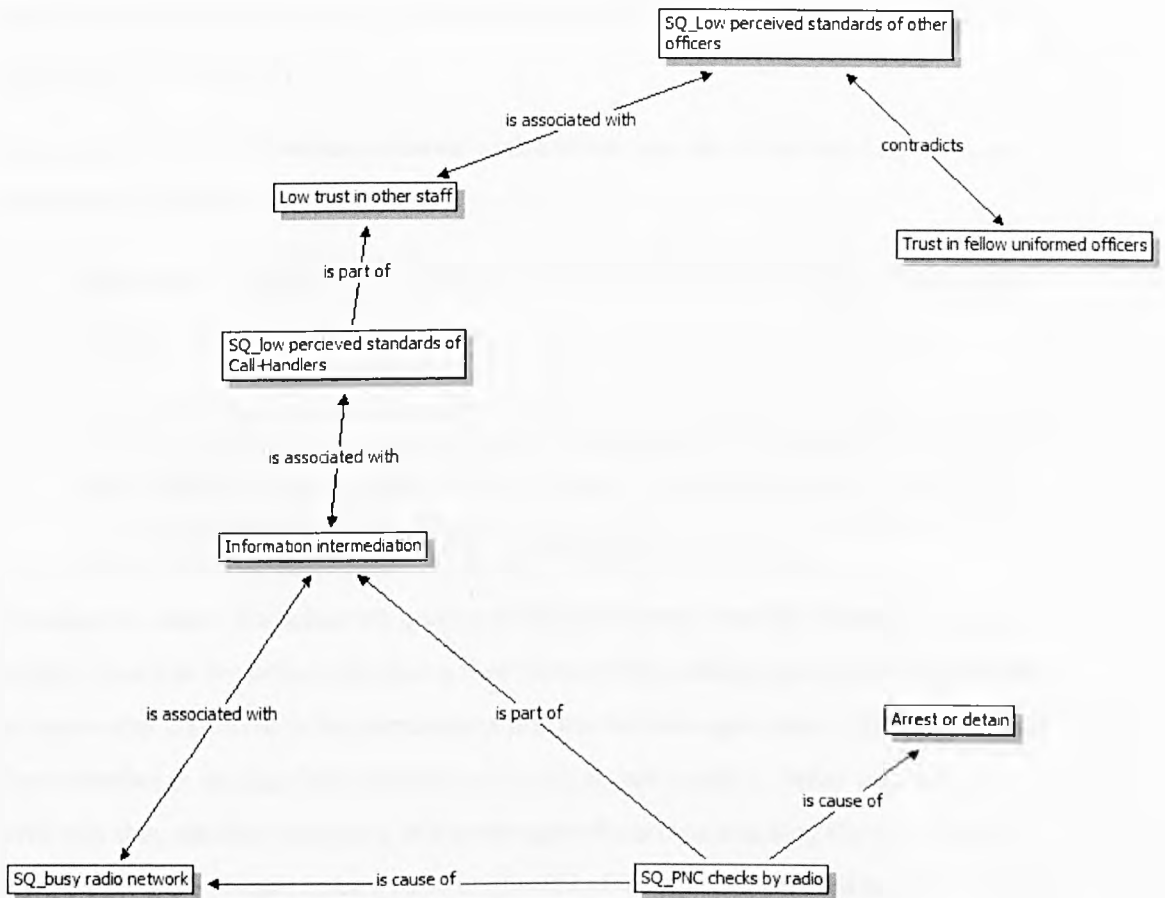
Figure 24: Perceived failures of information intermediation service

In addition, the officers felt that the service performed by intermediation suffered because the radio channels (requests for different types of information are made on different channels) were very busy during peak periods of activity such as Friday and Saturday night and therefore they had to wait for what they considered to be long periods of time before their request for information was responded to. For the officers, those long periods of time were measured in units of seconds and minutes. The radio channels and the call-handlers are involved in any number of information requests, from finding a telephone number for an officer to passing on messages from the public or requests for information or documentation from other areas of the organisation. However, these requests for information were never discussed by the officers as serious concerns and access to the information held by the PNC was their main topic of conversation when discussing call-

handlers. This is related to the strong value that the officers placed upon the PNC when discussing what they saw as their primary occupational function – arresting criminals and disrupting criminal activity.

The accuracy of the information returned to the officer was also questioned by many as indicated in the following exchange:

> **Researcher:** Is that [the introduction of the PDT] because you are cutting out the middle- man [the call-handler]?
>
> **Officer 7:** Yes, so I can see it so I can make a decision on what I see up in front of me, as opposed to relying on that person in the control room and the information that comes up on their screens. Yes they might be telling me what's on that screen but I've had incidents of where people have told me what's on their screen and I have made decisions based on that and they have been wrong.

Consequently, when discussing the quality of the service and their perception of the call-handlers, many of the officers discussed their concerns regarding more general fears about the low overall standards in the recruitment process for the organisation. While uniformed officers tended to discuss their activities in the plural, 'we would...', 'what we do is...', conversely they also felt that many of the younger officers were lacking the quality that they thought were needed to be a good uniformed officers. When pressed to discuss those quality, many offers expressed it in terms of the officers needing to have an assertive and perhaps aggressive manner to those they stopped, someone who was willing to 'not hang back... get in their faces' (Officer 14) and that 'The way I put it is that they are apprehensive against confrontations against people in the street and you have to have confrontations to do your job' (Officer 9), all examples of the expression of what officers see as the real job (Manning, 1980).

6.8 The important of the confirmation of identity in the overall process

As emphasised in the case study, the trial participants were particularly concerned with the need to complete and compling information on the device as they collected it from a stopped individual. When discussing, demonstrating and thinking about their use of the device they clearly articulated their apprehension in terms of the level of concentration

that they felt the device commanded, both when attempting to populate the information Search application or complete the electronic Stop form.

The transcripts and accounts of the officers make it clear that the use of the PDT was highly variable across each of the identified subtasks that make up the Stop and Search work task. The physical task of intitating the Stop on an individual did not require the use of the PDTs neither did the physical task of performing the *search*, indeed to do so was impractical because both of the officers' hands needed to be free to comply with their standard method of performing this task. Taken in conjunction with notes from observation, it is clear that the changed process failed during the performance of the *confirmation of identity* and its sub-ordinate information based tasks. It is here the concerns of focus and distraction cluster in the responses of the officers. The *confirmation of identity* task represents a need to fill the most critical gap in the knowledge of the officer, they do not know with whom they are interacting and that models their information requirements to ensure that gap does not persist for any length of time. This is very clearly and explicitly linked by the officers to the identified thematic issue of *perception of risk* by a very simple and direct proposition as articulated by officer 15 'Say you were stopping someone in the street and one of the first things you need to know is who is this person, are they known to us and have they got any warning signals?'

For this reason, the PNC check is seen as vital by the officers because any stopped individual who presents a risk of violence will have warning 'markers' on their PNC record which are the first thing presented to anyone accessing those records. This can be seen as example of an individual caring as described by Savolainen, because the officer is engaging in his information seeking actions because of a 'a temporally sensitive context' (Terpstra & Trommel 2009) that represents immediate fear of harm. Moreover, the information seeking related to this task becomes central to the primary task at this stage because they are interested in specific rather than orientating information (Pica & Sørensen 2004; Sørensen & Pica 2005; Hampton & Langham 2005).

[xxxvi] This work considers, in terms of policing, the PDT a tool in the same manner as Lundin & Nulden (Newman 2009, p.1), artefacts that an officer carries that are closely connected to their ability to work in a competent manner.

xxxvii 'As recently as the sixties, urban patrol work followed the 'fixed point system' where officers patrolled between a series of contact points (usually police boxes or public telephone boxes) at pre-set times. The fixed point system was in essence a Victorian solution to problems of communication and supervision: sergeants - and the public – could get in contact with constables if they knew where they would be at any given time' (Savolainen 1995)

xxxviii The follow range of actions after a stop has concluded are performed are: no further action, Arrested, Anti-Social Behaviour Warning (Anti-social behaviour), Anti-Social Behaviour Dispersal/Under 16 Removal, Dispersal, Report Summons, Cautioned, Advised / Warning, Seizure Alcohol, Seizure Cigarettes, On Going Enquiry, Other.

xxxix The reasons why an officer may stop an individual are complex, Crawford and Burns (R. R. Johnson 2004, p.489) in a study of how and why officers decide to use force, note that 'there is a territorial awareness and perception held by police officers that carries a normative standard for the appropriate behaviour and activities for a given place. Citizens acting outside of the norms for a given time and place will attract police attention and shape the actions officers will take.' (p. 323). It is also important that not every occasion where an officer stops an individual to ask them a question is considered the start of a Stop and Search. The Home Office Stop & Search Manual (2005) on the performance of a Stop notes that an officer is performing a Stop, if they ask an individual to account (which is why the procedure is often referred to as 'Stop and Account') for themselves and their presence in that specific area. For example, an officer summoned to a fight in a public place may ask 'what's going on here?' this is seen as different from the officer asking 'what are *you* doing *here*?'

xl The guidance given to individuals is common across Forces, for example West Yorkshire Police's website notes that:

> 'The officer will also ask you for your name, address and date of birth. Unless they are reporting you for a suspected crime, you don't have to tell them, but it makes sense to co-operate. If you are innocent you have nothing to fear. If you are being reported for an offence, you may be liable to arrest if you don't give the details the officers ask for'.

Chapter 7 – The Impact on the Individual Officer

7.1 Introduction

In the previous chapter, the confirmation of identity was argued to be the point at which the Personal Data Terminals (PDTs) are most critical to the performance of the Stop and Search task. It was also the point at which they should be most central to officers' information needs – the devices should have allowed the officers to quickly and accurately identify an individual or confirm that they do not have a criminal record. The fact that the devices were not adopted was related to the officers' perception of risk and their view that the use of the devices increased the possible danger to themselves because of contextual and environmental constraints. In this chapter, the impact of the introduction of the devices on the actions and information seeking of the lone or solitary officers is considered and the reasons for rejection more carefully considered. Particular interest is taken in how the introduction of the devices changed aspects of the temporal and spatial elements of performing the task in a public space.

7.2 The removal of information intermediation

In the original performance of the confirmation of identity task, there is a clear divide between the acquisition activities performed by the officer in the field to obtain the information needed to perform this vital check and the information enquiry/search activities that are undertaken by the call handler acting as the information intermediary, as shown below in figure 24. The Information acquisition is an attempt by the officers to reduce the uncertainty (or the information gap) of the situation by actively searching via their questioning of an individual; they are ignorant of the identity of the individual and wish to gain enough information to reduce this uncertainty. Acquisition is also occurring (but not modelled in the diagram) via the observation and interpretation of symbols and signals – the behaviour of the stopped individual, changes, in and the nature of, the local environment and so on.
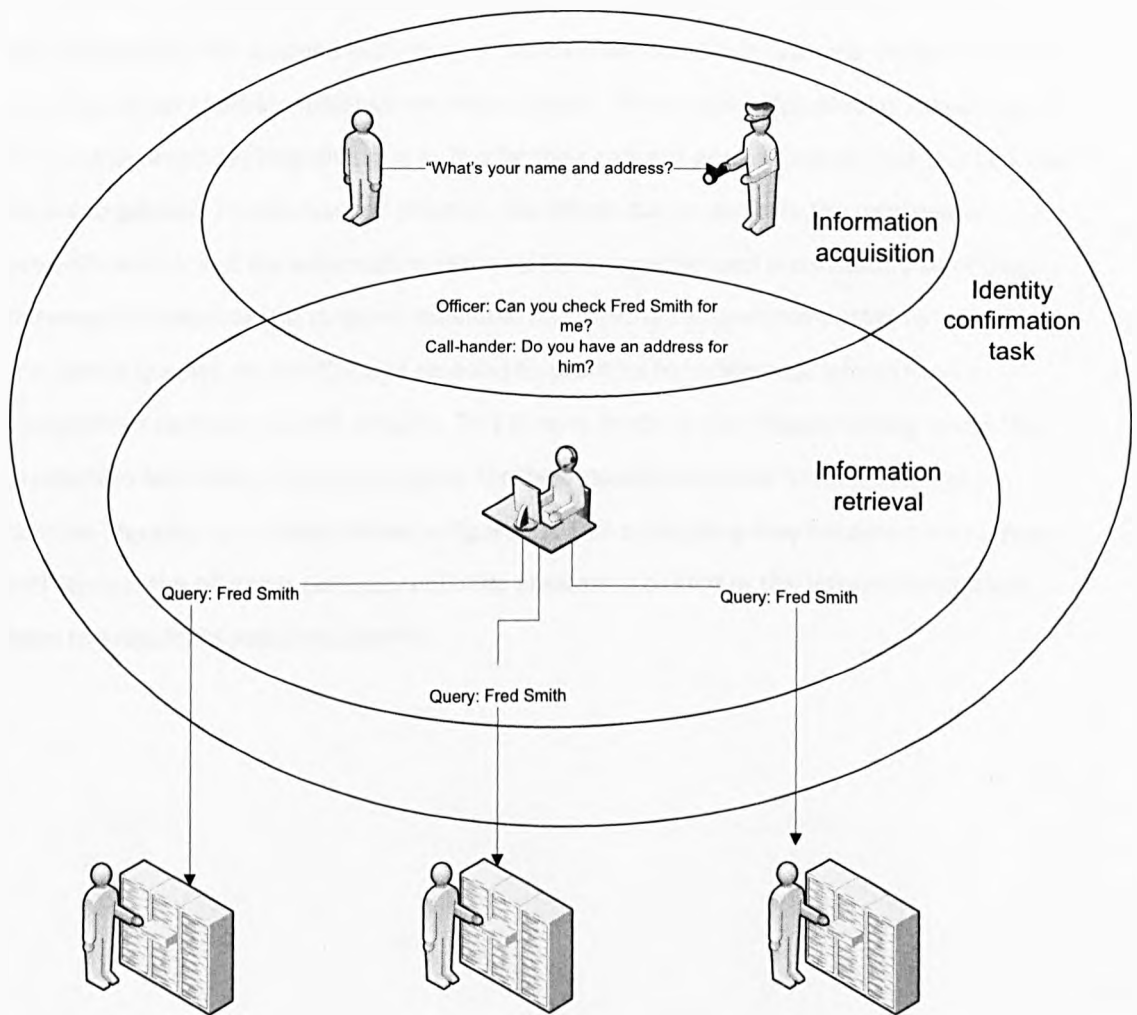
Figure 25: Information activities embedded in the identity confirmation task as part of original Stop and Search process

In the original identity confirmation task, as illustrated in figure 25, the officer is concentrating on engaging with (both verbally and via body language and eye contact) the stopped individual for the purposes of obtaining the minimum information required to determine if they have a criminal history, warning markers, or are currently wanted in connection with a criminal incident – this is identified on the diagram as part of the information acquisition task. The call-handler will then use this to perform the information retrieval tasks. This is not a hard line of demarcation, there is a process of iteration

between the officer and call handler as they communicate in an attempt to clarify, expand or narrow the possible search criteria. As they move towards their meaningful goal of identification of the stopped individual, in the original task there is a clear divide between the related but separate information related tasks. The stopped individual is also engaged in an information seeking dialogue as it is by their consent and assistance that this task can be accomplished. In the changed process, the officer has to perform the information acquisition task and the information retrieval tasks together and is constantly switching between questioning the stopped individual for information and attempting to formulate the search queries on the PDT and respond to prompts for additional information to complete or narrow a Search enquiry. This in turn, leads to the officers having to use the prompts to formulate further questions for the stopped individual in their attempt to confirm identity, as outlined below in figure 25. This prompting may become more urgent and tense if the officer is unhappy with the answers provided or the information differs from the results founded via the PDT.
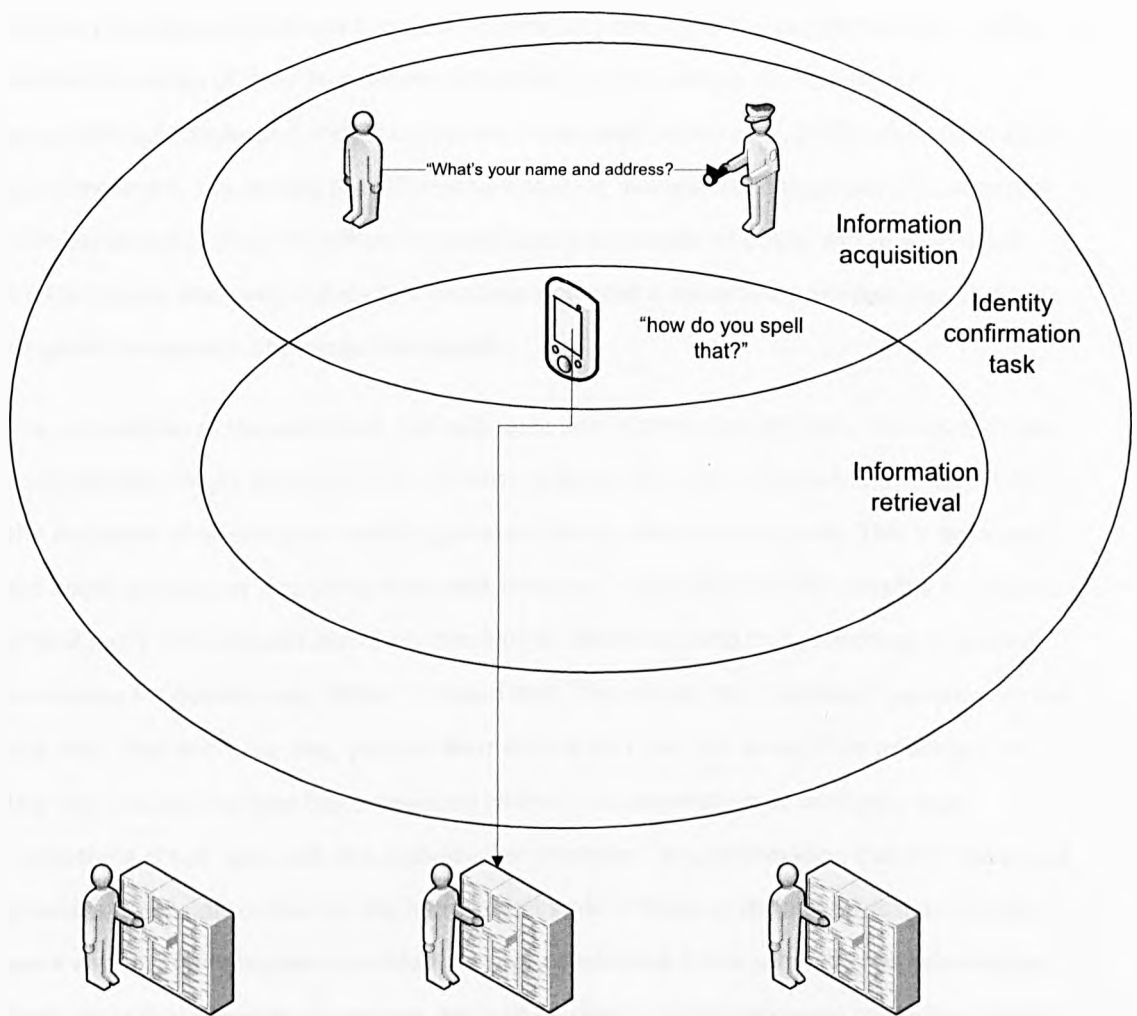
Figure 26: Confirmation of information sub-task in PDT based Stop and Search process

In both the information seeking and retrieval literature, the central assumption is that the information man will have an information need and will engage in searching activities. Reddy and Jansen (Edmunds & Morris 2000) noted that in information seeking that 'most models of information behaviour focus on the individual seeker of information', while Sonnenwald and Pierce (Kerstholt 1992) argue that even in situations of collaboration, that information behaviour is viewed via the lens of the individual. Similarly, Hansen and Järvelin (P. Hansen & Järvelin 2005) note that the assumption at the centre of much information retrieval research is that it is 'basically viewed as an individual activity and that the searcher performing the task is in a rather isolated situation' (p. 1102). The remote

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mobility literature is similarly framed and generally considers the activities of the mobile workers in terms of their interaction with other actors in terms of them being geographically dispersed, that is to say, not co-located (Axtell et al. 2008). The acquisition of information, and indeed the information seeking dialogue is an example of (contested) collaboration between the officer and the stopped member of public within a situation that is socially and geographically interactive and where the officers are required to have heighted awareness of their surroundings.

The completion of the work task, the sub-tasks and information related activities are more complex than might occur in other circumstances where two individuals may interact for the purposes of information seeking generally or acquisition specifically. This is because of the social and power disparities that exist between the parties and the possible resistance of one party (the stopped member of public) to either respond to questioning or indeed remaining for questioning. Officer 9 stated that 'if you have street robbers, people who are not nice, they don't like you, you are their enemy you can take away their privileges'. As the very nature of a Stop has embedded within it an assumption or inference that 'something is not right with this individual or situation', any information that the individual provides is considered low on the hierarchical scale of trust or social worlds that officers work within. The responses provided, are not considered in the same way as information from other more legitimate sources, and can be dismissed as inaccurate regardless of their actual legitimacy or truthfulness, and because of this, independent validity is always sought (Burnett et al. 2008; McCreadie & Rice 1999). Indeed, when engaging with the stopped individual, if they have something to hide, the response and the interaction can be seen to be inverted from the normal process of information seeking dialogue between individuals – where the information provider will try and infer the task-related plan that is motivating the seeker's questioning and will use their understanding of this plan to provide unhelpful or misleading answers. Furthermore because the stopped individual might be providing false or misleading information, the complexity of the information acquisition increases as the officer attempts to identify those lies and use the provided information to catch out the stopped individual in untrue statements. In turn, this can lead to further and increasingly complex reformulation of questions as the officers attempt to catch the individual engaging in a falsehood[xli]. As the conversation progresses, the officer is constantly integrating the extracted information with his prior knowledge, comparing the two and trying to determine where contradictions exist.

The officer will also wish to examine artefacts in the area and on the person of the stopped individual to provide validity to statements made during dialogue, for example, the presence of a sandwich box (as discussed in the previous chapter) will lend credence to a statement that someone has just come from a worksite. Another important point to make here is that attempts to reduce uncertainty about the individual's identity should not be seen as an attempt to render the individual 'safe'. The confirmation of an individual's criminal history and violent past history with police officers would reduce uncertainty, but would increase the perception of risk – it would provide confirmation that the individual is a possible danger. The practical outcome of this is that the officer has to be constantly mindful of behavioural or verbal cues that the encounter may escalate into a more heated or even violent confrontation and that they may need to take physical action, what Manning describes as a process of 'fate control' (2003). Research by occupational psychologists suggests that the routine work of policing is as at least as stressful as critical incidents involving death and serious injury and may cause significant psychological distress as officers try to complete their work (1999b; 1999a). The perception of threat to themselves or fellow officers is a common cause of this, especially when the stress is psycho-social in nature – influenced by their appraisal of the environment and the people they are interacting with (Giddens 1979; Giddens 1986).

The officers are engaging in a number of different activities at the same time, they will be trying to obtain the information they need for identify confirmation, passing this over the radio to the call-handler and engaging in 'verbal judo'[xlii] or other behaviour likely to defuse tense situations, all the while trying to maintain the professional 'business like' attitude that modern policing is expected to conform to (C. Crawford & Burns 2008, p.325). Officer 9 commented that during a Stop and Search, an officer needs to have 'critical vision around everyone and everything' because of the perceived risk to officer safety. It is here where the officers' desire to formulate and conduct their own information searches and enquires as expressed in Chapters 5 and 6 conflicts with the officers' expectations and experiences of working the streets. Highlighting the difference in the focus of officers after the disintermediation, officer 8 observes that 'when I'm using it [the PDT], I will look up occasionally, but if I was dealing [performing the task] without it; I would be focusing on them all the time. I'd be on the radio and I would not be concentrating on the [text] boxes on the device'. Furthermore, officer 15 noted that in their own usage of the device that 'you can feel yourself getting very involved into putting the information into the PDT...

you're not watching what your colleague is doing', a sentiment that officer 2 concurred with: 'the person using the machine is not looking at the person or what is happening around you. You are very fixed on that [points to PDT]'. This modularisation of the senses in information seeking has been identified in other remote mobility studies within policing, where one sense, the eye or the ear or the voice dominates, according to the task being undertaken (Bittner 1979; Bittner 1990; C. Crawford & Burns 2008). The descriptions of the officers, indicate that, in the original paper process voice dominates in regards to information transmission (via the radio),but in this instance the eye dominates as the officer concentrates on the screen and the process of inputting information into the PDT. This leads to engagement with the virtual world and a decontextualisation from the physical environment. Other officers noted that the complexity of trying to perform all of these tasks together while using the devices, required the assistance of other officers, as officer 7 stated 'what I've tended to do, because I find it difficult to do, is I take the information down or a colleague takes it down. It takes too much time to take down all the information and do the PNC check[10]'. This is a manifestation of information overload; the officers are engaged in information seeking behaviour to satisfy their need, managing the processual demands of the Stop and Search, while also trying to manage the physical environment around them. There is simply too much information to process in too short a duration of time and overload is the outcome (B. Wilson & Kelling 1982).

The removal of the information intermediary and the introduction of the PDT can be therefore seen to change the dynamic of this interaction and the work of the officers in three interwoven ways. First it decreases the officers' awareness of their surroundings and the objects, people and activities within it because of the switch in modularisation from the voice to the eye; second it has a number of impacts on the local and social temporal contexts; finally it encourages the officer's focus on the correct manipulation and management of the PDT to complete the various stages of the information enquiry process as dictated by the software and user interface. Changes to both the temporal and spatial dimensions of a task can be seen to add to the level of complexity. However, in most studies of task complexity, as they relate to information seeking or searching behaviour, the concentration is on a rather narrow and specific class of tasks, and instances where the

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[10] The questions raised by group usage of the technology and the collaborative task and information behaviour it suggests are discussed in detail in the next chapter, rather than here with its focus on the information man, the solitary worker.

task environments are under the control of the researchers and/or the individuals undertaking the task (Lundin & Nulden 2007), neither of which are true for the police officers or the interactions being discussed here.

7.3 Spatial awareness

Spatial awareness is related to an individual's mental picture of the people, objects and activities that are geographically proximal (Sørensen & Pica 2005, p.145). If one key thematic issue arose out of the discussion of mobility in the literature, it was that providing access to mobility is not the same as providing access to information, and that it is difficult for an individual to use a mobile device such as a PDT to transcend the limits of physical geography as hoped (Axtell et al. 2008). The introduction of the PDTs put the officer in a situation where the heterogeneity of the contextual constraints increases, as suggested by Kristoffersen and Ljungberg (Agarwal & Karahanna 2000; Hampton & Langham 2005; Haywood 2005). While the devices do, in the abstract, allow the individuals to overcome the physical locations of their organisation, they do not allow them, via usage, to overcome or transcend the limitations of the locale, that is to say, the settings of interaction with the public that influence contextuality (Saadé & Bahli 2005, p.318). In Bardram & Bossen's (2005) work on local mobility and the trajectories of work in hospitals, the 'place' is not seen as an abstract space, but must have a number of characteristics in order to provide an appropriate venue for action to occur. In their discussion, they propose the Standard Operating Configuration (SOC), the collective management of space, so that 'there is a tight flow coexisting between the design of physical arrangements, the design of the flow of things, actors, information, and the mobility work of which it is a product' (p. 139). As part of this, they proposed that over time, the arrangement of objects and physical locations will be changed to best support the work or activity being undertaken by individuals. For example, a radiology conference room will provide the facilities to support the discussion of x-rays. Moreover, places can have ordinary (a meeting room) or inherent (have a sterile environment) qualities. Here, the officers are working in public spaces, environments that are not configured for their usage and there is no 'prefigured coordination of who, when, what and where' (p. 138). Furthermore, the use of mobility in this instance is not simply one of time and place, but it is also heavily influenced by the individuals present within the space and the repeated experience of the officers in performing the task – the task determinability discussed in the

previous chapter. The officers expect an encounter and various sub-tasks of the Stop and Search task to occur a certain way *because* of the people and the place and therefore this influences their decision of where and how to use the technology, the sort of interactional mobility that the work of Kakihara and Sørensen describes (2003).

The officers meet this challenge by attempting to reconfigure the environment, and the position and the actions of people in it, to both maximise their safety and make the performance of their work tasks easier and the information seeking activities more productive in an attempt to meet a meaningful goal. These attempts might involve asking an individual to stand against a wall to limit their physical movement or asking for two individuals to become physically more distanced so that the officer can pose a question to one individual and then compare it to the answer given by another – 'you question them together and they get their stories straight, you question them apart them and you can say "your mate tells me different [about a series of events]"' (officer 20). The descriptions provided by the officers, and the policing literature, all evidence the dominance of concepts of danger and risk within policing and the general spilt of spaces into places that are safe (the police station, the canteen) and those that might be dangerous or provide risk (public spaces, private homes). Public spaces can be seen to have an inherent quality of risk because of the types of individual that officers expect to confront. Conversely, the police station does not have an inherent quality of risk because individuals are either police officers, visitors, or handcuffed and in a cell. In this sense, there seems to be no practical difference for the officer between the stopped individual and the place, for the officer they are one and the same, part of a difficult to control *other* outside of themselves, their organisation and their technology. This has been observed in the police literature previously; officers will be more warily if they are in a situation which 'the location is perceived to be a hazard' (Haywood 2005; Toet 2006).

The introduction of the PDT and its demands for the concentration of the officer on its glowing screen therefore impact on their ability to subtly manipulate their environment by persuasion, or more crudely, by the application of the core technology of policing, that of force or violence (Saadé & Bahli 2005). Here, the presence of the PDTs was perceived to interfere with the ability of the officers to protect themselves via the use of the earlier self-identified (by the trial participants) 'officer safety equipment', that of the extendable

truncheon and CS Gas[11]. It is not enough to say that concerns about the senses and modularisation of the ear and eye are the main problem with hand-held technologies in policing when interacting with the public; it is also that they are literally *hand-held*. This seems a trite observation, but there is a logical consequence of holding a device in one hand and using a stylus with another, the officer cannot strike out or defend when needed. As rapidly as needed, as officer 15 noted, 'you want your hands free if there is trouble'. This is a problem measured not in minutes or even seconds, but micro seconds and officers commented that as a consequence of this that they were concerned that the spilt-second distraction of trying to decide if they should simply drop what was perceived to be expensive piece of equipment, or try to put it in its holster before taking other action, was a concern to them. Indeed, referring back to problems with the police rattle mentioned in chapter one, officer 16 noted that he was concerned that because of the hard casing on the device and their size, they could be used against them in a struggle. It has to be emphasised that within the perception of risk, officers were preoccupied with a worst case scenario; they were projecting their concerns about interactions with the public and what *might* happen based on their experience of front-line policing and dealing with difficult situations. As established in the literature review, the reality of police work is one of administration and discussion, and while violence might ensue, it is not a commonplace occurrence in these types of routine procedures. The officers would frequently refer to the bad experience of other officers and use this shared understanding of the dangers of the occupational role to further influence their decisions and actions. Moreover, even when the officers were not overly concerned with the risk of violence or flight on the part of the stopped individual or individuals, the lone officer is limited in his ability to physically *move* individuals within the environment if they do not wish to do so, even more so when the officers are attempting to manipulate the PDT and their hands are occupied[12]. The situations in which officers interact with the public can be seen to be an example of the 'field' as described by Bourdieu and Wacquant (1992), a social space where actors

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[11] In regards to the use of CS Spray, Tyler and King (2000) note that 'at a trainers' training session, a Metropolitan Police officer was sprayed and badly injured. He was reported to have suffered 50 per cent burns to the cornea of one eye, 40 per cent burns to the other eye and burns to the forehead' (p. 391). The description of those devices as 'safety equipment' therefore seems represent an attempt to obfuscate meaning.

[12] The group as opposed to solitary officer response to those problems is discussed within the next chapter.

compete and attempt to establish control over the environment and each other. As part of this process, individuals develop a 'habitus', a certain disposition to how things should occur and happen. While the training of officers provides some determining structures to their actions, their response is shaped by their previous experience and preconceptions of this external environment.

Returning to the Sørensen and Pica study discussed in the literature review, while this thesis provides support for a number of their findings such as the officers reluctance to use mobile technology because of the aforementioned issues of modularisation within a hostile environment, that study concentrated on the use of Mobile Data Terminals (MDTs), which are small computers that are fixed within a police vehicle and therefore require the officer to be within the vehicle to make use of it. The use of PDTs is not the focus of their attention, but is mentioned briefly within a discussion with informants about their perceptions of the benefits of other mobile technologies for use in the field. The very brief section explores their use of handheld technologies for the purposes of the confirmation of identity and the negative reaction of officers. An officer is quoted as saying 'when faced with a person, who potentially can hurt you badly, you want to look that person in the eyes and not stand there staring in screen' (2005 p. 145), a very similar remark to those made by officers on this trial and discussed in the narrative case study. A critical difference in this study is that the majority of uniformed officers on the trial, as well as being solitary workers, were also on foot, with only sporadic access to official vehicles. It is evident from the policing literature that as an object, the police car is seen as a tool that projects the authority and legitimacy of the organisation. It provides an environment that is safer than the street for interaction with members of the public, one where the power balance is tipped towards the officer (Agarwal & Karahanna 2000; Saadé & Bahli 2005; Jennett et al. 2008), the police car is therefore a space where co-ordination and communication may occur (2008). A number of the officers commented that they made more use of the devices when they had access to a police car or van. This allowed them to make use of the PDTs if they judged that the situation was 'safe' or simply leave the device in the car when they deemed it was not. The devices in this context are 'ready-to-hand' (2005) and therefore not intrusive. Again this can be related to the perception of risk and the use of physical spaces to manage the interaction – officer 10 notes that, while he was not using the device for the intended purpose of the Stop and Search process, that when arresting individuals that 'you are doing crime enquiries, you nick someone, you want to check their

details before you take you them in, so there is no officer safety because you have them cuffed.' Again, there is an interaction between technologies – the use of the handcuffs 'configures' the individual in the environment so that the perception of risk is changed and the officer feels that they can safely use the PDT to perform confirmation of identity and other information related tasks. Others noted that when they had access to a car that they would ask an individual to get into the back when questioning simply because it lowered the risk of flight. Often as officer 14 noted, this did not require them to fully get into the vehicle but simply to sit on the back seat while the officer loomed over them. This seems to suggest that counter-intuitively, for many of the officers, the devices, intended for foot patrol usage were more useful when they had access to a police vehicle because of the additional control over the environment and the individuals within it. Similar many of the officers reported that they were more likely to make use of the printer in conjunction with the devices when they has access to a vehicle as they could complete the form and then return to the car to collect the record for the stopped individual.

7.4 Temporal impact

The changes to the Stop and Search process impacts directly on the relationships and interactions between three groups, the police officers performing the Stop, the call-handlers who act as intermediaries and the member/s of the public who are stopped. The previous chapter discusses these changes predominantly within the extended boundaries of the organisation and the interaction between the uniformed officers on the trial and call-handlers. In this chapter, the analysis so far has concentrated on the concerns of the individual officer as they attempt to manage their environment and the spatial dimensions of the task. In this section, temporality becomes the central focus for discussion and analysis. While the intermediation process offers another set of temporal work based contexts to explore, those of the local situation and those imposed by the distant organisation (Labianca et al. 2005), it is removed in the PDT process and therefore are not explored here. The impact of temporal and organisation contexts on the effectiveness of the intermediation process is considered in more detail in the next chapter when discussing the possible reasons for the more successful adoption of the technology in collaborative situations and the impact of the differing reward/disciplinary systems that the two occupational roles make use of. When considering the use of the PDTs, the issue that the officers would return to is one of engrossment, as noted in the descriptive cases

study, 'you become very fixed' (officer 2) and that the device 'draws you in... Officers are concentrating on getting the right things in the right boxes' (officer 7), 'you have to be careful not to spend too long looking at it [the PDT] (officer 21). Indeed, while the officers would use a range of terms from concentration to 'focus' to 'fixed' (upon the device), this engrossment that they felt with the device was a common concern. This concentration upon the devices and the inputting of information is not to be unexpected, indeed, the paradigms behind the design of software applications and user interfaces is intended to, as best as possible, create the decontextualisation and virtualisation as a means of providing an enjoyable user experience (Ackroyd 1992). This has also been described as flow, a state where the user is so involved or focused with their device that they 'experience a loss of time' (Manning 1996; Norman & Allen 2005; Hampton & Langham 2005).

The central problem for officers when considering using the devices for the purpose of the Stop and Search task were those of engrossment and a fear that using the device to confirm identity when there was uncertainty about whom they were engaged with, represented a increased level of risk, both for their own safety and the successful completion of the task. These problems and issues would be expected to present themselves during the performance of many common police tasks, such as the confirmation of the ownership of a motor vehicle. The problem might not be with the attempted redesign of this single work task, but a wider problem with remote mobility in this particular occupational context. The Sørensen & Pica (Berry 2009; PA Consulting 2001) study suggests that rather than wider technically or organisational issues, that at some basic level that the use of some mobile technologies such as handheld might be incompatible with the work tasks that are being undertaken by uniformed operational police officers. They note that 'we find the paradox that as degree of mobile data support increases, the degree of de-contextualization increases as well' (p. 145). Moreover, that peripheral awareness of the senses, and therefore the surrounding environment, decreases when officers engage with mobile technology and for this reason, officers will chose for the reasons of risk articulated in the sections above to engage more fully with the physical world. In both the general and police specific mobility literature, the question of fitness for purpose is 'of the moment'; it is a consideration of a specific technology a case rather than more general consideration of the possible unsuitability of mobile computers such as the PDTs.

The users' decontextualisation from the physical environment and their lack of awareness of the passage of time has been discussed and expressed within the information systems development literature. The intend here is not to engage fully with this body of literature as it obscures the focus on the core study of information seeking behaviour but simply to note the similar findings in that area and highlight the tension that exists because of the different application of those findings. Within information systems development work, the focus is not on those constructs as dimensions or aspects of a task but rather as processes of thought - cogitation. The exploration of these issues has been undertaken in the study of video games, business applications and other information systems. Within this body of literature, much discussion is given over to identifying problems with applications or user interfaces that decrease levels of concentration and immersions for users. The objective being to identity those problems and eliminate them, increasing the opportunities for the users to adopt those technologies into their work tasks and enforcing monochronistic behaviours. The concept of immersion is seen as having the following features or characteristics – an involvement in the task, a lack of awareness of the passing of time, a lack of awareness of the real world (Allen & Shoard 2005; Sørensen & Pica 2005). Absorption has been defined as an 'individual's trait involving a high propensity to engage in events with total attention, where the object of attention consumes all the individual's resources' (E. T. Hall 1959; E. T. Hall 1983). Similar, the temporal disassociation and deep involvement with software to complete a task or activity is seen to represent 'cognitive absorption' (CA) (2007). Jennett et al. (Payne 1976; Payne 1982) notes in an exploration of the different conceptual constructs that there is convergence in studies of immersion and cognitive absorption and that temporal and spatial dissociation are common to both. While those models all present different relationships between the constructs presented, they all have an element of convergence in that whatever gradualism of immersion they present, they all include an element of temporal and spatial disassociation on the part of the user.

While these are likely to highly desirable states for individuals using devices within 'safe' environment or alone, developments of this type seen to increase the level of risk to officers and therefore decrease the level of usability for police officers and others in similar situations. This is not to suggest that those problems are intractable but that a different set of thinking is required when designing systems and interfaces that are to be used by individuals in challenging situations. This idea of cognitive absorption could also be

seen as an alternative explanation for why officers return to the intermediation service. Leo and Cho (Sørensen & Pica 2005, p.143), in an exploration of consumer behaviour when using intermediation services, argue that their 'cognitive capacity' (p .95) is stressed by attempting to do too much at once when attempting to process information, and that the benefit derived from the use of an intermediation service in these circumstances is how they assists the client group in managing their limited attention across a variety of information sources and activities. Here, the use of the information intermediation services allows the officers to concentrate more fully on their interaction with the public.

While this decontextualisation and the engrossment of the officers with the devices are important to the understanding the reasoning of the officers for abandoning the technology, they were not the only temporal concerns that arose during the trial. The comments of the officers make it clear that there is another dimension to the introduction of the PDT and the temporal aspects of their interaction, one that more full encompasses the stopped individual and demonstrate a change in their relationship. In addition to their concerns about the engrossment they encountered when using the devices, the officers also made frequent comment to how they felt the devices changed the nature of the interaction with the stopped member(s) of the public. These "between" moments, when not entering information into the devices, seem to be as important to the rejection of the technology as the engagement with the devices. The changes to the work task in these direct interactions with the Stopped member of the public can be seen as a flip to the decontextualisation and modalisation discussed above, here the issue is the change to the rhythm of the interaction and the heighten perception of the passage of time. While the officers or organisations do not impose an absolute limit on the time taken for the Stop and Search task, the rhythm of interaction and the desire for the Stopped individual does seem to impose its own qualitative measure of how long the task should take and what the temporal deadline is. It has been acknowledged that when performing activities, that individuals or parities' of individuals will try to conform to social rhythms' of interaction (Burnett et al. 2001; Chatman 1999; Chatman 2000) and Here the officers, while not able to provide a definite time period for how long a Stop should take to perform, reported periods of between ten minutes and twenty minutes for a 'normal' Stop. The sense of deadline being experience by the officer is subjective and the scarcity of time being dictated by the tension felt by the officer's interaction with the stopped individual and the

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tone of their conversation. The very presence of these 'between' moments also seems to represent a change in sequence with officers, who, when using the radio to provide information to the intermediation service keep eye contact and in conversation with the stopped individual.

The disassociation described when using the devices seems to carrying over into the more fragmented conversations with the individual, leading to a sense that the encounter is more disjointed. It introduces a rhythm of alteration into the encounter that was undesirable, and where the officer felt that there was discontinuity in the conversations with the individuals, many noted that they would lose the point at which the conversation has stopped and they had to try and recall what had been said, often to the frustration of stopped individuals. Moreover, the comments in the case study in chapter 6 suggest that the officers feel that they had transgressed the accepted social norm or deadline for how long the confirmation of identity work task should take. Alternatively some officers felt that using the devices to increasing the time of the Stop was useful when the stopped individual was being less compliant than they wished, officer 21 noted that when dealing with intransigent individuals, that 'let's just say, you might drag it out a bit [The performance of the Stop] if the individual is not being as helpful as they should be' (Officer 21).

Those remarks and their influences on the behaviours of the individual officers on the trial can be seen to parallel the 2005 study of Sorensen and Pica who argue that the interaction with the public leads to a situation where the need for monochronistic engagement 'intensifies' (p. 143) and the ability of the officers to multi-task and engage with the technology decreases as they engage with stopped individuals in often tense situations. The technology therefore is problematical because it requires the stopped officers to engage in polychronistic behaviour – what was described earlier as an increase in task complexity.

7.4 Changes to the temporal location of aspects of the task

While the use of the devices for aspects of the task which required intermediation or interaction with the public were considered disappointing by the users, analysis of the officers' accounts indicates that the devices were seen by some officers to provide benefit when used by the solitary uniformed officer in situations where the perception of risk was

low or non-existent. The devices allowed the officers to restructure or rearrange aspects of this work task, in particular elements of the sub-task of the conclusion to be performed after the interaction with the public has ended. Officer 7 noted that 'because the officers are concentrating on getting the right thing in the right box, you lose focus. With a pencil, I can scrawl but still keep the eye on someone, but I will still have all the details. I just find it easier and I still maintain that point of contact, then I'm going to do it later, I can put it through the kit [PDT] later', while officer 18 noted that 'you can fill it in [the electronic stop form] in the car later'.

It is important to distinguish between two separate outputs of this data collection, the officer for auditing purposes has to provide a receipt of the Stop to the organisation; if requested they also have to provide a record to the individual who had been questioned. On the trial, the printer allowed the officers to provide a record to the individual and the device automatically sent a receipt to the organisation's audit database. In the original process, the officer would complete one copy of the form and retain the carbon copy. In practice, the officers would find that most stopped individuals would not ask for a record and were keen to terminate the interaction as soon as possible. In this example of usage, the original intermediation process (the use of the radio and paper for noting down information) remained unchanged, but the devices were used to replace the paper based forms that were part of the administrative/audit aspects of the work task. As the interaction itself has concluded, the dominant thematic issue of perception of risk is not a relevant concern for the officer, or at least its importance has receded and the officers were therefore not concerned with task complexity or the constructs identified above. They could allow the eye to dominate and complete the electronic form using their notes at their own pace and with no concern for their safety. The devices therefore have another temporal impact, they allow for the temporal location (when events occur in relation to each other) to be shifted, from a period where the pace is fast and there is an intensity to the interaction, to a time where they can fully concentrate on completing the electronic form. The information provided by officers regarding what would happen, if an individual asked for a record of the Stop are limited, and were mainly related to the common view[13] that people did not wait and therefore this is not a major issue for the officers.

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[13] While the Home Office and other organisations collects quite detailed statistics on the use of the Stop and Search power, they do not seem to collect any information that be used to independently collaborate this viewpoint or to determine how representative it is of reality or uniformed officers as a whole.

Consequently, it is therefore difficult to draw any firm conclusions from this type of use of the device – for example, would they use the device if asked by an individual to provide a record or simply write out their notes on a paper stop form? Moving away from the perception of risk issues, Bardram (2000) discusses scheduling as being partly the practice of 'negotiating temporal concerns' (p. 192) and the use of the devices in this way can be seen as a way to overcome the temporal concerns associated with transgressing the perceived accepted deadline for performing a Stop and Search and detaining a member of the public.

Manning (1996), in his exploration of the 'sailor phone'[14], noted that one of the possible outcomes of technology implementations within policing was counterappropriation, the use or modification of a technology to undermine the domination or the control of the organisation. In his study, officers were using mobile phones to undertake activities, such as contacting the public, without having to make use of the information intermediation and therefore rendering them invisible to the management and auditing processes. Here, the officer makes use of the device to complete an element of the Stop and Search task that is intended to be completed during the interaction simply because the stopped individual may want a copy. Consequently, the use of the devices in this way undermines this organisational aim. Tied to this, the device was intended not only to provide the officer with the means to quickly perform a Stop and Search task, but also to improve the audit process and provide statistical information for the purpose of management statistics and 'compliancy' – to show that the organisation was not stopping a disproportional number of member of ethnic communities and also that the officers were meeting their local performance targets. As discussed in the literature review, this shift is seen as part of the increased focus by officers on meeting performance targets and as part of the new public management (Clarkson et al. 2007). Some of the officers made a connection between the devices and wider changes to policing culture and perceived the devices as an attempt to more closely control and modify the behaviour of the uniformed officers group. For this group, the change was one about an organisational culture that did not '... want you to be police officers they want you to be robots with tools, rather than go and fight crime' (officer 9). Other officers took a similar view, but saw the use of the devices in this fashion as a way to demonstrate their competency, officer 10 noted that: 'Well, before this

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[14] 'Sailor is not a nautical reference but rather a commentary on the Texan pronunciation of 'cellular'.

[PDT] came along, we might be asked to go on patrol in a specific area and make sure you stop people and not wander around and say you didn't see anyone. Before you would come back and Say "I did a few but I have to type up my notes'. Now, you come back and they say "how did you get on?" and the information is already on the system. On this basis, the benefit for these officers was not during the Stop and Search process, or for its ability to replace the information intermediation service, but for its ability to allow them to better hand their administrative burdens without returning to the station house whilst also showing compliance with the performance goals imposed by the organisation. This finding is not unexpected and has been seen in most studies of mobile technology within policing (Hertzum et al. 2002; D. W. King et al. 1994), indeed the interest in mobile technology within policing has largely been based on the desire to keep officers out of the station for longer periods of time (2005). This goal is also undermined by the use of the devices, as some officers noted that they would use the devices to complete Stop forms using information they had completed in their pocketbooks after returning to the station. This was seen as easier than waiting for computer terminal to become free in the station and also because the forms could be completed without interruption by members of the public.

The relationship of mobile technology within policing and its ability to change behaviour in relation to time location and deadlines has been noted within the literature, Norman and Allen (2005), in their investigation of mobile technologies within a policing environment noted that the introduction of laptops allowed officers to both concentrate on a single task (monochronistic) and engage in multiple tasks (polychronistic) as they saw fit and as circumstances allowed. Similar changes have been observed within other examinations of mobile technology within policing (2000). What is problematical about those readings and indeed the analysis here is that the concept of polychronistic and monochronistic behaviour as expressed within the mobility literature is treated in a largely technologically deterministic fashion – the presence of the technology has inherent properties that changes the actions of the individuals engaged in the tasks. The concepts of monochronistic and polychronistic behaviour within the mobility literature are often narrowly focused on the dimension of time; we can do many tasks in this period of time, we can do one task in this period of time. However the application of these concepts is divorced from their origins in behavioural and sociological research where it was determined that people can be monophasic (they like to complete one task at a time) or

polyphasic (they like to complete many tasks at a time), and that in turn those behaviour are influenced by the wider organisational and social cultures (D. Best et al. 2004).

The (local and remote) mobility literature takes its stance on polychronistic and monochronistic behaviour from Barley's (1988) widely cited work on the changes to working practices within a radiology department within a hospital. However, that discussion was situated within an identification of the existing relationships that exist between the network of actors within the hospitals, and how they were changed. This was used to evidence the idea that the introduction of radiology machines changed behaviours and make workers within the hospital work more in synchronisation with each other and increase the amounts of polychronistic behaviours that were occurring. What is important, is that the organisation already had some very complex networks and interrelations occurring between the various actors in the hospital, and the more relationships or networks that exist, the more likely than an individual is to engage in multiple tasks at once, often simply by necessity. Within many of the policing studies, the discussion concentrates on the isolated individual officers performing tasks with the assistance or interaction with others, here the completion of the Stop and Search form does not require the interaction of anyone else in the organisation, it is a solo activity, there is no compulsion or need for the joint action that Barley and later writers such as Bardram & Bossen (2005) see as being at the centre of those changes. As this is not a cognitive study, it therefore remains unclear what the relationship between the introduction of technology and those identified behavioural types is. From the research conducted here, it is not clear if the devices lead to changes in the amount of monochronistic or polychronistic activity because of the inherent properties of the device or if that is too pedestrian an answer and that they simply provide the means for those who would engage in the behaviours as a matter of course. Without performing detailed cognitive work, it cannot be determined if polychrons report that the devices allow them to multi-task, simply because it confirms to their personality type and that the devices simply enhance or allow them to engage in their preferred forms of behaviour, There is no extant work on the behavioural preferences of mobile workers that considers those points, so there is no literature to drawn upon for guidance. If the dominant culture is one of polychronistic behaviour, and the introduction of the devices reinforces or enhances this behaviour, then this is clearly a different impact of the introduction of mobile technologies than if the culture was

monochronistic and was significantly altered due to the presence and acceptance of mobile technologies.

7.5 The value of the intermediation service

Lundin and Nulden (Bardram & Bossen 2005; Hutchins et al. 1999) see the tools that police officers carry and find useful as being closely related to their ability to perform their duties and tasks in a competent manner. Here the cumulative impacts of all of the spatial and temporal issues identified by the officers and discussed in the previous section means that for the solitary officers, the devices do not provide sufficient usefulness to overcome the usability issues when interacting with members of the public, they do not make them more competent. However, when not engaged in interaction, and therefore not requiring intermediation, the PDTs provide some benefits for the performance of mundane administration and data capture tasks. For the individual user, for all of the perceived problems with the existing information intermediation, it is clear from the usage of the devices that it was preferable for the solitary uniformed officers. The benefits of the service is not simply the provision of the information, but that having someone or something else perform the information enquiry aspects of these types of interactions allows them to concentrate more fully on the interaction with the member of the public and environment around them. The use of the service prevents the sub-ordinate information enquiry tasks from interfering with their management of the interaction. As officer 10 notes:

> Say you were stopping someone in the street and one of the first things you need to know is who is this person, are they known to us and have they got any warning markers? So if you getting the piece of kit out of your belt and then put your head down and start typing in the password then you are taking a little bit of a risk. You have to be really quick or you could say 'oh well ok I'll chance it a bit' 'I'll try and hold it up at bit and do it that way' for the amount of time it takes I'm not really prepared to stand there and start getting into a piece of kit like that. Because you don't know who they are when you're doing it the old way, **with all the problems with the old way, you can still keep an eye on the subject.** You need to keep an eye on the subject. For that reason it makes much much more sense to use the radio.

The eye is allowed to dominate but it dominates for the purposes of managing the environment and the information seeking not the enquiry tasks. This is the 'added value' provided by the traditional intermediation service to the client group of the uniformed

officers. It is evident that when undertaking information seeking, that subjects will make choices that maintain an acceptable level of accuracy at the lowest level of investment (Savolainen Spring, p.115) – simply put, the call-handler is accurate enough for the information need of the officers when considered against the risks and problems presented by the PDT. Moreover, the existing technology used, the radio, is one that can be coupled and decoupled quickly. This is one of the primary reasons for its permanency within policing, it can be engaged or disregarded rapidly and as a result, attention can be shifted 'when required in the now' (Bardram 2000, p.139).

[xli] An officer on the trial, when asked for an example of how this was achieved discussed what officers do when they think they are being given a false date of birth. They will ask the stopped individual to quickly tell them their star sign according to western astrology, if the individual is hesitant or gets the answer wrong, this is seen as an indicator that the information they have been provided with is incorrect or misleading.

[xlii] 'This training system focuses on using pre-determined steps, scripted phrases, responses that deflect insults, showing of empathy, and gaining compliance through personal appeals' (2005).

Chapter 8 – Impact on Relationships

8.1 Introduction

In the previous chapter, the failure of the Personal Data Terminal (PDT) and the disintermediation process was attributed to a number of spatial and temporal issues associated with the work task and the influence of the dominant issue of the perception of risk on the behaviour of the uniformed officers, resulting in an unwillingness to use the PDT for the purposes of completing the Stop and Search. Moreover, the use of the device also introduced separate but related changes to the rhythm and pace of the interaction between the officer and the stopped individual; again heightened by the sense of risk. The officers perceived, using their own subjective internal measurement of the passage of time, the devices as being slower than the intermediation service for tasks such as the confirmation of identity and therefore the extra time taken heightens the tension experienced and changing the tone of their encounter for the worse. Tied to this, because of the engrossment with the devices, those 'in-between' moments of interaction with the stopped individual became fragmented and subject to discontinuity, leading the officers to feel that their ability to manage the encounter was diminished. This lead to concerns for the officers which they associated with the theme of risk in the form of 'officer safety', a police specific occupational construct that cuts across all of their activities when working outside of the station house and guides their actions when considering the best ways to proceed towards their meaningful goals and undertaking associated information-related tasks.

8.2 Non-registered users

Given the failure of the PDT to change the behaviour of the solitary officer as intended, the project team were surprised to note that as the number of officers present at an incident increased, so did the number of Stop and Searches performed and the willingness of the officers to use the technology. In addition, the audit database being developed by the project team as part of an overall organisation commitment to reduce the

disproportionality of Stops against ethnic minorities indicated that the work task was either being performed, on behalf of or by, officers that were not registered as participants on the trial and were not issued with the PDTs or peripherals such as the printers. When asked to clarify the presence of officers not on the trial on the Stop and Search audit data base, officer 7 noted that,

> I've done it while a colleague is talking to the person I'm putting the information in for the Stop slip and running the search but it's them that is doing the [physical] searching.
>
> Researcher: Oh right I get you, so all you are doing is the data entry?
>
> Officer 7: Yes, just the data entry and checking on the PNC.

Similarly officer 18 notes that 'if you have it [the PDT] and there are a few of them [stopped individuals], it's easier than running checks on the radio'. It is important to note that the officer whose name appears on the stop receipt as having performed the stop is the person who is deemed to be responsible for the legality of the Stop and the performance of the subsequence interactions and questioning of the stopped individual or individuals. The decision to use the devices in conjunction with other officers does not seem to be planned or pre-determined in that it occurs because the officer is there and equipped with the technology at an opportunistic moment. What is clear is that the introduction of the technology changes the ways that the officers interact with each other, their environment and how they manage their information seeking.

8.3 Changes to task performance

In Chapters 5 and 6, the Stop and Search work task was discussed in terms of four activities or sub-tasks that make up the larger Stop and Search work task. These were the Stop (initiation), the confirmation of identity, the search, and the exit (conclusion). Each of those tasks has its meaningful goal and a set of objectives that the uniformed officer attempts to complete as he progresses towards the conclusion of the Stop and Search work task and determines if the stopped individual should be sent on their way, arrested or other action should be taken. As discussed there, the main intended benefit for the officers in terms of their management and remote direct access to information sources, was their ability to undertake their own searches of the Police National Computer (PNC) for the purposes of identifying the identify of a stopped individual. It was in this

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performance of the confirmation of identity task that the most frequent use of the PDT occurred and also where the critical point of failure was identified because the officer was asked to perform both the information acquisition and enquiry at the same time leading to the feeling of decontextualisation mentioned previously. When asked about using the devices in collaboration with others, the officers made a number of remarks that differed from their statements when discussing the problems and issues that arose from solitary usage. Officer 10, who described the same problems as other users such as engrossment, virtualisation and the coupling/decoupling effect, had a different perceptive on the devices when considering the completion of group Stop and Search situation. In that particular set of circumstances, they note that when used with a group of other officers that the situation was much changed and it was not simply that officers were using the devices to complete the Stop and Search receipt for their colleagues:

> It's a superb piece of equipment for Stop and Search, because you can put a person in [to PNC for confirmation of identity] and then another person and then another so you can have five people on it very quickly. So that would make it much, much quicker than it would writing it down. One person on their own it would probably take the same amount of time as doing it on paper.

The most obvious change to the use of the PDT within collaborative situations was that it introduced a level of variation in what the officer would do with the device during others officers' performance of the Stop and Search task. In this group situation, the PDT equipped officer was seen to perform two activities for their fellow officers; they were i) perform PNC enquiries for his colleagues, which is part of the confirmation of identity task and ii) completing the legally required record of the work task for a colleague, which is part of the exit (conclusion).

During their performance of these tasks, the officers are constantly communicating to each other about the pieces of information that they find, especially when examining bags or other belongings of a stopped individual. In addition, while a check on the PNC is often helpful to determine the identity of someone, the majority of stopped individuals will not have a criminal record and therefore will not feature on this system. In these circumstances, the communication between officers helped them to establish the truthiness of the information provided and what other sources of information they needed

to obtain to confirm identity[15]. In addition, the objects and forms of identification that an individual may have on them will help the officers to determine how valid or truthful their information is. An iterative pattern of information seeking-sharing-seeking can be seen to form, the individuals move between the different states as they examined objects, question the individuals and compared what they find with each other. Reddy and Jansen (2005) in their investigation of collaborative information behaviour amongst medial workers in various contexts noted that during verbal communication, that individual would take their turn to speak. While the officers would demonstrate this behaviour when interacting amongst themselves, when engaged in conversation with a stopped individual they would often talk over each other when addressing the stopped individual, in particular, when performing the confirmation of identity task or when trying to establish what an individual was doing or where they were going. Those tactics were an accepted method to try and catch a stopped individual out in a falsehood, and was by officer 17 as a way to 'get to the truth'. Coupled to this, officers would often repeat questions that had already been asked by a colleague, also in an attempt to try and determine the truthfulness of a statement. The other complexity that exists here is difficult to quantify; policemen put much stock in their ability to 'sense' if a stopped individual is simply nervous or trying to mislead them, what they described as the 'copper's instinct'. In situations, where the search has turned up nothing that the officers deem interesting or indicating criminality, and the confirmation of identity has turned up no criminal record and no known links to crime, the officer would formulate increasingly complex questions to try and 'catch out' a stopped individual if they thought that someone was amiss with the behaviour or answers. Officer 22 noted that the framing of questions was particularly important in getting people to co-operate

> I could ask, "Have you been upto no good here?" and that puts them on their guard and they can get argumentative. How I do it, is to say "We're just trying to establish what happened. You haven't done anything wrong have you? So you have no problem with helping me?" it works better framed that way.

In some circumstances, the officer with the PDT would, once he has established that the stopped individual has a criminal record, wait for the conversation between the officers conducting the questioning to subside before interjecting that they had found information

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[15] A point to note here is that unless other European countries, there is no requirement for citizens of the United Kingdom to carry any form of identification.

that the stopped individual was being less than truthful with them. The interaction of all of these different tactics seems to be representing a group understanding of how things should be done. Where the information need was complex, it draws the attention of more officers, and drove their actions, with them splitting the information task down into smaller pieces or elements. For example, in some situations, the stopped individual will (or will attempt to present as) someone with limited or no English language skills. In these circumstances, the officers had to work together more closely because the stopped individual was unable to articulate clearly much of the information that officers needed to complete the task. Officers indicated that they would undertake information acquisition tasks with whatever artefacts they had at hand. For example, if the stopped individual was in possession of a map they would ask them to point out where they were staying or similar information, in this way, a picture of the individual could be built up while the PDT officer performed checks. The presence of foreign individuals in the country seemed to be a bone of contention for officers, not on racial or immigration grounds, but because of the lack of information on such individuals and the difficulties that this lack of information sources caused them when trying to complete either the Stop and Search work task or similar tasks when identity needed to be confirmed. These individuals will have no record on the PNC or other information systems, and it is often easy for them to present identification that belongs to other individual or simply that they have no identification. Moreover, if they are in the country for short periods of time or are constantly moving, this makes it more difficult to obtain reliable information on an individual. Officer 20 noted that one of the issues he had faced when dealing with individuals in cars registered overseas was his inability as an officer to obtain useful information:

> It's a con really, they come here, they buy a car in one country, they register it in another, you've got no way to work out who owns what or even who's driving licence it is. They knew this; we know this, that's why they do it. Unless they are involved in a serious accident, it's a lot of hassle, often you think 'is it worth it taking the time' [to try to establish identity]?

The presence of more officers also introduced changes to how officers made use of physical space, often with impacts on their information seeking activities. The physical configuration of the officers and the stopped individuals is quite fluid and changes as the officers undertake the different tasks that make up the stop and search. Their training in regards to 'cover' and 'officer safety' and their experience of working on the streets helps to determine where an officer decides to stand. Moreover, the position of the officers in

regards to a suspect was intended to help in the information seeking process. Officers would move to opposite sides of the individual so that the rapid questioning from either side would help to determine the validity of the statements that they were making. Officer 17 noted that when they were working with other officers, he preferred to stand slightly to the side and behind the suspect; this was so that while he could ask questions as needed, the individual was 'boxed in'. In addition, officers felt that this configuration provides a psychological edge over the stopped individual as they had to divide their attention between officers in two separate spatial locations. As discussed in the previous chapter, the individual officer is limited in how they can control the movements of individuals or manage multiple stopped individuals in a public space, or indeed, position themselves for the purposes of productive information seeking. Here the extra number of officers allows the movement of people to more effectively form part of the information seeking processes. When there were two individuals, the officers (if numbers permitted) would separate them so that the answers provided by one could not influence the answers of the other, the spatial movement of the actors influencing the unfolding flows of conversation and information. In larger group situations, the officers would separate an individual from the group for the same purpose, to be able to question them without others influencing or being influenced by the answers they gave. To do this to multiple individuals as the same time, allowed officers to effectively compare and triangulate the responses they were receiving from multiple individuals.

8.4 The removal of information intermediation

In the previous chapter, it was established that the most critical change to the existing process was the disintermediation of the call-handler from the confirmation of identity task and the desire of the organisation for officers to formulate and mange their own searches of the available information systems. In chapters 6 and 7, the sometimes negative views of the officers towards the call-handlers were noted. The officers and the call-handlers inhibit two connected but different communities; they access the same information but have different concepts about its use and usefulness (Axtell et al. 2008; Kristoffersen & Ljungberg 1999b; Perry et al. 2001). Officers were particularly concerned about the quality of information they was provided to them over the radio system. In turn, the call-handlers also had their own views on officers and their requests for information. Call-handler three noted 'I work really hard at my job, every job my officers are dealing

with, I give them as much detail as possible, anything I can do to help', while Call-handler two noted that 'An officer is dealing with one incident at a time, it's very stressful, I'm dealing with many things at one'. Call-handler one also noted the stress that they felt the job involved

> 'You have heard the phrase, 'like juggling cats?', that's how I feel some days in here, like I'm juggling cats but one handed. It's especially bad when we are down on numbers [of officers available per shift for operational deployment]. I might have on-going enquiries that are on the deferred list that means nobody has followed them up'.

It is important to note that call-handlers are not only dealing with immediate requests for information and assistance but also trying to ensure that tasks that were not completed on the previous shift or indeed over previous days were deferred tasks from previous shifts were seen to. Call-handler four noted that

> 'I have a job here that requires a phone call to a lady simply to see if anyone has followed up on a problem she has, nobody has done it, its laziness, they [the officers] say it's because they don't have the time. They can have selective hearing when you ask if there is anyone available to deal with those things'

The call-handlers saw some of the problems with the quality of information being provided to the officers as being related to the automatic call distribution system that allocated requests for assistance to the next available person. Call-handler 5 noted that 'some of the calls for complex requests for information go to less experienced comms operators [Call-handlers] and they struggle with it' and that 'I don't think some of our training is upto scratch, it's quite hard to think things through when you have a lot of jobs [tasks to allocate or complete] on, lots of jobs deferred and you are trying to make headway'. The stress of the job was also related to having to the contact with the public, 'People will literally phone up for anything, literally anything. "My pizza is late, someone sent me a nasty text message, there are kids hanging around"' (call-handler four).

It could be argued that, on the basis of basis of the officers accounts of the collaborative completion of the Stop and Search work task, that this simply represents a downward movement of the aspects and responsibilities of the work task carried out by the call-handler to the PDT equipped officer and that accounts for the changes to the work task as outlined below in figure 27.
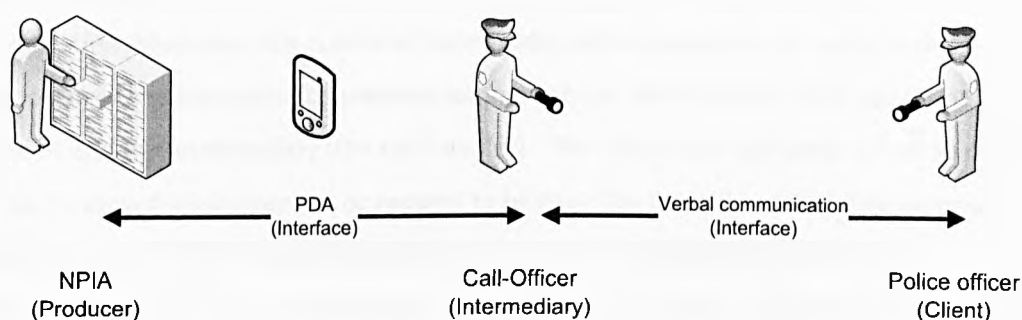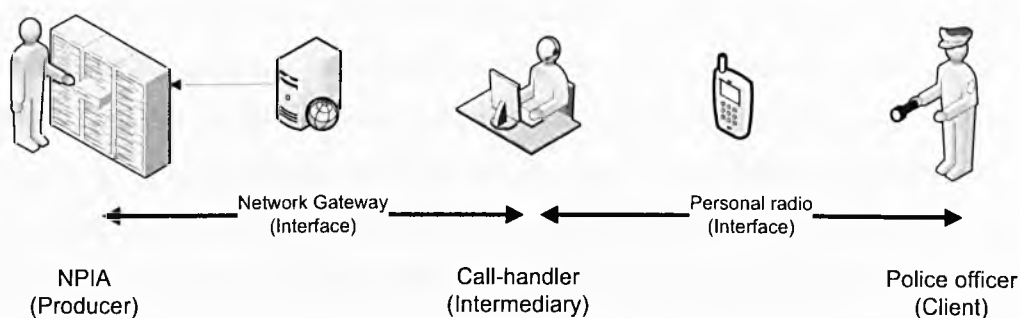
Figure 27: The intermediation process before and after the introduction of the handheld devices in group situations

In the changed process, the police officer and the PDT equipped officer communicate verbally and this results in the officer (referred to as the **call-officer** in the diagram and the rest of this chapter) formulates and submits searches via the PDT which in turn are sent to the National Police Improvement Agency, the organisation that manages the PNC. Fundamentally, as the diagram suggests that, in terms of the process and the flow of information indicates that this is not very different from the traditional method of the call-handler managing this part of the confirmation of identity task. However, the simple act of the call-handler not being embedded in the spatial and temporal context impacts on the completion of the task in a number of important ways.

Officers noted that the remoteness of the call-handlers from the scene, both temporality and physically meant that they could not fully comprehend the urgency under which the officers performed this work task or indeed asked for information search/enquiry activities to be undertaken for any number of similar tasks (such as the identification of the registered owner of a vehicle). Within the intermediation literature exists the concept of

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information asymmetries – where differences in skill, experience and specific knowledge of the time and space context embed in a work task cause difficulties in the intermediation process and the provided a barrier or limitation on call-handlers' effective participation in the process (Manning 1996). The call-handler as agent has a different perceptive and place in the organisation, they possess a different domain expertise and as their main role is management of information between the field, officers and the organisation, they have a level of skill in manipulating internal information sources such as the intelligence system and external ones such as the PNC. However, temporally and spatial, they are distant and removed; they lack the Hayekian 'knowledge of the particular circumstances of time and place' (Hayek, 1945, p.524), and as distance increases, this inhibits the ability to share information. Moreover, the nature of police radio communications also adds to this remoteness and promotes fragmented communication between the client (uniformed officer) and the intermediary (the call-handler). The officer will hold down a button on the radio to allow their instruction or request to be heard by the call-handler. The purpose of this is to ensure that call-handler time is not wasted while they wait for officers to formulate their requests for information or other actions, and to prevent confusion, whilst also allowing the call-handler to distinguish between conversations directed at them or someone physically co-located with the officer. Even with these procedures in place, it has been noted that there are many issues that are common to this use of telephony, *Beyond the call* (2007), a national review of call-handling standards within police call-centres[xliii] by Her Majesty's Inspectorate of Constabulary (HMIC) notes that 'general radio disciple is poor – exemplified by a lack of clarity over the meaning of radio transmissions' (p. 74).

In addition, the officer and call-handler relationship is designed to be non-continuous; the call-handler does not wait for the officer to formulate further information search requests but deals with their immediate need and then moves on to the urgent requests of other officers as and when they are allocated to them by an automatic routing system. If the officer performing the Stop needs to obtain additional information or clarification, then they will be routed to the next available call-handler who may not be the same person as before. The call-handler is working against the ticking clock; their performance is measured in minutes. The call-officer, in contrast, has continuous communications with his colleagues due to his close physical co-location, a factor that has been identified as presenting more opportunities for the exchange of information and increased performance (Burnett et al. 2008; Culnan 1985). It is therefore, not that they simply lack

the 'knowledge of the particular circumstances of time and place', but that their different occupational role imposes upon them two different objective temporal scales that dictate their behaviour. The officers on the ground are t not only in sync because of their co-location but also because they share the same occupational expectations about how the Stop should progress and how the sub-tasks such as the confirmation of identity should be performed. This gap of time and distance is amplified by the occupational differences between the call-handler and the officer and means that the collaboration between the two is contested. The officer and the call-handler are working together to complete a task but they have their own separate needs and requirements due to the differences in how work tasks relate to their occupational roles. The thematic issue of performance and its importance within the policing culture, as tempered by the new public management ethos and the demands for more accountability was raised in the literature review.

While the police officer and the call-handler are part of the same organisation, the roles are occupationally very different and therefore assigned their own numerical and temporal values when considering and measuring performance and the ability of each to carry out their assigned duties. The role of police call-handlers has come under particular scrutiny in the last five years and has been subjected to immense pressure to improve the time take to answer and deal with calls from both the public and members of the organisation. When examining the role of call-handlers, the HMIC investigation into police call-centre *Beyond the call* noted that 40% of call-handlers cited 'Pressure/stress/unmanageable workloads' as one of the top three reasons for wishing to leave their role within the command and control environment. In the same survey, 11% noted that management priorities for statistics (p.69) also increased their desire to wish to leave the role. In their study of the adoption of mobile working by officers, Allen & Wilson (Stop and Search Action Team 2005) provide an example of this differing reward system by providing an example of the strained relationship between call-handlers who were judged on speed rather than quality of information and officers. The call-centre visited by the researcher had a number of large LCD screens that were constantly updated with statistics about performance and the time taken to answer and deal with calls. It is difficult to independently confirm the narratives contained within those accounts because the information available about the quality of call-centre staff is fragmented and no common measurements are currently employed although they are in the process of being introduced[xliv]. Of course, the individual officer also operates under the weight of

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disciplinary coercion, and is subject to performance targets related to the clear-up and detection of criminal activities. These targets are decided by the senior management team and those trickle down to the operational level, they might relate to increasing the arrest rates for burglaries within a given geographic area or increasing the perception of citizens of the visibility of police officers in their neighbourhood. However, when considering the transaction that occurs, the intermediary experience, there is a disparity in the relationship between measurement of performance and the passage of time for those two actors. In a typical Stop and Search interaction, that measure is not applicable to the officer, he will be judged on a different scale, at the end of the shift or when figures are collocated and analyzed at the end of the month. He is not concerned with clock time in regards to a Stop and Search process taking twenty minutes (although as mentioned in the previous chapter, he's may be concerned about it in a subjective sense depending on how his interaction is progressing with the stopped individual) or that it will impact negatively on his overall performance, the scales are simply different.

8.5 Management of information

Sonnenwald & Pierce (Manning 2001) in a study of information behaviour as related to the command and control practices of a military unit note that for successful completion of their duties that the soldiers need to demonstrate 'Intragroup situational awareness'. An important aspect of situation awareness is temporal, it is the continuous or near continuous scan of the environment or situation and using that information to build upon pass knowledge or experience. In the previous chapter, the role of immersion and cognitive absorption was discussed as one of the reasons for the failure of the PDTs to change the practice of individual officers. The key aspects or traits of the phenomena were described as i) lack of time awareness, ii) lack of situational awareness and iii) involvement with the task environment. If not eliminated, the concern about decontextualisation and being drawn into the device as seems to be decreased to a level where it is not a primary concern for the call-officers in regards to their ability to process the information enquiries of their colleagues or have concerns about their safety. Indeed, in some of the descriptions provided by the officers, the simple steps of standing against a wall and/or being slightly physically remote from the interactions of their colleagues with the stopped individuals seems to also have a positive effect of their assessment of personal physical risk and the tempers their fears of engrossment in the devices. The officers' work together to perform

this scan and therefore their knowledge of the locale is enhanced. One officer may notice something about the environment that others have missed. For example, it is common for people carrying small quantities of drugs to drop them to the floor or attempt to swallow them or conceal small bags or 'wraps' in their cheeks while an officer's attention is diverted (Savolainen Spring). The presence of many officers makes it possible for the group to work together to 'analyze and synthesize information collaboratively and orchestrate or synchronize actions their group.' (pg.472) in a similar manner to that described by Sonnenwald & Pierce. It also seems apparent that the usefulness and indeed the usage of the devices are greatly enhanced by the presence of enough officers to be present for interwoven situational awareness to develop and also where they are confident that there are enough officers to ensure their safety while they concentrate on information related tasks.

One of the common themes in the extant literature around collaborative information behaviour is that the individuals interacting will have complementary but different domain expertises or skills. For example, the concept of socially distributed cognition is based around the observation that participants who collaborate are likely to have varying expertise and therefore have to engage in dialogue for the purposes of negotiated collaboration and to overcome difficulties in the completion of their task (2004, p.294). Similarly, the work of Sonnenwald and Pierce mentioned above was exploring interwoven situational awareness in a situation where all of the actors were from a shared military background but had different roles and information needs and are attempting to perform their own activities and work tasks. A critical difference between that study and this is that the soldiers formed a team by having different specialist roles, so the working of the group task involved a synthesis of individual but overlapping domain expertise. In this study, the constitution of a team is that of people with the same domain expertise – they are all intervention officers or pro-active crime officers. While the relationship between the call-handler and the uniformed officers may fit these observations as discussed above, within the group context and use of the technology, the uniformed officers are not only from a shared occupational culture, but also have a shared role and understanding of the information they wish to obtain and how it will be used. Moreover, as discussed above, they are in temporal synch, not simply in regards to their spatial co-location but also in regards their occupational/role needs, the organisation's expectations of how they should performance and the time in which they should do it. They have a shared understanding of

the tensions and problems of working in public spaces and the fact that the interaction with the stopped individuals will be contested and may need careful management. This collaboration itself has also temporal implications, within information seeking; there is the concept of the information ground as described by Savolainen and others. Those are situations where individuals come to together for the purposes of sharing of information; this is a virtual space in that it disappears or dissipates with the conclusion of the task. Here this differs in that the behaviour of the stopped individual may not be that that is conductive to 'a social atmosphere that fosters the spontaneous and serendipitous sharing of information' (2008, p.257).

8.6 Reinforcement of the temporal location of the task

In the previous chapter, the introduction of the device was seen to have some limited benefit for the solitary officers by allowing them to complete the administrative and auditing aspects of the Stop and Search in a time and place that was more consistent with their perception of risk. This meant that the completion of the electronic form was shifted from its temporal location as part of the interaction with the stopped individual to being completed after the individual has left the area. Here, the introduction of the device had a different impact in that it reinforces the idea that the period of interaction with a stopped individual is when the electronic form is completed. The performance of the Stop and Search activity as a group allows the call-officer to complete the form because other officers are able to engage in information dialogue and the search of belongings and thus this can be done in parallel to other activities. It is interesting to note that in terms of the relationships of the officers to the organisation, that there is a similar tension with the intended purpose of the devices as a means to audit the process of the Stop and Search. For the solitary officers, the use of the devices to reschedule aspects of the task meant that a misleading impression of when the Stop was concluded, it would be assumed that the form was completed while the individual was present. Here, because officers were completing the forms on behalf of other officers, the devices provided more accurate information on when a stop was performed but obscured who did what.

8.7 The value of disintermediation

The process of using the PDT was becomes too involved and complex for the lone officer dealing with an individual because of the need to both perform information seeking and information searching while maintaining situation awareness, here the collective efforts and activities of the group provide a satisfactory situation for using the devices. The officer with the PDT, described within the chapter as the call-officer, provides a similar but distinct role from the call-handler. They provide an information intermediation service, but one that is seen to be enhanced by their continuous nature of their collaboration with others and their shared situational awareness of what is occurring by virtue of occupying the same temporal and spatial environment. Importantly, they have a shared situational awareness based upon a shared domain expertise. All of the individuals working together are uniformed response officers and therefore have an understanding of the Stop and Search task and what they are trying to achieve. The call-officer is therefore trusted as someone who can 'do the job', representing a marriage of the two roles. Moreover, through the continuous nature of their interaction and their detailed understand of what their fellow officers are trying to achieve by their questioning of an individual, they can anticipate and articulate (what they think is) their fellow officers information needs by their use of the devices to formulate and enter information enquires on the devices.

The confirmation of identity task is again the critical point for the use of the devices, but here the PDTs allow the officers to shift the temporal location (the point at which they are performed) of some aspects of their work. As an officer quizzes the stopped individual about his name, date of birth and other relevant information, the call-officer is formulating search strings and trying to find matches for the details provided. They are aware that the confirmation of identity task needs to be completed before the Stop and Search can be concluded and will use their judgement to ensure their pace of activity matches that of their fellow officers. They are able to present this information to their colleagues when they complete the search or during it, if warning markers are present on the system, rather than having to wait to be prompted to provide it in the same way that the call-handler is. The confirmation of identity task can therefore occur parallel to other tasks and is an example of information provision that is 'just in time' because of the anticipation of need by the officer.

[xliii] The 2007 government document *Beyond the Call: A thematic inspection of police contact centres contribution* notes that 'The Police Service uses two main methods of incident management: 'command and control', where radio operators take control of resources, supervise their movements and control their allocation to incidents; and 'dispatch only', where radio operators allocate resources but do not supervise subsequent actions. There is evidence that each model can work effectively. The command and control style is the one used by most UK police forces and is derived from the model used by the military; the dispatch style of incident management has been used for many years by police departments in the United States, and only more recently has it emerged in some parts of the UK'.

[xliv] In regards to this management of performance, *first contact: A thematic review of Police Contact Management* notes that 'Contact centres are generally awash with technology able to generate a wide range of performance and workload statistics. It is therefore disappointing to note the paucity of valid, comparable performance information, together with a virtual absence of national performance indicators' (Her Majesty's Inspectorate of Constabulary 2005, p.5).

Chapter 9 – Three factor model of critical factors

9.1 Introduction

A range of issues are critical to understanding the failure of the trial implementation and the use of Personal Digital terminals (PDTs) for enabling remote access to critical information sources for police officers. In Chapter 5 (*The Trial Implementation*), a case group and study was provided to give a background rationale and narrative account of the trajectory of the trial implementation. The expected benefits, for the project champions and officers participating on the trial (the case), of removing the existing information intermediation and replacing it with a system based around the use of PDTs for direct access were discussed. Moreover, the ultimate failure of the PDTs and the trial itself was highlighted as were the possible reasons for that failure.

This was followed in Chapter 6 (*The Stop and Search Task*) with a discussion of the policing task most directly impacted by the trial, that of 'Stop and Search', the legal right of an officer to stop, question and search a member of public. The changes to the relationships between officers, the public and the intermediation service in regards to this task were considered. In addition, the task itself was analysed and broken down into a number of different sub-tasks (*Initiation, confirmation of identity, the search, the conclusion*), each with a start and end and meaningful purpose. The *confirmation of identity* sub-task was identified as the element within the overall task at which the PDTs were most critical to the officers information needs and directly influenced if *the search* task was initiated. The differences between the performance of information search and enquiry activities in the status quo process (use of an information intermediary) and the new (direct access to information via PDT) were highlighted as the key reason for failure.

In Chapter 7 (*Impact on the individual officer*), the impact of disintermediation on the performance and behaviour of the individual officers was discussed. In particular the inherent difficulties of officers trying to manage their own information enquiry activities while in often volatile environments led to a range of issues around officer safety because

of the need to concentrate on the device to the exclusion of the surrounding environment and the individual(s) stopped for questioning. Of specific importance was their inability to control the environment and the actors within it due to this need for concentration and focus.

Chapter 8 (*Impact on relationships*) continued this discussion with an exploration of scenarios around group based use of the devices and how, while unintended, this provided a more successful use of the devices for the purposes of disintermediation. This was linked to intra-group situational awareness and the ability of one of the officers within the group to act as an information intermediary. Drawing together the analysis within chapters 7 and 8, a model that has relevance to a user's confidence in using mobile data devices in conflicted or chaotic situations is advanced within this chapter.

9.2 Interactions between critical factors

Within the case and the discussion that followed it, temporal and spatial factors were identified as two of the key influences in why the technology and disintermediation were rejected by officers undertaking the Stop and Search Process. To recap, spatial awareness[16] is defined here as the individual officer's mental understanding or picture of the placement and movement of people, objects and movements that are geographically proximal to them; temporal awareness referring to their mental model of the passage of time when interacting with others or completing tasks within that geographically proximal space. In the limited number of usage scenarios where the devices were not rejected, the other key factor was the number of officers present. For example, as discussed in chapter 8 (*Impact on relationships*), the TFL officers who worked together as a group found a way to integrate the technology in their performance of the Stop and Search task that overcame the temporal and spatial factors that were encountered by individual officers. The presence of increased numbers of officers is, as described within the case-study, tied to the operational activities undertaken. An individual officer or a pair of officers is the most common grouping but where officers plan to make stops of multiple individuals, then a larger grouping (5-10 officers) is often present to ensure that stopped individuals can be controlled in a safe and effective manner.

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[16] The concept is discussed in detail in Chapter 7, see section on *spatial awareness*.

As discussed in chapter 8, the devices found more success where used by multiple officers because one officer assumed the role of the information intermediary that had been removed, becoming the 'call-officer' (The officer assuming the roles and duties of the Call-handlers). In that situation, the utility of the devices were enhanced because this new intermediary, rather than simply replicating what was provided previously by the call-hander was able, because of temporal and physical closeness and their knowledge of the performance of the Stop and Search task able to provide a superior service to their fellow officers. An important aspect of this superior service was that it was continuous. In contrast, the relationship between the officer and a call-handler is designed to be non-continuous; a call-handler responds to a specific request for information and then moves onto requests from other officers. This means that multiple requests for information from an officer may be dealt with by multiple call-handlers.

In **figure 28**, those factors or 'dimensions of an encounter' are mapped against a three-axis or factor model. The model itself indicates how the interaction between these three factors determinates how likely or confident an officer is to be to use the PDT in any given situation when undertaking a common policing task such as in this case, the Stop and Search task. In terms of the *officers present*, the number can range from a singular officer (Individual), to a pair, to a group of officers. The spatial awareness of any given individual (The collective awareness is discussed later in this chapter) during an encounter can be either high or low depending on the aspect or sub-task of the Stop and Search task that they are engaged in and what it requires of them. Equally as discussed in the case study, the temporal awareness of the individual will be high or low depending on their engrossment on a single task or an aspect of a task.

Some tasks were seen to impact on both temporal and spatial awareness; for example within the case-study, one of the concerns of the officers was that, when they performed the *confirmation of identity* sub-task of the Stop and Search task using the PDTs, that they developed 'tunnel vision'. This was attributed to the need to concentrate on the devices when entering and receiving information, which in turn lead to discontinuities' in their awareness of both their physical surroundings (spatial awareness) and the passage of time (temporal awareness). Within the model, higher spatial and temporal awareness is seen as leading to the officer feeling more in control of their interaction with a stopped member of

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public and equally less at risk of physical injury. Therefore their confidence in using the device is higher.
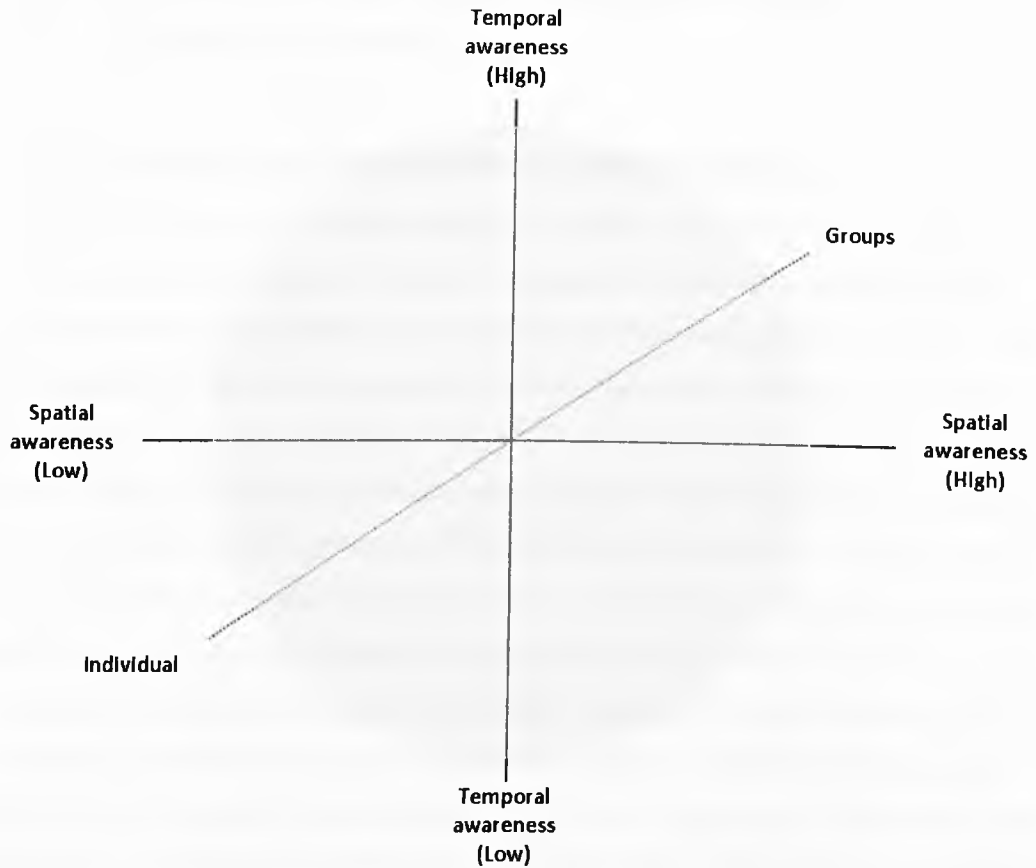

Figure 28: Three-axis model of critical factors impacting mobile usage.

The following sections consider the application of this model using three different usage scenarios that are considered typical by the case group, that of response officers, when performing the Stop and Search task. What does not change in any of scenarios is that the start and end of the Stop and Search task must be initiated and concluded by the officer and as discussed previously, they undertake sub-tasks 'in-order-to', each have a recognisable beginning and end and a 'meaningful purpose (reason)' (Bystrom & Hansen 2005, p.1055). Additionally, the regular performance of the work task means that there is an aspect of *a priori* determinability of task outcomes, process and information requirements (Vakkari 1999; Vakkari 2003; Bystrom & Hansen 2005).

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The three usage scenarios discussed are 1) The status quo – a single officer making use of the existing intermediation service; 2) The changed process (Single officer) – a single officer making use of the PDT devices; and 3) The changed process (group) – a group of officers making use of the PDT devices.

9.3 The Status quo (Single officer, intermediation)

As discussed in the literature review (Chapter 2) and the case (Chapter 5), the status quo for officers when reporting their status or trying ascertain information about the identity of an individual is via the radio service and an intermediary represented by the call-handler (see **figure 29**[17]). To briefly recap, an officer will use their radio to contact a call-handler to request information that might help them deciding if a search, further enquiries or even an arrest should occur. Within the case, the most common usage of this service was during the *confirmation of identity* sub-task of Stop and Search, as a means to check the date of birth of an individual or their registered address or to determine if they were known to the police for existing criminal offenses. During this process, the call-handler and officer engage in conversation and using the information supplied by a stopped individual, the call-handler searches the Police National Computer (PNC) for possible matching results. The argument made for this intermediation service by its organisational champions is that it provides 'added value' to the officers in two different ways, first by filtering extraneous data sources by providing increasingly granulated results based upon the information given by the officer and secondly it allows the officer to more fully concentrate on their surroundings and their face to face interactions with a member of the public.

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[17] The relationships outlined in Figure 29 are related to the use of the Police National Computer (PNC) which is read-only for the officers on the street; in regards to other data-bases, the officers can be both producer and client but this type of access was not part of the trial and therefore is not discussed further here.
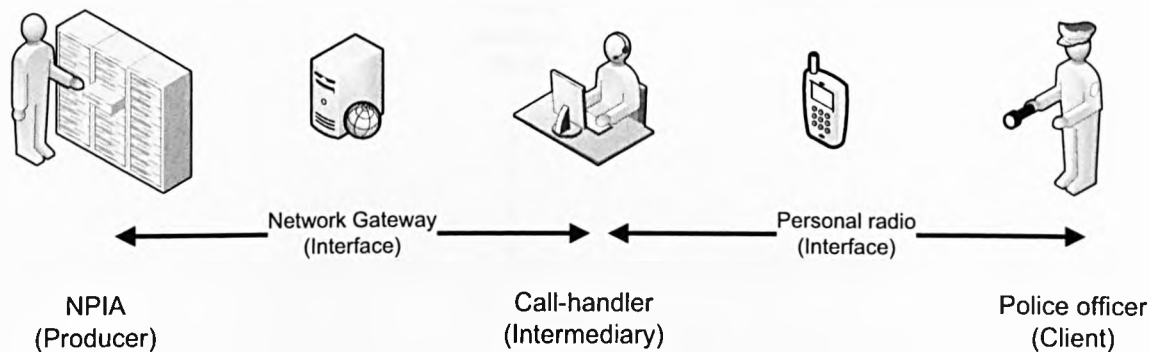
Network Gateway
(Interface)

Personal radio
(Interface)

NPIA
(Producer)

Call-handler
(Intermediary)

Police officer
(Client)

Figure 29: The information intermediation process before the introduction of the PDT

This process is mapped (indicated as **SO-I** or **S**ingle Officer-Intermediation) against the model in **Figure 30**; using the discussion and observations of the officers in the case as a basis and single officer is present and their ability to concentrate on their surrounding environment and the passage of time is relatively high. From a safety perceptive, officers were happy to follow this established process because verbal communication and the call-handler performing the data entry for the information enquiry activity, allows them to concentrate fully on the stopped individual for potential threats to officer safety[18] or attempts to deceive them either by action or verbal response. A single officer can also maintain a good awareness of the environment around them, the locale, and gauge if others may become involved or should be questioned about their possible involvement in any given situation. In addition because the radio is attached to their vest, it leaves their hands free to response to any sudden movements or aggressive actions by a stopped individual. Moreover, their ability to react to any sudden change in the environment or the behaviour of stopped individuals is also high because there are none of the discontinuities in their perception of the passage of time as experienced when using the PDT devices, thus their temporal awareness is also high.

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[18] Officer safety is where we see Waddington's (1999) two essentials of police danger and authority are interwoven. As discussed previously this is not a novel finding and has been well established in the literature. It is more than simply a description of a procedure or the use of equipment (the stab-vest, CS gas) but a term used by the officers to describe any action or activity that may impinge on their safety.
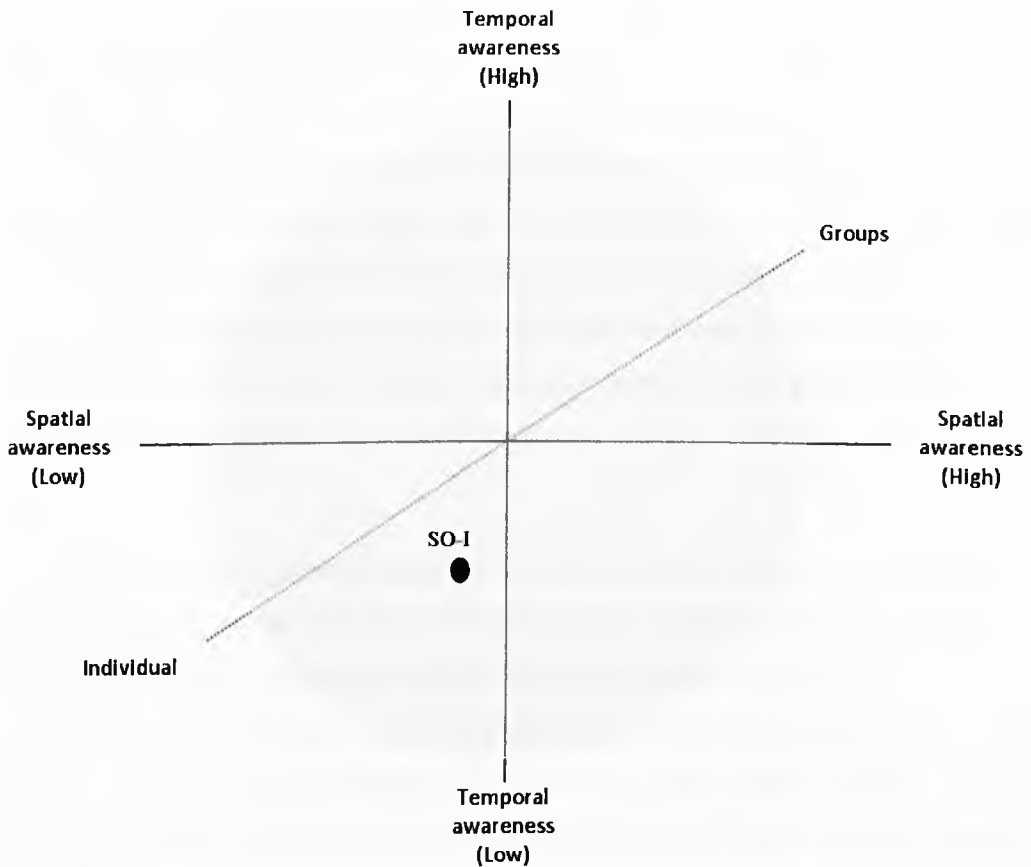
Figure 30: The Spatial and Temporal awareness of single officers (Intermediation)

9.4 The changed process (Single officer, disintermediation)

While as mentioned, officers were happy with the safety aspect of the status quo, there were also elements of the existing information intermediation process that they were unhappy with, specifically the amount of time it took to establish the identity of an individual during the *conformation of identity* task. At the start of the trial, the officers who formed the case were happy to attempt disintermediation because of what officer 7 described as 'cutting out the middle man' and the perceived benefits that would be derived from officers having the ability to make their own checks without needing to use the information intermediary represented by the call-hander and being able to make decisions based upon 'what I see in front of me [on the device]'.

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A key concern of officers when using the information intermediation service is not economic but purely concentrated on *time*, for the officer the consideration is how quickly an identity check via the radio provides the information they require to deal with or let an individual go about their business. For the call-handlers providing the intermediation, this consideration of time is more acute as their role performance is measured by how quickly they can deal with a request and move onto another one. The radio is therefore more than simply a means of transmitting or receiving information but is also a vital lifeline for the officers and the removal of the intermediation services was noted in previous studies as providing problems for officers in other studies into policing and mobility (Allen et al. 2008).

The change described in the case-study was that of direct remote access ('self-service' within the project), or disintermediation. It removed the officers from the information intermediation services provided by the call-handlers who were located in the organisation's command and control environment and broke the link between the consumer (The officer), the intermediary (call-handler) and the producer (shared information sources such as the Police National Computer (see Figure 31). As described in the task description and the case study, the general dissatisfaction with the intermediation service provided by the call-handlers was related to the *confirmation of identity* task. The trial and by extension the introduction of remote access was seen as empowering because it allowed them to overcome the perceived and actual issues with the information intermediary. Moreover, from an organisation perspective, the use of the PDTs was expected to lead to a small but measurable downward shift in the use of the radios for routine information enquiries associated with the Stop and Search process thus allowing call-handlers to spend their time on other information enquiry activities and reducing the overall strain on the capacity of the service.
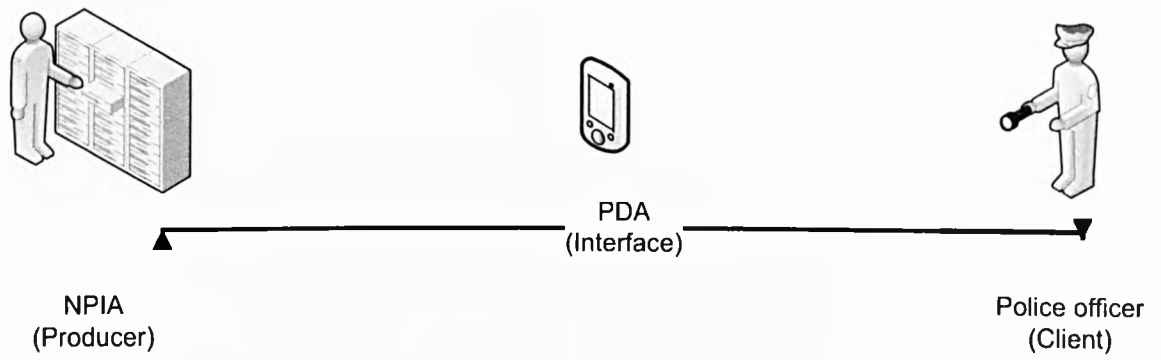
While the devices were subject to a number of failings at the start of the trial (signal failure, password and security problems), even when these problems were resolved, usage of the devices still fell off leading to a return to the status quo of intermediation via the radio for information enquiry activities during the Stop and Search procedures. Using the information supplied by officers within the case, the 'single officer, disintermediation' usage scenario is also mapped upon the model (**SO-D**) in **figure 32**.
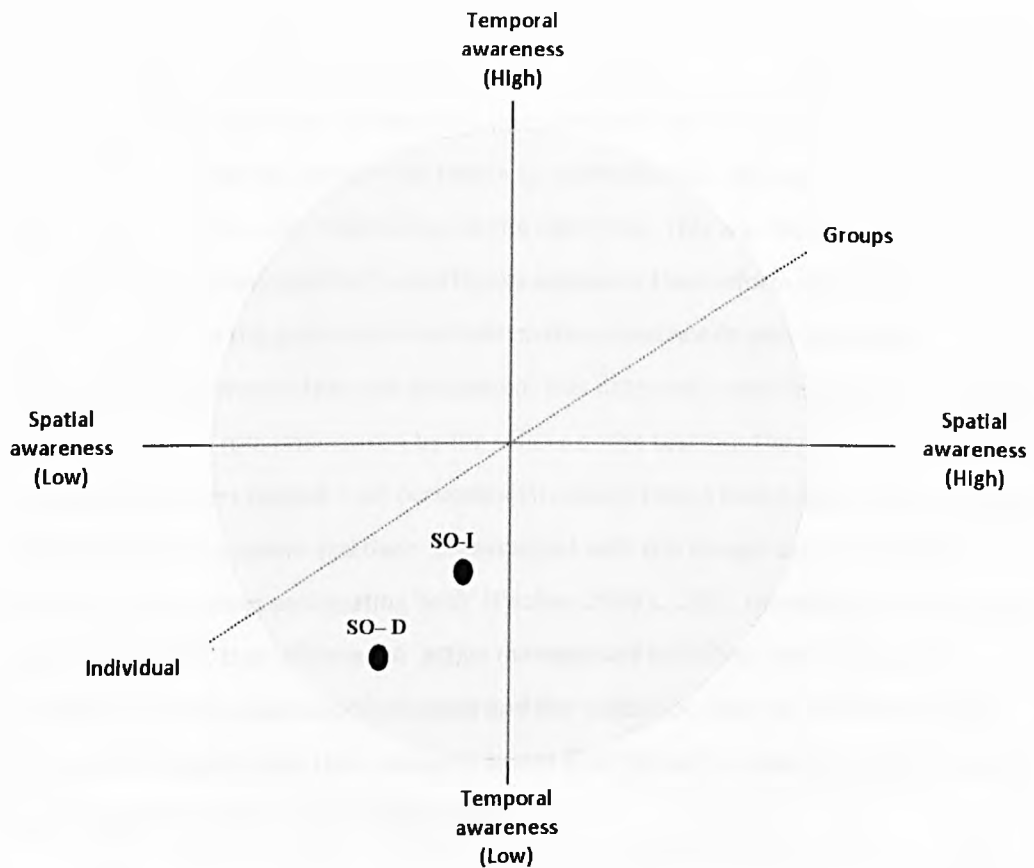
Figure 32: The Spatial and Temporal awareness of individual officers (Disintermediation)

The introduction of disintermediation lead to a situation where both their spatial and temporal awareness decreased compared to the status quo as shown by **SO-I**. Specifically, that they were engrossed in the device leading to officers 'not concentrating on what is going on around you' (Officer 3) leading to a sense of tunnel vision and the discontinuities in spatial and temporal awareness described in detail previously (chapters 6, 7, and 8). The critical consideration of the officers is again time but not the seconds taken to find a result via either the radio or the devices but the fractions of seconds in which the behaviour of a stopped individual might change and they might shift from benign and passive to belligerent and aggressive. The general theme and perception amongst the officers that the devices compromised what they termed as their 'critical vision' (Officer 9), their ability to see what was occurring around them and to key 'eyes' on the suspect, all factors that they considered essential to the practice of officer safety. In some situations, the focus on the devices and general sense of engrossment had resulted in individuals making an

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attempt to leave the scene while the officer was distracted by the need to correctly input information into the device. The return to the information intermediation represented by **SO-I** demonstrates that when contextual constraints such as a physical risk to safety presents that information seekers will return to methods that, although considered flawed, presented 'enough' information at the right time. This was favoured over continuing with technologies that superficially empower their information seeking and enquiries but where the presentation of information does not fit into the rhythm of the interaction or judgement of the risk presented. This outcome is one to be expected when considering not the role undertaken by the officer or the task but the cultural norms of serving police officers rooted in an occupational culture that is based around the isolation of its members from others and their 'preoccupied with the danger and violence that surrounds them, always anticipating both' (Paoline 2003 p. 201). Moreover, if as discussed in chapters 2 and 4, that officers are 'active managers of risk'(Dorn and Brown, p.851 2007) who use environmental information and the actions of other to assess risk, then anything that detracts from their ability to assess that risk will be rejected. In this case, a device that distracts from such an assessment.

In the previous chapters it was also noted that the use of devices by single officers remained higher when they had access to a vehicle, that it is to say, they were able to place the person they were dealing with or arresting in the back of a police car and control their movement. Moreover they were able to make better use of the attached printer (to print off the Stop and Search form for the stopped individual). In this instance, while the officers cannot control the environment or pre-configure it over the long term, they will, on an incident by incident basis, try to configure the artefacts and the individuals within it to manage their information seeking as they attempt to move towards their meaningful goal (task completion). Thus their spatial awareness remains relatively high because the area that they must be aware of is quite limited and they have limited the possible movements or actions of a stopped individual. In **Figure 33**, that type of interaction is mapped as **SO-D1**, here it is suggested that the spatial awareness is higher because the officers are trying to control and/or monitor a much smaller physical environment (the back seat of a police vehicle) than if they were dealing with a member of public on foot in the street.
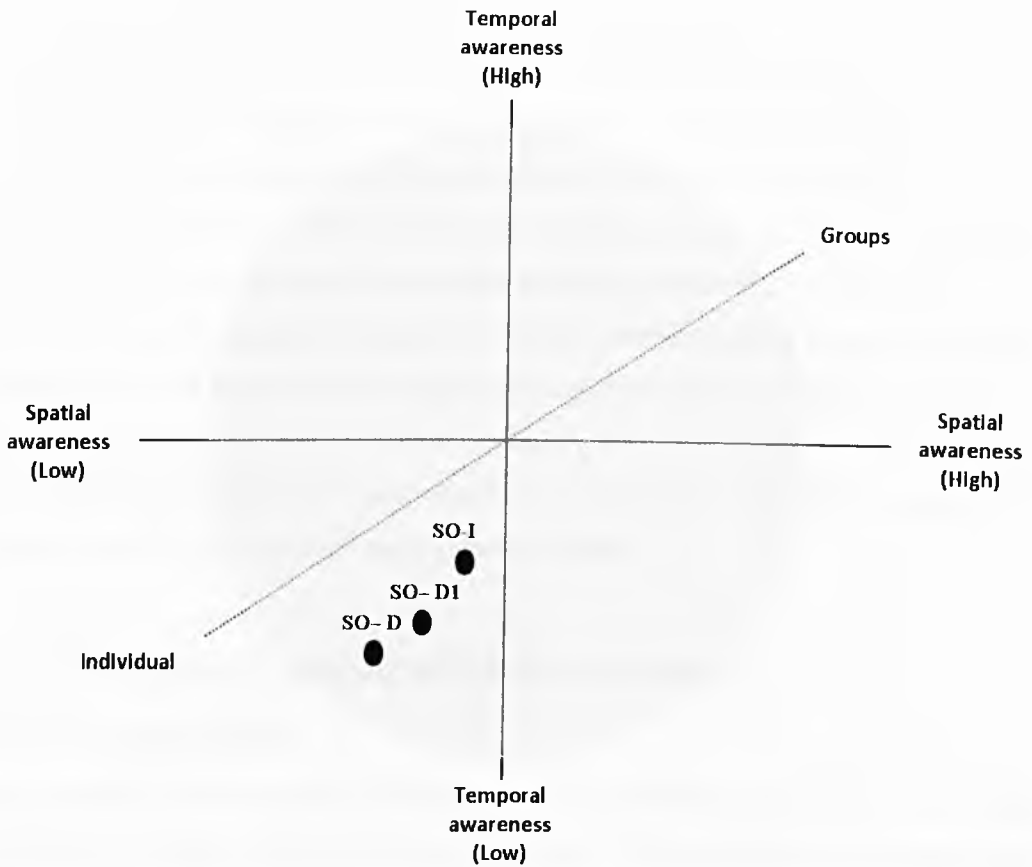
Figure 33: The Spatial and Temporal awareness of individual officers (Disintermediation)

The decision to make use of mobile devices in conflicted situations is therefore influenced by the availability and interaction with other technologies. A device (The PDT) selected because it was deemed the most suitable for officers on foot was found to have more value when they had access to, or made use of it in conjunction with, other technologies and artefacts. For example, the use of handcuffs to restrain an individual was discussed within the case as an example of where the application of an existing technology was likely to make the use of the PDT more probable. Indeed, the combination of the PDT and the police car seemed to represent an optimum usage scenario for the individual police officer, one in which the environment (inside the car) they were using the device in was also an extension of the organisation, and thus the contextual constraints are managed and the perception of risk from the officer is low. In effect, their spatial awareness is higher because the physical environment is so much smaller.

The technology is therefore used by the individual mobile workers to provide benefit in a ways that were not intended by the project team or the organisation and is actually counter to it (to provide a solution fit for a single officer on foot). This exemplifies a constant theme within policing; the tension between the desire of the organisation to lay down the correct ways to perform a task, and the officers using their individual discretion to complete tasks in the way that they feel is the most suitable for the field (Manning 1996). This counter-appropriation was seen in other ways on the trial, for example officers undermined an element of the audit process that the devices were intended to provide; the electronic Stop and Search forms on the devices are automatically time-stamped, and by completing this aspect of the task after the interaction had concluded, a misleading temporal picture of the officers' activities was provided.

9.5 The changed process and groups (Groups, disintermediation)

With the study, it was seen that significant number of the procedures were being done by the groups of officers at transport hubs such as bus or railway stations. In this collaborative situation, the PDT equipped officers' concern for their own physical safety recedes to an extent that they feel conformable to use the devices for performing the information enquiry tasks that were previously performed by the call-handlers – In **Figure 33** this is mapped on the model as **GU-D** (Group Use-Disintermediation).
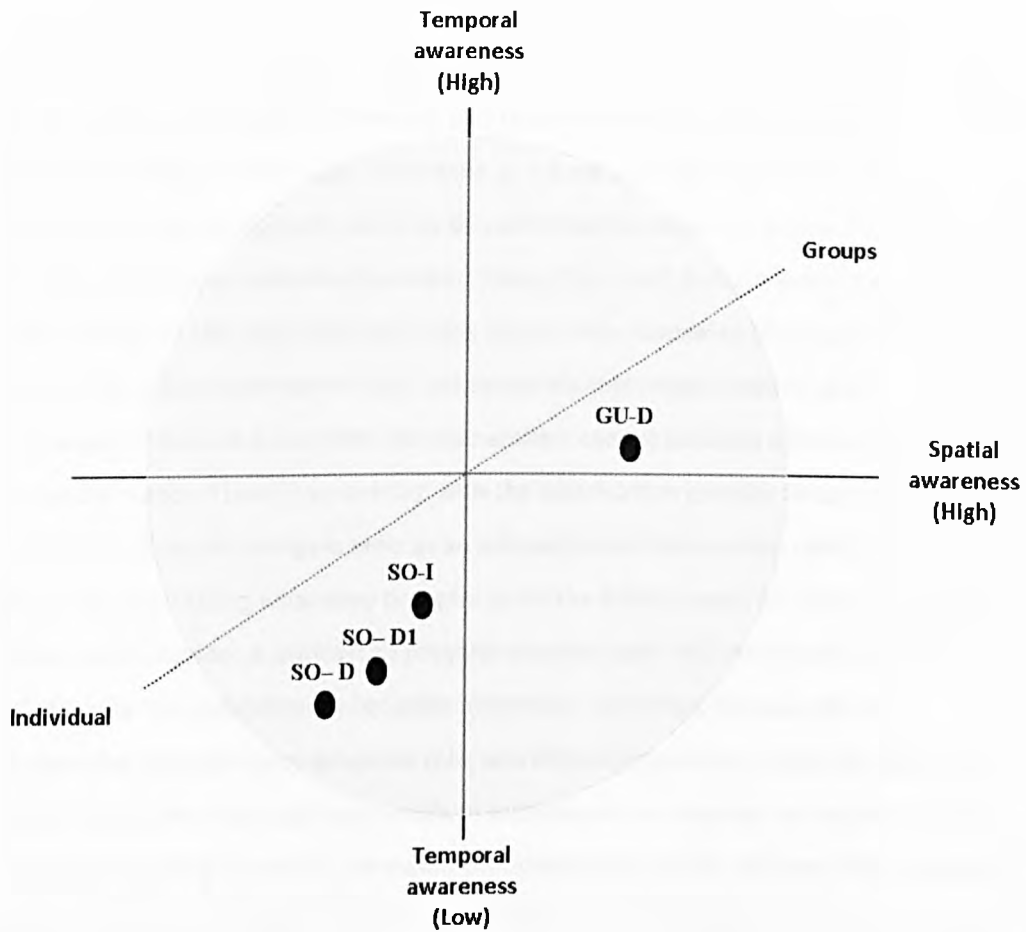
Figure 33: The Spatial and Temporal awareness of the group (Disintermediation)

The officer with the PDT fulfils a specialist role in a similar way to the call-handler, but without being subject to the same temporal work context restrictions. Critically, the group share both a local and organisational work context that means that the collaboration is not contested in the same way as between the uniformed officer and the call-handlers. The occupational role of the call-handlers is one that is measured via clock time in terms of minutes and seconds, the reward system that they work under is based upon the management of high volume of information requests as quickly as possible. The uniformed officers are also concerned with clock time but on a different scale when it comes to measuring performance of the Stop and Search task, they measure time in tens of minutes not the minutes and seconds of the Call-handlers.

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That the uniformed officers share the same domain expertise and this means that the interwoven situational awareness that they have in common is not simply of the situation but also of the performance of the task and the meaningful goal they are trying to reach. Savolainen (2006), in his review of the time as a fundamental attribute of information seeking notes that more work needs to be performed to understand how individuals anticipate their future information needs. Here, the shared domain expertise and understanding of the Stop and Search task seems to be central to this successful joint process. The officer with the PDT can anticipate the information needs of other officers on an 'as needed' basis in a way that the call handlers cannot because of their physical and temporal distance. There is an overlap with the information enquiry field, in that, the formulation of search strings is seen as an articulation of information need, here, the officers are articulating what they perceive to be the future needs of others. This type of collaboration provides a contrast to previous studies, such as Sonnenwald and Pierce (2000) where the collaboration between actors was contested because the team collaborating had their own specialist role, and differing goals and needs. As discussed in chapter 8, It is clear that existing models of mobility are incomplete in that they, like the information seeking literature, are based predominately around the lone individual and actions or trajectory as they complete tasks when moving through various heterogenic contexts – the worker uses his phone at the airport or using a laptop on a train to receive their email. This overcomes the problem of 'not looking at what the other person is doing' (Officer 2) as the collative awareness of the group allows for the officer with the device to become an information specialist allowing others to concentrate on officer safety and the physical handing and management of stopped individuals. The overall group temporal and spatial awareness is therefore high. In addition, the underlying culture of policing is equally important, as the presence of more than one officer means that the concept of officer safety (see chapter 4) comes into play. The officer with the PDT is happy to become pre-occupied with it and the entry of data because he expects that his 'brother officers' will constantly mindful of the environment and will protect him from harm.

9.6 Conclusion

The dominant interest within the remote mobility literature is one that focuses on the individual actor travelling with agency through the world. This study and the model outlined in this chapter shows that technologies intended for use by an individual user

may fail in that purpose but provide value for information seeking and enquiry activities when used in collaboration with other members of the organisation in the unplanned and unanticipated ways described here and in Chapter 8. While the remote mobility literature concentrates on social interdependency over distance, here joint activity occurred between the PDT user and other members of the organisation who were geographically co-located with the user. For the solitary officer, the concern that use of the devices leads to engrossment and a decontextualisation from the environment and the people in it, leading to risk. The conceptual model presented here indicated that many mobile technologies intended for single use have a different utility when used by a group or in a group setting. Moreover, the presence of the group can lead to novel or unexpected applications of the technology as the group consider the locales they are in and try and manage the spatial environments in ways that an individual mobile worker is unable to. Moreover, this further demonstrates that the unanticipated use of the device in these types of collaborative scenarios indicates that the mobility literature must more carefully consider the impact and affect of mobile technologies when used with other organisational actors that are physically co-located rather than distant. The mobility concept need to be further developed to more carefully consider the networks that may develop in the field between members of the same organisation who are attempting to reach a common goal or fulfil an information gap. While in most scenarios, there will be no risk of physical harm, other, as yet unknown factors, may come into play and mean that group awareness is required for the successful adoption of mobile technologies such as discussed within this case.

Chapter 10 – Conclusions

10.1 Introduction

When the opportunity was presented to investigate the trial implementation outlined in the case study (Chapter 5), the focus was on the information man – that is to say, focus was on the impact of the introduction of the PDTs (Personal Digital Terminal) and information disintermediation on police officers. While the effects on other stakeholders were considered, the actions, changes in relationships and reactions of *individual* police officers were to be the nexus of this thesis. This was driven by the reasoning that the trial implementation was a solution for officers working alone without the support of colleagues. With that in mind, the initial research aims for the project were:

- To conduct an in-depth study of mobility and the impacts of mobile technology on a specific group – here the case is based around the actions and activities of Response officers, the largest single occupational role and function of Police Officers in the UK;

- To contribute to the small body of research that intersections information seeking and mobility by providing novel findings around the group described in the case;

- To contribute to the limited current understanding of how collaborative/group information seeking is undertaken within a framework of mobility;

- To provide specific recommendations to those involved in system/hardware design on how to both anticipate and overcome issues of rejection in trial implementations.

The approach taken to the research was an inductive one, making use of Grounded Theory as a method to identify and analyse the issues that arose out of the situation, rather than shaping the collection of data around a need to fit an existing theoretical perspective. The researcher was theoretically sensitised to the literature and issues with mobility and had experience of observing mobile technology in other organisations without having a dogmatic approach to what perspectives and concepts should be applied. Moreover, whereas other studies of the operational usage of policing have explored the impact of mobile technologies at a quite general level, here the concentration has been on providing a thick and rich description of a single identifiable and repeatable task, that of the Stop

and Search process described in Chapters 5 and 6, and using it as a way to determine important changes to processes and relationships. Again, this arose out of an inductive approach rather than being a conscious decision at the outset and was a result of the initial coding of the data. This was a research direction that proved to be fruitful as further analysis of the data indicated that the devices were being used in unanticipated ways - to support the work of officers who were not on the trial and in support of collaborative information behaviour. These were both unintended outcomes for the sponsoring organisation based on their aims for the trial. The focus of the study was then widen to consider why and how the PDTs increased utility and why they were being used more by groups rather than individuals. This in turn illuminated an aspect of mobility that has raised little attention; previous studies have highlighted how mobile technologies can enable communication and collaboration between geographically disparate groups (and are designed for this purpose), but not how they may facilitate the collaboration of groups who are co-located within a single geographic location. Beyond this finding, this study highlights a number of other issues around mobility and information seeking, the development process, and the need for a great understanding from organisational stakeholders of how culture rather than occupational role strongly influences behaviour and the acceptance of new technologies. These are considered individually here with discussion of the ramification of each for organisations and where further academic research is needed to advance the conceptual model presented and fill the gaps that that this study opens in the current understanding of this area.

10.2 Understanding culture rather than simply just the role is key to understanding the failure of the trial implementation

The aim of the trial was to make officers more effective in their duties by allowing them to directly access (disintermediation) information rather than having to use an organisational call-centre (Intermediation). However, access to technology does not simply lead to the successful management and use of information; they are not one and the same (Burnett et al. 2008; Culnan 1985). It is accepted that the information seeking behaviour of an individual attempting to complete a task will vary depending on the problems that they encounter when attempting to reach their goal and that active information seeking is impacted by the possible social, political and physical risks or rewards. This thesis has concentrated on the changes to a single work task completed by a specialist group of

mobile workers and the subsequent changes to their information behaviour in terms of seeking, acquisition and enquiry.

Here the presence of risk and reward is one where the possible physical dangers are uncommonly high, and are greater than often described within a body of literature which is largely concerned with knowledge workers in mundane situations. Risk for the knowledge worker is that of success or failure in a work task not an immediate possibility of violence or the need for them to last out or use force on others. It is clear that the situational contingencies experienced by uniformed police officers represent a challenge to the development of mobile information systems that are not present or fully realised in other contexts. This context is one where the environment itself and the people within it may present dangers or risk and the information provided might be incorrect or deliberately misleading. Within the Stop and Search task, the primary gap or information need for an officer is that of the 'confirmation of identity' – trying to establish whom they are dealing with. This is a very specific example of an information gap that has two aspects to it – 'who is this person and can they harm me?' While the devices provide, in theory, a means for them to more quickly establish identity (and therefore risk), as the case indicates, the devices are seen as a distraction during the interaction with the public. The focus of the officers on the stopped individual is particularly important because the 'collaboration' between the two is contested. The information seeking process and the need is triggered by an officer stopping an individual in a public space. This encounter is framed by a reasonable level of mistrust, officers stop individuals because they suspect they are a criminal or have been involved in criminality. Indeed, within the legal guidance on Stop and Search, the individual is referred to as a 'suspected person' (Stop and Search Action Team 2005). The information seeking dialogue between the two manifests in ways that differs from other examples of information seeking involving two individuals. First, if the stopped individual is involved in criminality, they will be constantly trying to anticipate both the questions and the reason that the officer is asking them. The officer, in turn, is mindful that this is occurring and is looking for contractions and inconsistencies in the information provided. The presence of the device leads to decontextualisation of the officer and detracts from this process. Fundamentally, for the officers, a significant part of the information seeking process is 'looking them in the eye' (officer 15).

Officers make use of a hierarchal structure of trust when considering the validity of information, fellow police officers are at the top and criminals are at the bottom (Manning 2001). In this situation, the stopped individual, until their identity or criminal intend is confirmed, is neither 'citizen' nor 'criminal' but could be both. The use of the physical objects in the environment provides an additional source of information for the officers to verify or reject the statements that they provide with via dialogue with the individual. Moreover, the presence of some objects such as a collection of mobile phones or a balaclava provides the basis for additional questioning and a changing sense of the risk that the individual may present, so their presence alone may provide useful information in isolation without needing to be linked to information returned from organisational databases nor statements from the stopped individuals. The use of the devices further detracts from this environmental scanning.

It is at the point where officers interact with external stakeholders in this case, the public that provides the strongest most negative influence. Indeed, it is the very nature of the interaction between the user, the user and device and the stopped member of public that provides the larger barrier to adoption. In particular, the conflict between the intent of the device – to provide information to confirm identity and minimise risk against the reality that its use for such a purpose paradoxically raises the risk because of the temporal and spatial constraints of working within public spaces. This resulted in a return to the information intermediation service provided by the radio and the organisation's command and control environment.

Officers preoccupation with risk or 'officer safety' in terms of threats to their physical welfare are clearly closely intertwined to their management of the environment. For the individual, the trial failed because it was based around a consideration of how officers manage and use information and what information they would need to perform information seeking and enquiry tasks associated with the Stop and Search task; hence it is arguable that the trial failed because it was misconceived from the outset because it was based around a false or incomplete premise. Rather than trying to establish a means for effective information management, it should have considered how mobile technology could be provided for individuals who are 'active managers of risk' (Dorn and Brown, 2007 p.851). The emphasis placed firmly on the management of risk not the management of information. In essence, the developers and project champions were preoccupied with the

requirements of the role rather than more carefully considering the cultural impact of trying to provide mobile technology for the individual fulfilling that role – individuals who are part of an occupational culture that isolates them from the communities they serve and makes them 'preoccupied with the danger and violence that surrounds them, always anticipating both' (Paoline 2003, p. 201). For the same reasons (while unintended by the sponsors' of the trial), the occupational culture of the police officer explains why the PDT was rejected by the individual but adopted by the group. The officer making use of the PDT is confident and happy that, as an accepted part of the occupational culture within policing, with its strong emphasis on loyalty, that his 'brother' officers are there to manage risk and protect him from violence (Chircu et al. 2007). What lessons can therefore be drawn from this failed trial implementation for systems/hardware designers?

10.3 Systems/hardware developers need to under culture as well as role or task.

This study provides support for previous investigations that suggest that the use of hand-held technologies within areas of work such as policing and public safety are problematical because of the need for the user to concentrate on the technology, thus reducing their awareness of the spatial environment and causing discontinuities in their awareness of the passage of time. Further, it is evident from the usage scenarios discussed in the case and built upon with the conceptual model (see Chapter 9) that officers found the risk associated with using the PDT only decreased to a satisfaction level when they were collaborated with other officers who could monitor the environment and ensure their safety. Those involved in the design and implementation of mobile information systems must consider more carefully the very specific situational needs of users engaged in social interactions that may be dangerous, conflicted or rapidly changing. It is an understanding that must be based on organisational and occupational culture rather than a naive and narrow understanding of the requirements of role. If it is anticipated that the use of mobile devices can involve a loss of awareness of the real world and the passage of time, with the sense of 'being within' the task environment, then the ramification must be acknowledged. Within current system and hardware developments, the broad direction is to increase the feeling of absorption and decontextualisation and create a sense of immersion for the user. Indeed, such occurrences are commonly perceived as a sign of successful HCI (Human-Computer Interaction) design, the more 'enjoyable' a system is to

use, the more drawn in a user will become and the more likely that they will adopt the technology or systems. If the goal is to make immersion of the user key to the effective use of an information system, then more work must be done to consider the sorts of usage scenarios described within the case and the conceptual model. Within a culture where the individual has been shaped by direct experience and/or as with policing 'canteen culture' to have a preoccupation with risk, scenarios where the use of a system designed to increase immersion will be rejected because of risk. Where individuals are always mindful for opportunities for physical harm to them and are constantly watching for such opportunities, such immersion will be rejected and any technology that provides it will also be rejected.

These problems are magnified by the use of off-the-shelf hardware designed to be used in a range of roles rather than specific for policing or this specific type of conflicted task. The PDTs were designed for urban use and thus were 'hardened' to resist impact or damages but were intended for work tasks (parking wardens issuing tickets) where interaction with the public for the purposes of information seeking/enquiry is minimal, limited in scope and unlikely to be conflicted. This does not fit either the specific task discussed within the case or more generally the sorts of activities and interactions that may be undertaken as part of the day to day activities of the response officers' central to this thesis. That is to say, officers using the devices to issue tickets for motoring offenses may encounter similar problems.

This is not limited to situations within the sphere of policing, and will also encompass other occupations such as the fire service, the military and aspects of public health such as the ambulance service. Broadly, any situation where the environment might be chaotic and fast-moving may present the same problems for users. There is a clear need for both software/hardware developers and those considered with HCI issues to more carefully consider real world usage scenarios via the use of observation and user-centred research methods. Again, An understanding of the culture (and its preoccupation with risk) surrounding the response officers in the case rather than solely concentrated on the work of that role may have lead to a more successful outcome; rather than attempt to take off the shelf technologies and attempt to make the role fit the technology as opposed to making the technology fit the culture.

The specifics of how this could occur are outside the scope of this work but there are a number of broad directions that may provide fruitful avenues for further works by interested parties. The advances of the last few years have seen much interest in augmented reality, the presentation of information as a layer over a live feed or video, either via glasses or over a device screen. The use of such technologies, while in their infancy, might provide a useful alternative method for the presentation of information to these specific or similar groups of mobile workers and alleviate such problems. Indeed, the use of information systems within aircraft has been increasingly designed so that the user does not have to take their focus off their surroundings or indeed the presentation of information is non-distracting, a similar approach is recommended here. At a bare minimum systems developers must overcome the need or desire for engrossment in the systems they design or face further rejection by police officers more concerned with immediate risk than immediate access to information.

10.4 A greater understanding of the relationships between mobility and group collaboration must occur

The aim of the project team in the case was to provide a new way of working for individual officers and this was also the initial focus of this study – how the introduction of the PDT (Personal Digital Terminals) would impact the work of the individual. However as the trial progressed and analysis of data was conducted, it became clear that the devices, intended for individual usage (and largely rejected by such because of risk), were finding more utility and were being employed more effectively by *groups* of officers. There is some evidence that the specific technology is more successful when used during collaborative information behaviour or in situations where the lone officer is not interacting with the public. The technology was not intended for group usage and its use here highlights that more research must be done in group mobility, in particular how groups of individuals with a shared goal may come together for the purposes of what could be called 'social search', that is to say working to together to overcome a gap. Within static situations, Reddy and Jansen suggest that 'what researchers and practitioners critically need is a model of CIB [Collaborative Information Behaviour] to form the basis of investigations of users in collaborative contexts and to create design technology to support those contexts' (2008, p.257) and they argue that clearly defined models of CIB do not exist in static situations because of the dominance of focus on the information man. This study highlights that

existing knowledge of the relationship between mobility and the group is equally sparse; this is partly understandable because the technologies for mobile usage such as the PDTs are designed for the lone individual and that represents the pattern of usage.

An understanding of collaborative mobile information behaviour where the actors are co-located should be a priority. The development of a accepted model of CIB in static situations would still require application within a mobile setting to see if the same constraints and influences apply, or if the additional complexity provided by the heterogenic nature of the environment demands modification to such a model because of the additional complexities experienced by mobile workers. Another extension question is to consider how the interaction between co-located mobile workers would differ if more mobile workers were equipped with PDTs or similar equipment, and how information enquiry activities differ within group settings. That is to say, if four members of a group had access to mobile technologies rather than one. There is a bewildering combination of factors that may be examined.

In addition is clear that understanding of 'task' when being undertaken by groups of individuals within a context of mobility is rudimentary at best. Here the study has concentrated on a specific task, the performance of the Stop and Search task. It is strongly influenced by the habitus, the officers developed idea of how the task should be performed and also the repeated performance of a task over a long period of time. Simply, experience changes how an individual approaches a task and the case has shown that this is no different when an individual is asked to make use of mobile technology. However, within the context of groups performing tasking with mobile technology this finding raises more challenges. The concept of the 'information group', the coming together of individuals within an environment for the completion of a task, has already been advanced. If the information ground is, as Savolainen (2006) describes it a 'virtual context of information seeking' (p. 115) that disappears after the group separates back into individuals, then more investigation needs to be done to see what officers carry off from the repeated performance of tasks like the Stop and Search. Moreover, as Pica and Sørensen note when considering mobility that 'Work can be generally divided into two distinct categories: structured –one which requires a high degree of routine steps and a low degree of complexity – and un-structured – one which requires a high degree of improvisation' (2004, p.294). In the case, officers were able to successfully come together

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and use the PDT to fulfil the Stop and Search task without compromising their safety or effectiveness. It must therefore be considered if successful strategies for working together can be carried over from information ground to information ground – is it improvisation or is something else at work?

10.5 We need to know more about the relationship between physical space and how it informs information behaviour

As discussed in the literature review, there are two broad areas within mobility research, local and remote. Local mobility explores the work of individuals in fixed static environments with clear geographical boundaries and where work trajectories can be modelled because they are largely repeatable. Over time, individuals collectively reorganise space and flows of information to best support their movement around the environment. Technology is therefore embedded or selected on the basis of the inherent proprieties of the known structures and environments they will be used within. These changes lead to the development of the Standard Operating Configuration, the collective management of the environment and the people and objects within it, so that there is a 'tight flow co-existing' between those elements. This has received extensive coverage within the literature and largely understood. Conversely, remote mobility is concerned with the accommodations that the worker has to make while perform their tasks as they travel through different contexts and they have to deal with unexpected or unanticipated situational constraints (Axtell et al. 2008; Kristoffersen & Ljungberg 1999b; Perry, Hara, et al. 2001c). Many of the individuals and information sources that mobile workers need to access are geographically scattered, leading to the use of mobile technologies that are socially independent (allowing them to be moved) but socially interdependent (providing communication over distance). In the case, the PDTs fulfilled this function.

It has been established within the information behaviour literature that the performance of a task impacts on each subsequent performance of the same task. What is successful in one attempt will be attempted again, what is not will be disregarded or attempted in a different way. Within a static environment, as discussed it is possible to shape physical objects to best suit completion of task – for example in an office situation, place a printer in easy reach and a telephone on a desk next to a desktop terminal. That type of control is not possible within the external environment regularly encountered by the officers

described in the case. However, although the environments may change, the possible actions and behaviours of the officers are carried over from encounter to encounter and this means that the contextual constraints and heterogeneity of the environment must be treated as continuum not as the absolute that the mobility literatures suggest. The completion of a Stop and Search on one street corner provides guidance for the next. This type of behaviour when performing tasks is well documented in static situations but not so within the mobility literature with no body of cases to build up. A greater understanding or categorisation of the physical spaces that workers will encounter is needed to understand what properties from one encounter are considered to be similar or the same in another, and therefore influence the mobile worker to repeat behaviour and attempt similar strategies for managing individuals and the spatial environment to their advantage. It is hoped that the case presented here can be drawn upon by future researchers as providing guidance to some of the areas that require more investigation.

Over the three month life of the trial, officers quickly determined the situations and circumstances under which they would use the devices, key to this was their ability to control the environment and the individuals within it. As can be seen in the discussion of relationships in Chapter 8 and the usage scenarios outlined in Chapter 9, that sense of control increased significantly with the number of officers present. Control over the stopped individual was the main concern as it related to preventing their flight or their opportunities to harm the officers. As most officers saw the devices decreasing their control of the interaction and therefore increased the risk, they were quickly disregarded for this purpose by the individual/lone officers. Conversely, officers were more likely to use the devices where they could change the temporal location (the point in time at which they performed the task) and reschedule aspects of the task to a time there was lower or no risk. The most specific example of this was the completion of the electronic form, a task that was intended to be performed when the officers were still in the presence of the stopped individual, but instead was performed after the interaction had concluded.

The Stop and Search provides an example of information seeking activities where the legally prescribed nature of the task would suggest that performance would be highly structured, but in fact, is fragmented and complex. While the actions taken at the conclusion might be pre-determined (to arrest or let go), the information sources collected and evaluated to reach this point are many and varied, far more than complex

than that of the radio or the PDT to check the Police National Computer (PNC) to confirm identity. Indeed, in many situations, there is no criminal record for an individual, so the check is useless beyond confirming that they are not already known to the police. The investigative skills of the officers are therefore critical as is their ability to rapidly link and connect disparate sources of information in innovative ways. Ultimately, this study indicates that more work needs to be done to understand how information seekers who are predisposed to distrust, or indeed disregard the information provided to them by others, formulate their search strategies, and while in situ make temporally restricted judgements about accuracy and validity. The use of the surrounding environment and the objects within it to determine the validity of information in these contested circumstances is another existing facet of the existing process that was disrupted in such a way by the need to concentrate on the PDTs that they were rejected.

Another facet of this interaction with the environment is the ability of the officer to search the individual and their belongings to try and provide collaboration for his statements. These artefacts are often mundane items that have informational value that can be extracted when taken in conjunction with the statements made by stopped individuals. For instance, in one of the provided examples, an officer became more trusting of the answers provided by a stopped individual when he found a sandwich box in his tool bag and noted that based upon his experience, 'robbers don't carry sandwiches'. The literature that deals with the information habits of police officers is predominately focused upon the occupational role of the detective or investigating officer and their management of individuals and objects for the purposes of detection and prosecution of crime. In this case, while the uniformed officers are dealing with very short incidents, rather than the longer more detailed investigations of detectives, they must also be able to connect together many different forms of information. Research in this area has implications across policing, if Chief Constables and by extension forces understand better how officers collect and process information while in the field, they can avoid the failures of the trial implementation and provide tools that fit both the role of the officer and the culture that informs the performance of their duties. In addition to the economic savings, by better understanding the behaviour of officers in relation to their management of physical space and its use as a source of information, forces can benefit from better more timely information of a higher quality and avoid the types of failings described and discussed within the literature review.

10.6 Researching mobility needs in-depth methodologies and suitable tools for data capture.

Finally, the author would like to reflect on some of the practical lesions arising from undertaking field research and producing this thesis. It is hoped that by discussing the successes and challenges that arose, that they can be respectively replicated and avoided by future researchers who are exploring complex and often chaotic organisational situations. First, it is clear that the use of in-depth methodologies and tools such as Grounded Theory is both rewarding in producing the sort of thick and rich narrative talked about by Orlikowski (1993) time-consuming in that it generates vast amounts of data. In particular, it is difficult to know while collecting data, when a period of reflection and analysis should occur. For example, during a three month data collection period, is it better to be in the field collecting data or to taking some time to perform analysis on a small body of data to better inform and narrow the research process. For the novice researcher, beyond generic research methods tomes (such as Yin 2002), there is frustratingly little practical guidance within the research literature. Much discussion within previous studies is given over to discussion of why a research methodology and method was chosen but very little about the practicalities of putting those choices into action.

The experience of being embedded in the organisational context for long periods of time is one that was useful for illuminating the difference between the role of police officers and the organisational and occupational culture (pre-occupied with risk, mindful of danger) that informed and influenced their actions when performing the Stop and Search. Waddington (1999) and others exploring policing have discussed the 'canteen culture' in detail, a space where ideas and concerned between officers are shared. For the author, being embedded in the organisation meant that chance encounters with officers often lead to both opportunities for further data collection but also a more general opportunity to become involved in discussions that were beyond the scope of this investigation but helped in developing an in-depth understanding of the role and nature of police officers and their cares, concerns and worldviews. In addition, another benefit of being embedded within an organisation is that there are often significant gaps in any given day between interviews. With some careful planning, the researcher can therefore use this time to

analyse interviews and observations while they are fresh in their mind and further refine research questions and approaches while in-site - neatly side-setting the question posed above of it if the researcher should be collecting data or analysing it.

Another practical point arising from the use of in-depth methodologies is that of trust, the very process of being present within an organisational situation on a regular and routine basis makes the researcher seem more mundane and therefore more approachable. One benefit of this is that the researcher can also engage with individuals who might not be critical to the case or subject under investigation but provide some additional detail or commentary that helps in understanding the organisational context and its influences and political currents. Tied to this, the respect and confidence of the individuals within a case type study requires openness and frankness from the researcher. To maximise the benefits of the data collection period, anyone considered part of the case must be given as much information as possible about the research aim, possible outputs and the possible ramifications of being part of this case. Research training often covers this subject in general terms but providing enough information to subjects to inform rather than confuse them is actually a quite challenging task. During the data collection process, some subjects were resistant to be interviewed due to minor misunderstanding about their answers would be used.

Another area that is frustrating vague within the research literature is the use of selection of data collection and data collection tools. Providing the type Of rich narrative described in chapter 5 and the analysis that follows it in Chapters 6,7 and 8 requires that as much relevant data as possible is collected. This is especially important if the researcher is exploring a specific event (here a trial implementation) that is time-limited (six months), if the researcher is unable to capture data during this time then it is lost. This in turn may lead to a situation where the research has to 'force interpretations from inadequate data' (Goulding 2002, p.156) Tied to this, data recorders are commonly used for interviewing stakeholders but over the course of this study, the researcher found it immensely helpful to record his own thoughts and observations as they occurred.

There are however areas where current tools and standard practices for collecting data for a project that is explorative and generative are current inadequate to capture the richness of what is occurring. One of the key findings for this reason was that the monitoring, management and control of spatial environments was critical to the successful adoption of

the PDTs by the groups. While this was observed by the author and notes and diagrams were followed up by interviews - this is a rather two dimension way to capture data in a mobile world where the movement of subjects (the positioning of officers to maximise officer safety and maximise their ability to question stopped individuals) is as important as the questions they ask or the information sources they consult. In addition, as officers were revealed to use information from the local environment as much as they were from sources such as the PDT and the stopped individual capturing that via notes and diagrams without losing some of the detail is challenging. While the fundamentals underpinning the methodologies are unchanged, it is clear that we need to expand our researcher tool kit to capture more of what is occurring. The use of video seems a obvious solution to this problem but that raises other logistical and ethical problems as well as questions about how would such data be coded, analysed in conjunction with written data.

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Appendix items

Appendix item 1 – sample semi-structured questionnaire from start of study

NOTE: This questionnaire was held electronically on a Personal Digital Assistant used by the researcher and therefore the version here is an approximation rather than a recreation of a paper questioning and therefore spacing and formatting should not be taken as indicative.

Interview number:

Job title and work role:

Male/Female:

Date of interview:

Time of interview:

Time finished:

I am conducting interviews about the use of the PDTs by the XXXX. The aim is to get as complete a picture as possible of the progress of the trial and of any benefits and problems experienced by individual officers.

No officer will be identified in my report to MPS and no quotation will be attributed to any individual.

Demographic

Using the following categories *[spin Laptop]* could you select the category that identifies how old you are, please?

|A   B | C |D   E| F | G |H | | |

under 25 26-30 31-35 36-40 41-45 46-50 51-55 over 55

Could you tell me how many years of service you have in the Force? That is, the total in this and any other Force?

How do you see your role as a police officer?

What do you see as your main duties?

1.0 - Implementation issues

1.1 Do the technology and the systems appear to be well-designed for the tasks you need to perform?

What kind of problems do you experience?

1.2 Given your experience of the technology, do you have any concerns about its use?

What concerns do you have?

1.3 Do you find technical support effective?

What kind of problems do you experience?

1.4 Do you find that you are given adequate guidance on the use of the available applications?

What kind of problems do you experience?

1.5 Can you give me an example of a situation in which the technology has been particularly helpful to you? For example has it helped you to make an arrest or identify someone?

Can you give me an example of a situation in which it has been particularly problematic?

2.0 - Process related

2.1 Would you say that mobile technologies have enabled you to "work smarter", "work harder" or both?

In what ways?

2.2 People sometimes feel stress when they have to adapt to new technologies at work. Have you experienced any such stress?

In what ways?

2.3 How confident are you, personally, when making a decision in the field that depends on the PDT?

Using the scale of 1 to 10

Very uncertain | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Very confident

What is the effect of this on you?

2.4 Do you ever feel that the mobile technology can be a distraction from the job at hand, for you personally?

In what ways?

2.5 Does this bring about any change in your work behaviour?

In what ways?

2.6 Do you think that the technology is being used to monitor your work?

In what ways?

2.7 Have your relationships with other officers or the call-handlers changed as a result of using the technology?

In what ways?

2.8 Has use of the technology had any effect on your relations with members of the public?

What kinds of effects?

2.9 What sort of information are you using the devices to find?

What kinds of effects?

3.0 - Unassigned officers

Looking at the records, it would appear that the terminals are being used by officers who are not on the trial (Stress this is not a problem). I'd like to quickly discuss some of the issues around this.

Finally, is there anything else you would like to comment upon regarding the use of mobile technologies in your Force, and in particular, how it impacts on your working life or the quality of your life outside of work? *[Prompt: e.g., family life]*

Thank you for your time in answering these questions.

Appendix item 2 – Project team questionnaire (example page)

Mobile Access Platform Stage Three User Trial Project
CF– 18 Evaluation Form

Please complete and return the form at the end of the month. An important part of the trial is to obtain feedback on the use of the CF–18 in operational conditions.

Name:	Unit	Date:

Enter your comments in the table provided.
SIGNAL DETAILS
How would you rate the signal strength? Give examples to explain your answer. Orange ☐ Vodafone ☐ Please indicate which carrier you are using.
Do you have problems in any particular locations with the signal, i.e. NSY, at Home. If so please provide the post code of the area for further investigation.
Have you sent any SMS Messages or used the Voice Option (available only on the Orange SIM Cards) Was this a useful feature?
Did you use the equipment abroad? If so where and what was the response like?
How do you rate the GPRS connection, is this fast enough for operational use? Below Expectations, Meets Expectations, Exceeds Expectations.