

# **The effects of mobile technologies on the work of front-line police officers in a UK Police Force.**

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The candidate confirms that the work submitted is his own and that appropriate credit has been given where reference has been made to the work of others.

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## Abstract

This thesis reports on three sequential cases in the development and deployment of mobile information and communication technologies to front-line operational police officers in a police force in the United Kingdom. The purpose of the thesis was to explore the introduction of these technologies into the police context and the impact of them on the operational officers to whom they were issued.

Mobile technologies, allowing remote access to information systems without the need to make use of information intermediaries, have recently become a priority both for central government in the United Kingdom and for the individual police forces. These technologies offer police forces the potential to deliver developments which help them to deliver performance in line with the various pressures and priorities which they have either developed internally or have had placed upon them. Police forces have come under pressure over the last decade to increase the level of visibility and effectiveness of police officers, especially in the community. These pressures have come out of the doctrines of new public management, out of developing policing models reacting to public concerns, and out of media attention. Significant amounts of money, on the order of £110 million from central government, have been spent to help police forces to develop the capacity to deploy and make use of mobile computing (mobile data in the police community) especially with front-line officers - the vast majority of the uniformed police officers in the United Kingdom. Developments to date have mainly been at the level of pilot projects and proof of concept deployments and they have adopted widely differing technologies with varying levels of success. This research aims to provide a more detailed understanding of both the process of introduction of these technologies into the police context and the impact which they have on the front-line officers to whom they are deployed. This is, clearly, a recursive relationship with the process of introduction and management of the technologies having an impact on the way that officers use them, and the use of the technologies by officers in turn affecting the wider organisation as well as the communities policed. By understanding the process and the effects of it better I aim to both develop practice in implementation and an understanding at a theoretical level of the key areas of attention in such developments.

This research is based on the introduction of mobile data to a territorial police force in England. The research was conducted across a total of twenty-eight months and involved sixty-one interviews with users of the technologies, their supervisors and managers, and members of the team implementing the project. Thirty observations were carried out, for of training sessions and twenty-six observations of officers using mobile data in operational contexts. Six focus groups were also run with officers. The bulk of the data was, thus, collected from interview and observation and this was analysed using a qualitative analysis package. The overall framework for both the collection of data and the analysis of it was Activity Theory in the evolved form of the activity process model. Activity Theory was used as a lens both to examine the three cases individually and also the process of introducing mobile data in the force as a whole.

The research has provided contributions to practice with the force with whom the research was carried out and in other forces in the United Kingdom as well as with central agencies charged with assisting the development of mobile data in police forces. It has also contributed at a theoretical level; extending the understanding of the level at which users constructed and interpret the information technology artefact, providing a broader understanding of the key areas of attention in the development of mobile information systems in the public safety context and, at a methodological level, in evaluating the use of activity theory across sequential cases.

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# Chapter One: Introduction

## 1.1 INTRODUCTION

This thesis reports research I undertook with a county police Force in England, hereafter referred to as the *Force*. The Force was tasked with a project to introduce mobile information and communications technology (MICT) and had embarked on the first of what would eventually be four stages (technology proof of concept, systems proof of concept, trial prior to full roll-out, and roll-out) when I began my research. My research focused on the first three stages of the project, and I used Activity Theory as a framework. In this chapter I have provided details of the research aim and objectives, background information on the Police Service, reasons for undertaking the research, and an overview of the structure of my thesis.

## 1.2 AIMS AND OBJECTIVES

My aim was to explore the introduction of MICT into the Force and its effects on the work of front-line police officers from their perspectives, with specific reference to four areas of attention – equipment and infrastructure, work practice, relationships and organizational capability. My research objectives were to:

- explore the nature of the MICT equipment introduced, police officers' perceptions of the equipment and the training and support they received to facilitate their use of the equipment
- explore police officers' perceptions of how MICT changed the way they undertook their job roles
- explore police officers' perceptions of how MICT changed their relationships with people
- explore police officers' perceptions of the added value the kit could give them in relation to undertaking their work roles

## 1.3 CONTEXT

This section provides background information on the police service in the United Kingdom (UK) to set the Force's project, and my research, in context. It outlines key aspects in the history of policing and places them in the context of the current organizational arrangements for policing in the UK. Policing is a political activity and, as such, is subject to some of the pressures which the public sector more generally has been exposed to. There are two specific areas which have had a major recent impact on the police, namely, the drive towards new public management, and the development and implementation of models of community policing. I have also reviewed the way police services have managed both technology and information historically, and outlined the current initiatives (coming, in part, out of the drives for new public management (NPM) and community policing) regarding mobile information provision.

## *History of the police service in the UK*

This section provides a picture of some of the main steps in the development of the police service as we know it today. Emsley (1996) categorises police forces as being of three principal types – territorial police forces, special police forces and miscellaneous forces. Territorial police forces are forces which cover a *police area* (a specific region) and have an independent Police Authority. Currently, forces have their legal base in the Police Act 1964 (in England and Wales), the Police (Scotland) Act 1967 or the Police (Northern Ireland) Act 2000, which set out key organisational structures including the appointment of a Chief Constable, jurisdiction and responsibilities. Special police forces are national police forces with a specific, non-geographic jurisdiction, such as the Civil Nuclear Constabulary and the British Transport Police. Miscellaneous forces are founded in older legislation and/ or Common Law. They usually have a responsibility to police specific local areas or activities, such as ports and parks. These constabularies are not within the scope of the Acts covering the territorial and special forces, but can still be the subject of statutes applicable to places including parks, docks, harbours or railways.

Table 1.1 below sets out a timeline of key dates and events in the history of UK police service. It deals primarily with the territorial forces which form the vast majority of police forces by area and by number of officers (ACPO, 2009).

*Table 1.1: Timeline of the development of UK territorial police forces*

<b>Date</b>	<b>Event</b>
1749	The Bow Street Runners, who are sometimes regarded as the forerunners of modern police forces, were formed.
1812-1822	A series of committees examined the issues of order and crime in London and recommended the formation of a service to maintain order.
1829	Metropolitan Police Act 1829. Formed the Metropolitan Police Service under the direction of Sir Robert Peel. Officers came to be known a 'Peelers' or 'Bobbies'.
1835	Municipal Corporations Act 1835. Among other matters this required each borough in England and Wales to establish a watch committee, who had the duty of appointing constables "for the preserving of the peace".
1839	County Police Act 1839. First county police force created, in Wiltshire.
1856	County and Borough Police Act 1856. Made county and borough police forces compulsory in England and Wales and subject to central inspection. By then around thirty counties had voluntarily created police forces. Similar legislation in Scotland followed in 1857. By 1860 there were over two hundred separate forces in England, Scotland, and Wales.
1914-1919	At the outset of WW1 the police became unionised. The police went on strike over pay and working conditions and, because of this, the right to strike and form a union was revoked. The Police Act of 1919, passed in response to the police strikes, criminalised the police union, replacing it with the Police Federation of England and Wales.

1922	Royal Irish Constabulary is replaced by the Royal Ulster Constabulary in Northern Ireland and the Garda Síochána in the Irish Free State.
1946	Police Act 1946. With over two hundred separate police forces still in existence the Act abolished nearly all non-county borough police forces in England and Wales leaving one hundred and seventeen forces.
1964-1974	Police Act 1964. This created forty nine larger forces in England and Wales, some covering two or more counties or large urban areas. Force mergers across the next decade reduced the English forces to forty three. Similar legislation and rationalisation in Scotland reduced the total of forces there to eight.
1984	Police and Criminal Evidence Act 1984 (PACE). Regulated the actions of the police in England and Wales, particularly in relations to arrest and searches/powers of entry. Analogous legislation in Scotland.
2002	Police Reform Act 2002. Introduced Police Community Support Officers (PCSOs), and a number of other similar roles in England and Wales (these are not Police Constables but have some of the powers of a constable).
2003	Railways and Transport Safety Act 2003. Constituted the British Transport Police (originally formed in 1951) as a Force in its own right with full powers and an independent Police Authority.
2004	Proposals to reduce the number of Forces to twelve in England and three in Scotland were taken to an advanced stage before being dropped in the face of fierce police and wider political opposition.

### *Current organisation of the police service in the UK*

The organisation of the Police in the UK is complex. There are forty-three mainstream Forces in England, eight in Scotland, and one in Northern Ireland; in addition there are eight special (non-geographic) Forces (ACPO, 2009). These Forces have much in common; for example, they have similar rates of pay, pensions, rank structures and powers, and are subject to the same overall legal controls and enforce the same national laws (Emsley, 1996). However, they also have to enforce local bye laws and manage policing within their areas, subject to the oversight of a Police Authority as well as the Home Office (Stallion and Wall, 2000). Thus, while to a large extent the Police service is homogenous, there are very real differences among Police Forces which do not simply reflect their relative sizes or the areas which they serve. Some of these differences are due to Chief Officers having considerable autonomy and extensive powers. Working with their senior managers and their Police Authority members, they have to interpret the edicts of the Home Office as well as the laws of the land in order to arrive at a policing model and plans for their areas that have to address local as well as national priorities (Home Office, 2003). As Stallion and Wall (2000) note, Chief Officers have autonomy and power, and a powerful say in how their particular services operate and the extent to which innovation takes place.

Policing in the UK is subject to a significant level of ongoing media attention and to the operation of political will to set overall targets for the Police to achieve. Such media attention tends to be haphazard and critical incident driven and, as a result, it is perilous to identify themes as being those of concern. However, there are some themes which have been relatively constant as a part of the media environment for policing in the last five or so years; these include having more Bobbies on the beat (Guardian, 2004; ComputerWeekly, 2006;

HomeOffice, 2009), getting Police officers out of Police stations (Singer, 2001; PoliceReform, 2002; Copperfield, 2006), catching criminals not motorists (DailyMail, 2005; Spectator, 2009), keeping yobs and thugs under control (Guardian.co.uk, 2006; Navigor, 2006; PoliceOracle.com, 2009), and dealing with nuisance neighbours (Guardian.co.uk, 2003; DailyMail.co.uk, 2009). Many of these media themes reflect, and are reflected by, political will and objectives set for the Police by the Home Office. These objectives (backed up by a set of performance indicators) have included, in recent years, an emphasis on visibility of policing (i.e., more officers, more time out of stations, more time out of police cars, more presence in high-visibility situations), targets for dealing with nuisance crime (e.g., anti-social behaviour, drunkenness, low-level street crime), burglary (domestic and commercial), and speeding as a cause of road traffic accidents and injury (resulting in the widespread introduction of speed cameras) (Home Office, 2002, 2003, 2004). Perhaps the longest running of these themes has been the drive to have more visible policing; what Crawford and Lister (2004) refer to as “the spiralling localised demand for a police presence, best illustrated by continual public calls for ‘more Bobbies on the beat’ ” (Crawford and Lister 2004, p. 420) and this has meant that Police Forces have been looking for ways both to recruit extra officers and make them more visible (Home Office, 2002, 2003, 2004; Singer, 2001; Crawford and Lister, 2004). This has, in turn, meant that pressure has been placed on Police Forces by the Home Office, and on officers by Chief Officers, to find ways to make policing higher-profile and more visible. One key response to this has been to provide officers with MICT such as in-car terminals (also known as mobile data terminals (MDTs)), laptops, and personal digital assistants (PDAs) which allow them to do more work outside Police stations. This has been one of the key drivers for the introduction of MICT.

### ***The Police and models of policing in the UK***

The police service in the UK has been widely regarded as a key influence on other systems of policing across the world (Emsley, 1996; Stallion and Wall, 2000) and, within the developed world there is now a degree of commonality in the models which are used to analyse and categorise policing methods and approaches. Jiao (1997, p.456) suggests that “Police literature indicates that there are four major policing models that are theoretically supported. These are police professionalism, community policing, problem-oriented policing, and the security orientation”. He argues that community-oriented and problem-oriented policing have become the dominant paradigms for policing in developed countries, although he points out that there is a need to ensure the models reflect a perceived reality rather than being superimposed by researchers and professionals onto police officers and communities. Jiao (1997, p 468) advises that the theoretical models develop and have to be adjusted recursively with practice:

*“When a policing model accurately represents police practices, it is amenable to analysis and testing, and further information about how police should deliver their services can be gathered. If discrepancies between the theoretical model and reality are observed, the model should be modified.”*

Furthermore, he suggests that this does not happen in a routine manner, with models being accepted as true because of what is set out in policing policy and rhetoric, as opposed to what actually happens in policing activity.

Tilley (2003) states that community policing, with which he allies problem-oriented policing, is an international trend and has become the dominant paradigm in policing in the UK, although this is not universally accepted (Gowri, 2003) as being representative of reality. Tilley (2003) notes that the UK has developed a specific variant on community policing in the doctrines of neighbourhood policing and intelligence led policing specifying that "Community policing and problem oriented policing are global movements, although the latter has distinctly American origins ... [whereas] intelligence led policing is home grown in the UK, though it is exciting interest in other countries also" (p.312). He suggests that this is now the dominant paradigm for UK policing and comments that:

*"Community policing, problem oriented policing and intelligence led policing all comprise reform movements for the police. Built into each there is, thus, a critique of policing as deemed normally done, as well as the vision of some preferable alternative. All call on the police to be less reactive and more proactive. All are premised on the assumption that policing can be, and needs to be, improved."* (p. 312).

Tilley (2003) identifies the roots of the movement to community or neighbourhood policing as going back to the 1970s noting that the "main impetus for community policing derives from the sense that police community relations are unsatisfactory" (p. 311) and he comments on critical incidents in the UK going back to the 1970s. He highlights, among others, John Alderson's comment that community relations with the police broke down in the 1970s and also points to the miners' strikes and the Scarman report as examples of a recognition that there was a need to move to a model of policing which is done with people rather than to them; although he cautions against the idea that this is a return to the "good old days" of the village Bobby, noting that "Community policing aspires to greater involvement of, and a dialogue with, the community than ever envisaged by Peel" (p. 312). Crawford and Lister (2004, p. 414) comment that attitude surveys since the 1980s have demonstrated declining confidence in the police and that this has been "particularly marked since 1996". They suggest that this declining confidence has been directly linked with the Government agenda for community policing and visible policing presence. Davies and Thomas (2003) note that community policing can be seen as a divergence from the traditional policing model, emphasising the absence of crime rather than the response to it and that this requires dialogue with, and connection with, local communities. Fielding and Innes (2006, p. 5) note the move and comment that it is not a reaction to actual crime, but to the fear of it in communities:

*"This is where a connection can be made to the programme of "reassurance policing" promoted by the Association of Chief Police Officers and the Home Office Policing Standards Unit. RP seeks to address the gap between broadly improving indicators of risk of criminal victimization and declining indicators of public confidence."*

This is not to suggest that neighbourhood policing has been adopted wholesale, and without any resistance to change away from the more traditional models of policing. Davies and Thomas (2003) comment that models of policing have been resistant to change “on the ground”, whatever the rhetoric set out in policing plans and Home Office policy “it is a co-existence of formalized bureaucratic and standardized working practices, together with a deeply entrenched and pervasive occupational culture” (p. 682). They identify that this culture has a significant impact as “operational officers (‘street cops’) tend to hold different attitudes and values than the policy makers and it is these street cops who shape the canteen culture” (p 683). In an international context, this resistance is also evident and Winfree, Barktu et al. (1996) identify that police officers in the US differentiate between ‘proper’ policing and community policing. They also point out that there is a range of approaches to police solidarity and professionalism, with officer culture, as noted by Davies and Thomas (2003), being powerful in perpetuating attitudes and approaches to policing by officers. This issue of culturally entrenched attitudes is also highlighted by other writers who have examined the police and resistance to change (Fletcher, 1996; Barton, 2003), and Barton (2003, p. 346) comments that:

*“Past experience suggests that greater ‘nationalisation’ of policing in the UK is unlikely to meet Government expectations owing to the strength of the police (sub) culture to adopt and yet resist reform and that the Government’s failure to pay attention to this may result in the failure of the reform.”*

Crawford and Lister (2003, p. 413) discuss what they term, the “patchwork shape” of neighbourhood policing in the UK and note that the move to neighbourhood or reassurance policing models, taken together with the rhetoric of new public management, has been a driver in the development of the role of Police Community Support Officers who are intended to provide highly visible presence in local areas. Reactions to such models of policing will differ from area to area, both in the reaction of the public and the attitudes of the police. Ankony and Kelley (1999) suggest that community policing is affected by the level of community alienation (or the police perception of it) and that as this (and especially high profile issues within a geographic area, such as media attention to drug dealing) increases so does the preparedness of officers to engage in proactive policing reduce, with officers retreating to older and more reactive ways of working. Some police officers feel betrayed by the move to a new model of policing (Imroth, Pye et al., 2005). In a study of UK police officers Imroth, Pye et al. (2005) concluded that many officers felt that the psychological contract was not being adhered to and that the shift in the nature of their role from reactive law enforcer to proactive preventer of social problems leading to criminality was a factor in this sense of betrayal.

Neighbourhood policing can be presented as a down to earth attempt to connect police forces with the communities they serve, what Westmarland and Smith (2004, p. 3) term “customerisation” in policing, and this is very much the rhetoric of the Home Office and the Association of Chief Police Officers as a number of writers identify (Ponsaers, 2001; Crawford

and Lister, 2004; Fielding and Innes, 2006). Westmarland and Smith also note that it is actually driven very strongly by the performance indicator and target culture of new public management and Fielding and Innes (2006) very elegantly expose some of the tensions between the qualitative and the quantitative which this creates:

*“Everything the patrol officer does in this mode is “enculturated” - that is, attuned to, working with and creating understandings inflected by experience, constructive interpretation of constrained information and the relevance criteria laid down by current understandings of the police mission in that locale. Everything done in this mode is consistent with qualitative research. There is no mystery to qualitative research. It is what a competent officer does all day long. The objective must be to get some of that perceptiveness, some of that “feel for the street”, into our measures of service delivery”.* (p. 14)

*“If we want to reassure the public, we need “indicators” that bring police work alive, give people memorable stories that function as moral emblems and whose principles are transferable to related, but not identical, circumstances. These will not be stories about numbers, but about engagement, negotiation and shared interests.”* (p. 18).

Neighbourhood policing has, thus, created a situation where there is an expectation that officers will be connected with, and be visible in, their local communities and consult with them on priorities and actions. This requires presence. It has also created a need for officers to build up a picture of the community, not just for themselves, but also for the benefit of the force as a whole, contributing to the demands of the National Intelligence Model and feeding data and observations back into central systems and local systems (Ponsaers, 2001). This requires access to systems currently located only inside police stations.

This tension has been addressed in part by the introduction of PCSOs (whose role is intended to be highly visible) but this introduction of additional staff has, paradoxically, reduced visibility for other team members as they deal with back office and administrative work the PCSO role creates. Mobile data is a way for police forces to reconcile these tensions, by allowing officers to access central systems, and contribute to them while out of police stations and visible to the community.

### ***The Police and the drive to New Public Management (NPM)***

There is general agreement among academic observers of the police that that the UK police have been subject to ongoing demands for change in line with the NPM agenda. It is also recognised that, by comparison with other parts of the public sector, the police were relatively sheltered from the introduction of NPM techniques in the 1980s and that this was only introduced in a more comprehensive manner in the mid 1990s (Fielding and Innes, 2006). Butterfield et al. (2005) make the same point – noting that while there were moves to do so they were “in a piecemeal fashion” (p. 332). Nonetheless, the NPM agenda was introduced and Davies and Thomas (2003, p. 681) comment that “as in other parts of public services the police service has seen the introduction of wide ranging changes to structures and management processes over the past two decades as part of the New Public Management.” Davies and

Thomas (2003) characterise this as a part of a process of movement “from fighting crime to problem solving” (p. 682).

NPM is hardly an unfamiliar agenda and has been applied internationally to policing (Hoque, Arends et al., 2004). Ashby, Irving et al. (2007) point out that in the UK context NPM “has been built around private sector techniques of enterprise regulation, coordination and control, and reflects a sense of their innate superiority” (p. 159) and Leishmann, Cope et al. (1995, p. 26) comment that “since the 1970s new public management has been, and remains, a highly significant trend within western governments”. They cite Hood (1991) as having set out an enduring list of the doctrinal components which characterise NPM; these are *hands on* professional management in the public sector, explicit standards and measures of performance, greater emphasis on output controls, shift to disaggregation of units in the public sector, a stress on private sector styles of management practice and on greater parsimony and discipline in resource use (Hood, 1991). Leishman (1995) charts a series of developments in the political landscape for the police which illustrates progress towards these doctrinal goals. These include the Sheehy Report in 1992, the White Paper ‘*Police Reform*’ in 1993, the passage of the 1993 Police and Magistrates Courts Bill (as the Police and Magistrates Courts’ Act 1994) and the Posen Inquiry (Home Office Review of Police Core and Ancillary Tasks) in 1995.

Cope, Leishmann et al. (1997) argue that the police have been subjected to over a decade of pressure to follow the NPM agenda. They identify centralisation of key services and structures including the central policy and financial structures, the decentralisation of decision making on day-to-day management issues to local constabularies, and the ongoing thrust to privatise elements of the police via initiatives in load shedding, contracting out of services, charging for services and imitation of private sector management styles. Cope et al. (1997) believe that this lays the basis for four quite distinct possible futures for policing – centralised, decentralised, privatised and Europeanised. They also identify that the NPM agenda provides fertile ground for initiatives which are seen to serve the rhetoric of the doctrinal basis of the approach. Whilst they do not identify mobile working and mobile technologies as a part of this, they suggest that the introduction of such approaches can only be seen as congruent with the aims of NPM. Davies and Thomas (2003, p.689) comment that the desired shift is from “a largely hierarchical, formalised approach with an emphasis on ‘mistake avoidance, caution and systematic rule application’ to one where values of innovation, enterprise, management and problem solving are paramount”. As such it forms a part of the organisational background of the Police Force in which my research took place. Sorensen (2003) also notes this shift and raises the issue of professional service automation with technology being used in what he terms *Taylorism Nouveau* (Sorensen, 2003, p.8) to manage productivity in knowledge workers in the same way that time and motion were used to manage productivity in assembly lines and similar settings by the original scientific school of management. A specific area of attention in the NPM agenda is



supervision and management, and yet this seems to be neglected in the policing context. Beck and Wilson (1997, p.131) note that supervision is an area of attention:

*“Overall, there is a desperate need for police organizations to improve supervision at all levels. Emphasis on, and training for, good supervisory techniques (and particularly everyday, positive communication and feedback) is essential if police departments are to optimize performance and commitment.”*

and Butterfield and Edwards (2005) identify the nature of the NPM inspired changes in policing and investigate the role of the supervisor in this. They note that relatively little research differentiates out the impacts of such reforms on supervisory roles (Butterfield, Edwards et al. 2005).

Davies and Thomas (2003) note that there are issues with regard to the implementation of NPM and that police culture (as raised above with regard to community policing models) can be powerfully resistant to change. Davies and Thomas (2003, p. 684) comment that the police are not “passive recipients” of the NPM agenda and that individual officers and roles will react to the “discourses of NPM”. They point out specifically that there are issues relating to the implementation of NPM in policing in a gendered manner with female officers being subjected to a culture of “competitive masculinity” (Thomas and Davies 2002, p.187). Ashby et al. (2007, p. 172) report that “crime and disorder are perennially important to voters and, therefore, to politicians” and that this creates “a chronic gap between political aspirations and the reality of operational policy” which it is left to police forces, and police officers, to reconcile.

Throughout the 1990s the Government’s approach to NPM was to increase concentration on performance indicators, and as the potential for technologies to influence some of these performance indicators, such as officer visibility, is high, more emphasis began to be placed on technology. Visibility (a key policing theme as discussed above) means being seen in public places, and to do this, police officers need to work outside police stations. Police officers spend up to 40% of their time in stations where they are not visible to the public according to the ‘Diary of a Police Officer’ report (Singer, 2001), and one of the key drivers for the central impetus to give them mobile access to technology and information is that they can stay out of police stations, and can increase visibility.

### ***The Police and technology***

Due to the autonomy and power of Chief Officers, and their freedom to manage their Force independently of much central control, the extent of use of technologies differs from Force to Force. This means that at a local level the Force Intelligence System, for example, may well be locally developed and even if it is not, will probably not be compatible with those from many other Forces, or accessible to them (PITO, 2004). This is an issue which has been thrown into sharp relief, and into the eye of the media, as a result of the publication of the results of the

Bichard Enquiry (Bichard, 2004) into the events surrounding the Soham murders. Even within a single Police Force there are instances of incompatibility (Bichard, 2004). Chief Officers' freedom to innovate has resulted in a high level of disparity in the information technology infrastructure amongst Forces and therefore Police Forces have widely differing resources and systems (FileOnFour, 2004). Much of this variation has grown up in areas where no central resource has been provided or imposed. Despite this, the information ecology has not been allowed to develop completely haphazardly. Information Technology is very much a part of the police environment (Nunn, 2001) and it is managed aggressively in Forces to deliver the maximum benefit from the technology and the spend associated with it. Almost all permanent (and most temporary) Police stations have network terminals – either shared or allocated to individual users – and appropriate users also have laptop personal computers (PCs) for their own use or use within a team. Police officers can usually use any shared terminal at any station in their Force to access the information resources they are entitled to use, send and retrieve email, complete forms, word process statements and generally manage their work. This move to adopt MICT also needs to be set against the development of a stronger central control and direction in the use of ICT. The Police Information Technology Organization (PITO) was set up at the behest of the Home Office in 1998 with a brief to oversee and manage information technology developments for the police and liaise with the other emergency or *blue light* services. The remit of PITO was stated as "... to support the UK police and other criminal justice organisations in reducing crime and the fear of crime, improving the administration of justice and diminishing the social and economic consequences of crime" (PITO, 2007, p. 30) and the following set of specific objectives were established:

*"To determine, in partnership with the police service, their corporate requirements for information and communications systems, including how to interface effectively with the public and other criminal justice organisations, and to exploit developing technologies to meet those requirements. To develop, procure and manage delivery of national information technology and communications systems in support of effective policing.*

*To maintain a strategic approach to local information technology systems, by co-ordinating their development and delivery where common standards and systems are needed in the interests of effective policing. To facilitate the achievement of maximum value for money across police use of information and communications systems and to enhance value for money generally across policing by providing an overall procurement, contract management and advisory service. In addition, as necessary, to advise Ministers on the exercise of their powers to regulate the use by police forces of information technology equipment or systems."*

PITO had some notable successes – including overseeing the national roll-out and ongoing management of the revised Police National Computer (PNC) - and the organisation also sponsored the development of central systems for other functions such as custody management, command and control, and firearms registration. In addition, they oversaw the development of interfaces providing the police service with access to further databases (such as the Driver and Vehicle Licensing Centre (DVLC) records) via the PNC in order to provide further functionality for existing systems. PITO was replaced in 2007 by the National Policing Improvement Agency (NPIA) which amalgamated PITO and a number of other police related organisations

including the Police Scientific Development Branch (PSDB, formerly a part of the Home Office), and Centrex who are the central training standards body for the UK police service (NPIA, 2008, p. 12).

Mobile data and mobile working also needs to be placed against the ongoing introduction of a digital radio system for the Police, known as Airwave. The Airwave radio system, based on the TETRA standard, was introduced while this research was being carried out (2002 to 2005) (o2, 2004), as a much-heralded replacement for the almost emblematic Police radio. The Airwave system is designed to deliver more functions than the older UHF/VHF radios with far higher levels of security, improved coverage, messaging, mobile telephony and the ability to manage data being among the stated gains from its adoption (Home Office, 2009). This system is currently rolled out to all mainstream Forces and is being seen in many Forces, as well as by the NPIA and the Home Office (Home Office, 2009), as an opportunity to review communications and information policies in order to make sure that Forces gain the maximum benefit from the change.

In summary, the Police Service in the United Kingdom consists of over fifty relatively independent Forces, each with their own ICT infrastructure and readiness and motivation to use MICT. These motivations are manifold but some key ones can be identified. MICT is being introduced to free police officers to work in the communities they serve and is seen as a way to put officers back on the beat more, returning them to the mobile workers that they were in the days before ICT tied them to stations. It is intended to allow officers to access and provide information directly, without the need to use the voice radio channels and the services of information intermediaries in control rooms to relay information to them. It is intended to provide a way of reducing the volume of voice radio traffic by switching information provision to data, thus allowing for a more effective use of the skills of the control room staff. It is also seen as having the potential to deliver gains in the reduction of bureaucracy and the level of administrative work which officers have to complete, work which tethers them to computers in police stations and takes up time they could use more productively.

### *The Police and Information management*

Given the extent of use of ICT in their jobs, officers are, by and large, computer-literate and regard computers as a tool without which they would not be as effective in their work. The result of this strategy has been a strong information culture where intelligence (in the information sense) is seen as a cornerstone of effective policing (Ponsaers, 2001) and in which ICT is an integral part of the daily life and routines of all officers. This, however, brings issues of access to the fore when officers are not able to use the resources directly. Currently, when away from a Police station, most officers have to access information sources through an information intermediary; either using the radio system to ask the control room to make the

appropriate checks for them or calling a colleague in a Police station and asking them to access the computer terminal to obtain the required information. This, in turn, places demands on colleagues and also on the radio system and the staff at the centre who relay the information. At times the radio system is overburdened, or has to be reserved for the handling of a major incident and officers may have to wait for an extended period of time to be able to access a routine check. Thus, the system has created a demand for information, and an expectation that it will be available, but has not expanded the communication channels which provide access to this information for officers working away from the immediate environs of a Police station. In attempting to meet this need it is sensible for Police Forces to look to ICT, which has served them well in the past (Colton, 1979) and to do so in the form of MICT with the potential to allow officers working away from a desktop environment to access the information they need to perform their role without placing additional demands on already busy voice radio channels and control room staff or other information intermediaries.

*Information provision and technology – stages of development*

Police are information workers and, although they use a wide range of information sources, most police Forces are highly reliant on information technology. They have arrived at this position through a continuous development from the earliest days of policing to the present time. The section, which is based on the work of Dupont (1999, 2004) and Monjardet (1996) provides a picture of how the use of information and technology in policing has developed to where it is today. Dupont’s work is based on a general analysis of the process of technocratisation in policing and the table below adapts his stages to the UK police, taking specific dates for telephone communication, radio communication and data enabled communication for the UK.

*Table 1.2: Information provision in UK policing*

Stage	Tools	Practice
Early information provision  1749 to 1880	In the early days of policing personal knowledge of criminals and local geographical areas was paramount and officers away from their stations would be alerted to emergencies by the ringing of bells, or by the shouts of victims or members of the public. Information beyond personal knowledge was not available to the officers when they were out of their stations and no information which came to the officers’ attention while out of the station could be incorporated into any central records without return to their stations. Information was held locally in the main, with limited court and national records.	This stage is characterised by minimal information being provided to officers and poor speed and ease of access to information beyond personal local knowledge and immediate team knowledge. Officers spent most of their time out on the beat.
Intermediate information provision – stage one	At this stage police officers were tasked with recording information systematically and there were limited levels of contact between officers and their stations while they were on patrol. The contact was mainly via the mechanism of police boxes and access	This stage is characterised by intermediate levels of information with slightly improved speed and ease of access and some development of

1880 to 1955	to other, mainly municipal, facilities with telephones. Although this provided a mechanism for updating and exchanging information during a shift, the volume of information held centrally, and the speed and ease of access to it, was relatively low. Where information was requested it was rarely available immediately and usually had to be requested, often in writing, from a number of information intermediaries at remote sites or working for other organisations such as the Courts.	local and regional systems, with nascent national systems. Speed and ease of use of information tended to be related to location; with local information more quickly and more easily accessible than remotely-held information. Officers still spent most of their time out on the beat.
Intermediate information provision – stage two 1955 to 2003	At this stage radio communication provided officers with the possibility of being updated while out on patrol, and they could, in turn, update information systems while out of their stations. This led to the development of specialised information intermediaries in the form of control room staff who were able to access information which, albeit limited by today's standards, was greater in volume, and which could be accessed more quickly and easily, than had been the case. Access to the radio system was initially only available from vehicles, and only in metropolitan areas, but the networks were extended over time and handsets became available for personal use to the point where the radio became almost emblematic of the police.	This stage is characterised by intermediate levels of information with improved access to local, regional and national systems plus the development of a cadre of information intermediaries who provided information to officers as well as resourcing incidents and managing dispatch of officers. As officers were able access more information in the station and had more paperwork to complete than was previously the case, they spent more time in the station and less on the beat than previously.
Modern information provision 2003 to date	This stage saw the use of pervasive, secure, and resilient mobile radio access in vehicles and by personal radios and is the current situation. Radio communications systems were designed specifically to support the transfer of data as well as voice. There is pervasive fixed ICT access in Police stations to highly developed national, regional and local information sources, many of which can be accessed directly. There is some limited mobile access, mainly over commercial wireless networks, to mobile computing and mobile access to key databases and tasks. Information resources are increasingly being either tied together through interfaces, or indexed, to improve the volume and connectedness of information. Information intermediaries act as a conduit for officers out of their stations so they can access a vast range of information on people, vehicles, incidents and places. Some tasks can be completed by radio, others require paper records to be kept and forms completed either in hard copy or on ICT systems after return to police stations. Systems such as automatic number plate recognition (ANPR) automate access to some systems, but this often requires validation with control staff due to the asynchronicity of database updating.	This stage is characterised by a high level of information available with good speed and ease of access achieved through the use of information intermediaries. Information input via this route is, however, less developed than information provision. The advantage of modern information provision is that officers can be provided with accurate and up-to-date information in a range of contexts and allows for effective command and control in situations ranging from minor local incidents to major national enquiries as well as natural or man-made disasters. However, although the use of technology has provided officers with access to information, it has also meant that they spend more time in police stations thereby reducing visibility and lowering their performance in terms of the indicators used to judge it.

### *Mobile information provision*

As a part of modern information there has been a move, as documented above, to the provision of mobile systems which allow officers to access information systems while out of the police

station, without recourse to information intermediaries. There have been initiatives in Police Forces in the UK for many years, most recently making use of highly sophisticated voice radio systems. MICT, known as 'mobile data' in the police community, is a logical extension of systems which some Forces have evolved and developed to a sophisticated level (PITO, 2002). Police officers operate in an information-rich environment (Nulden, 2002; Nulden, 2003). They have access to sophisticated databases (Hauck and Chen, 2002; Hauck and Chen, 2003a; Hauck and Chen, 2003b) and Geographical Information Systems (GIS) drawing on Geographical Positioning Systems (GPS) (Pelfrey, 2001) and the facility to call on colleagues through the use of email, mobile phones, radio contact and in face-to-face meetings. The particular suite of applications used by a given officer will be role-dependent and Force-dependent, but certain key information resources can be identified. The Police National Computer (PNC) is the authoritative source for police officers countrywide on the status of vehicles and individuals. This will indicate, for example, whether a vehicle is stolen or whether a person is wanted by the Police or has convictions for criminal offences. Locally this is supplemented by a Criminal Intelligence System (CIS) which provides information on all of the people known to the Police Force concerned. This is essentially local data and will carry far more detail than the PNC. It is updated frequently and will link individuals to associates, addresses and vehicles. Checks can also be carried out on the (local) voters' register, firearms register and other databases via CIS. The status of officers and incidents is handled by a locally managed command and control system which provides the operational data on an incident, the progress in managing the incident and the resources committed to it. This system is tightly integrated with the terrestrial trunked (TETRA) radio system. In addition, officers have access, from terminals in police stations, to resources such as the Police National Legal Database (PNLD) which provides them with information on the status of laws and offences in a concise and usable format. All of these resources will be available on terminals located in offices and duty rooms in Police stations across the Force area as well as on individual terminals allocated to specific users. In most Forces, personal computer access is now almost universal and many Forces have also moved to email and intranet access for all officers, and are in the process of developing sophisticated Internet and intranet based information sources and portals for officers.

Kun, Miller III et al. (2004) identify that many developments in mobile computers and their use for policing have a technology focus although they also note the piecemeal nature of some of these developments commenting that "they weren't designed to work with each other – so each needs its own interface (p. 34)". They identify three key lessons learned in the deployment of 'Computers in Cruisers' (p. 39). The first is the need to build on user experience and move from the known to the unknown, the second is to appreciate the lack of primacy of these systems in the users' universes and the final one is that users will adapt to systems as well as systems having to adapt to users.

The key message from the account above is that technology has improved access to, and management of, information in policing but as this has happened the result has been that officers spend more time in police stations and less time on the beat. Although Police Officers have historically been mobile workers the advent and proliferation of ICT has resulted in them being less mobile. The introduction of MICT offers the potential to counter this and put officers back on the beat, or make them visible in other ways, as being one of the key areas of benefit which the technology can deliver, and Forces can expect.

#### **1.4 REASONS FOR UNDERTAKING THE RESEARCH**

In conducting this research I sought to understand the factors which affect the introduction and use of MICT, as well as the impact of MICT on work practices for the front line officers at whom the systems are targeted as users. I also wanted to understand the recursive work practice impact on the use and implementation of the technologies. I did so because I believe it is a valuable exercise, and this section aims to set out briefly the reasons why I believe that this is so.

I believe that the specific police setting for the research provides a high level of relevance and value to the work. The police-ICT context is not one which has been the focus of a large body of research, either as a service per se or as a setting for research into broader issues, although there has recently been an upsurge of interest in the area of public safety as a whole (e.g., Sawyer, Tapia et al., 2004) and in the police specifically. There has been research into police information use by Pica and Sorensen (2005), who outlined the differences in police roles and the issues of passive versus active, and structured versus unstructured, information use in police work, and by Nulden (2003) who addressed the difference between police and policing and suggested a framework to determine whether mobile technologies provide advantage for officers. A common theme in all of this work is the recognition that the devices themselves are not the focus of analysis – it is the use of the devices in context which is both more valuable and more complex. This has been neatly summed up by Sorensen (2003) who comments that technology use is about more than technology and clearly stated the need to take account of the actualities of human interaction. Despite this recent interest, the police in the UK remain a relatively under researched area as a group per se. There are a number of reasons for this paucity of research and among the key ones are that there are barriers to access to police settings (Nulden, 2003) and constraints on the information to which researchers can be given access and which they can make public as a part of their findings. In terms of access to police settings there are barriers of gaining permission to research in the setting and these will often include the requirement for a researcher to undergo a security clearance – a process which is time consuming and which carries a cost. There are also practical barriers and constraints. Police officers work to a shift pattern which can mean researchers have to follow this pattern with the

attendant issues of health and safety. As a result of police officers working in reactive roles in many cases arrangements for interviews and observations can be hard to make, and harder to keep, as officers respond to incidents and emergencies. The problems of access to restricted information are also ones which are particularly apparent in the police setting where information is available to officers on criminal activity and on the records maintained by the police on individuals. This information is covered both by internal guidelines on disclosure and by national laws based on European Directives with regard to Data Protection and Freedom of Information

In part as a result of the barriers outlined the police service use of ICT has not seen the level of attention that it might be expected such a key part of the fabric of our social life would attract. In this work I have had the opportunity to spend time with officers carrying out normal policing roles and to discuss with them, as well as with other stakeholders, the jobs they do and the way that MICT is brought into, and impacts on, their working lives.

The Force I have worked with is, as I have noted above, different from other Police Forces in terms of the ICT systems it has, its structure and the local emphases placed on its work by the planning process driven by the Chief Officer and Police Authority. Nonetheless, there are broad areas of similarity between this Force and others in the nature of the overall task of policing, in the specific areas of attention for uniformed front line officers, and in the processes by which incidents are managed, recorded and resolved.

I hope, therefore, that aspects of the research undertaken in the Force with which I worked can contribute to the understanding of, and development of, applications of MICT in other Police Forces in the UK on the basis that while the specific tools used to undertake activity may differ, the underlying activities undertaken will have significant levels of commonality. Other areas where there may also be opportunities to use and extend this work include policing in other national and international contexts, as well as in the public safety context more generally in the UK and internationally.

## **1.5 STRUCTURE**

The thesis has eight chapters. Chapter One introduces my research topic and provides background information about the context for the work – the police and the mobile technologies they are introducing. This includes a review of the literature with regard to policing and technology in the UK and the drivers in this context which have led to a significant groundswell of interest in MICT adoption. This chapter also provides an overview of the stages of this research and the structure of the thesis. Chapter Two reviews literature in three main areas. The first two of these are clearly inter-related and are key areas of interest with regard to mobile information technologies; the concept of mobility, and the current uses of mobile technologies.



and information systems, especially within contexts relevant to the one I am examining. The final area of literature review provides an overview of Activity Theory as this is the key lens I have used to examine the implementations I observed, and in particular the Systems Proof of Concept, and Trial stages. Chapter Three explains the methodology I used to undertake my research with especial reference to Activity Theory (AT), my reasons for using activity theory to guide and enrich data collection and analysis, and the manner of use of AT in that process. The chapter also gives details of the specific police Force I have used as a case study for my research and the stages of implementation I observed. Chapters Four, Five and Six report and discuss the findings in respect of the three stages of the introduction of mobile technologies – technology proof of concept (TPOC), systems proof of concept (SPOC), and trial prior to full roll out (Trial) - respectively. Chapter Seven is structured using AT themes and draws on all three stages of the research. This chapter outlines the way in which AT was used to structure understanding after the TPOC stage and then to provide emphasis on the key areas of attention in the SPOC and Trial stages. This chapter concludes with a characterisation of the high level activity system of front line operational policing and the two key associated activity systems of response policing and neighbourhood patrol. The aim of this is demonstrate some of the gains from using AT sequentially across the three cases as well as an integrative lens to assist with understanding of the three cases viewed as a whole. Chapter Eight provides overall discussion and conclusions. It is structured around the potential contribution to practice and to theory and highlights in particular three areas of theoretical interest; the first of these is the use of the AT lens to structure understanding of a set of sequential cases, the second is the development of a model, grounded in data and in line with AT principles which illuminates areas of attention for designers and implementers of such systems in similar settings in the future, and the third expands on the current theoretical literature with regard to perception of users of the IT artefact in the systems they are using.

## 1.6 SUMMARY

This chapter has provided an overview of the context for the research I have conducted, and explains why I chose to conduct this research. The chapter provides contextual information policing in the UK, about the importance of technological change in increasing the performance of police officers, and about the potential of the use of mobile technologies by police officers and the importance of research in this area. The key points of the chapter are:

- Police Forces are homogenous in many respects but they have many differences stemming from geography, social landscape, and local political demands
- The ICT landscape in Forces is diverse. There are some common systems but there is also significant variation.
- Police Forces use ICT heavily and many have experimented with MICT.
- There have been attempts to bring levels of central control to police ICT systems but they have not, so far, had a major impact.
- There have been, and continue to be, strong drivers for the adoption of MICT by police forces in the UK
- MICT use is accelerating, particularly with Central Government attention and funding, but police use of MICT is restricted. It is also quite different from Force to Force, making use of different devices, carriers and applications.
- Policing, and public safety, are vital parts of the operation of society but are under researched with regard to information management, and especially the use of MICT to support front line public safety professionals such as police officers.

This research explores the factors affecting introduction of mobile information and communication technologies (MICT) which allow police officers to access information systems directly without recourse to an information intermediary, such as a control room operator, as well as some of the key effects and impacts that their introduction have on the work of these front-line police officers as a working group. It can, therefore, potentially, assist practitioners in implementing such initiatives as well as contributing to theoretical understanding of the key areas of attention in such implementations.

## Chapter Two: Literature Review

### 2.1 INTRODUCTION

The aim of this chapter is to review literature that provides a framework for my research, enabling me to place my research in a context and illustrate the gap in literature that exists in respect of the introduction of MICT in front line policing. I have sought to examine the implementation of MICT in policing and, as such, have treated it as a specific instance of an information system and, specifically, a mobile information system.

In order to set the initiatives within the Force I have worked with in context I have provided some background information on policing and the drivers which have led to the current interest in the development and use of mobile technologies in front line operational policing in Chapter One. In this chapter I aim to place these moves towards mobile technologies, mobile data in the police parlance, in a context with regard to the development and use of mobile technologies to support mobile working. In order to do so I examine the concept of mobility as it has been applied to mobile working and mobile technologies as this provides a basis for the actual technologies in use as well as placing them in a social, as opposed to a purely technical context. I also review some of the technical issues and developments with regard to mobile technologies and, in particular, the broad trends in the development and provision of mobile data, the drivers for adoption, the perceived gains and problems, and the process of introduction of such technologies both generally and in the policing context as far as it has been studied. Because I have used Activity Theory as tool to help to understand and structure my analysis of the three stages of implementation of MICT into the Force, I have reviewed literature on Activity Theory at a general level as well as examining its use to help structure and frame understanding of the use of mobile technologies to support mobile information access and mobile working.

I have sought to show that there is a gap in the literature with regard to the understanding of:

- This specific context.
- The manner in which users perceive, adopt and use such systems, and the wider ramifications of this for the organization.
- The use of Activity Theory across a set of sequential cases to assist in understanding both those cases per se and the larger process of which they are a part.

### 2.2 MOBILE INFORMATION, AND ITS SYSTEMS

#### 2.2.1 Terminology

In discussing the process of introducing handheld computing into front line policing there are a number of terms which are used, sometimes interchangeably and sometimes with a specific

meaning attached. This is an attempt to provide some clarity as to these terms. The key terms used, often with little precision, include; mobile data, mobile information and communications technologies (MICT), mobile computing, mobile technologies and mobile information systems.

The term *information and communications technologies* (ICT) has passed into common parlance and, although the term would literally encompass a wide range of technological artefacts such as cameras, it has come to mean computers and their associated systems. Kling, Rosenbaum et al. (2005) equate ICTs with “computer based systems” (p. 9) and further comment that “Today, many people’s attention is focused on the new ICTs, such as those developed with computer and telecommunications equipment” (p. 11). Whilst they, and others, recognise that many artefacts are encompassed by the literal definition of the term, the accepted use of the term ICT is now almost irrevocably associated with mobile computing and telecommunications, either separately (such as mobile phones and laptop computers) or jointly (such as smartphones and data enabled PDAs or netbooks). This term has been appropriated by those discussing mobile applications of computing and has appeared as mobile information and communication technologies (MICT). The term has been taken up and used within academic research more than in everyday use, with web searches for “*mobile information and communication technologies*” and “*MICT*” returning results almost exclusively from academic writing. In the area of academic research into MICT there has been work on a range of different applications and types of equipment. Allen and Shoard (2005, p.1), in work relating to the use of portable email in a police force, comment that there is a “small but growing body of work [which] explores the use of mobile information and communication technologies to expedite ‘field work’ ” and Green (2002, p. 281), refers to an “explosion in the numbers of such devices”, in work which addresses the impact of the mobile telephone. Meso, Musa et al. (2005, p.121), in a study of technology adoption, comment that “there is no clear and agreed measure of mobile ICT use” or of the precise limits on the nature of such technologies and they propose using mobile phone adoption as a proxy indicator for mobile ICT adoption in general. Okoli, Ives et al. (2002, p.1) highlight what they see as the importance of the area, commenting that “Wireless mobile computing promises to usher in the next major paradigm in personal computing” but do not offer a definition of the term, beyond using it interchangeably with MICT.

The Police community tend to refer to ‘mobile data’ as the generic term for mobile computer systems, providing police officers with access to information systems directly rather than through the mediation of an information intermediary. There is no single accepted definition of ‘mobile data’ although the annual reports for PITO in the last two years up to the end of its existence (PITO, 2005; PITO, 2006) make use of the term in reference to the actual equipment in use and the associated information systems accessed by the hardware as well as in the naming of the Mobile Data Programme which was set up to oversee the introduction of mobile data in

policing. NPIA, as the successor to PITO (taking over that organisation's functions in April 2007) are still making use of the term in 2009 (NPIA, 2009) although they formally renamed the Mobile Data Programme as the Mobile Information Programme in 2008 (NPIA, 2008). The term mobile data has also been taken up and used by those reporting on police initiatives, for example The Register (2009). In my personal correspondence with a senior member of the NPIA Mobile Information Programme (Wyeth, 2008) he commented that the scope of the term covered "all of the systems associated with getting information to the officers on the front line when they are out and about. So, it covers the hardware, the software, the interfaces and the management practices which allow us to make use of it all."

Such systems can be seen as specific instances of information systems, and mobile information systems is a field of study in its own right. Hjelm (1996, p. 283) offers his vision of a mobile information system;

*"in the future the boundary between the local area network and global connectivity networks will disappear. This is true for mobile use. It means that existing information systems will be globally accessible but it also means that users will be able to access information which needs to be geared to them while they are mobile".*

In doing so he sets out a challenging vision for the future of mobile information systems and highlights the need for mobile information systems to not simply provide access to information but to do so in a manner which meets the needs of the users. Krogstie (2005), in the introduction to the MOBIS SIG-group (a sub group of IFIP TC8), comments that:

- "Mobile information systems differ from more traditional information systems along several axes:*
- *So far only a limited convergence towards a common user interface standard for mobile information appliances*
  - *Weak clients compared to traditional end-user equipment (vs. memory, bandwidth etc)*
  - *New dependability issues e.g. security issues when easily misplaced and stolen mobile information appliances can store and access corporate data*
  - *Small input and output devices (e.g. small screens and keyboards)*
  - *Converging functionality from many existing platforms".*

A linked concept to that of mobile information systems is, in almost all cases, the ability to use mobile computing. This is discussed further below.

### **2.2.2 Mobile technologies and the nature of mobility**

The structure of the section is based on the fact that, for many organisations there is an awareness of technology and a push to adopt technologies as a panacea, often without there being a planned process to ensure that the organisation gains the maximum benefit from the change process and expenditure, and the chapter looks at the way that MICT in particular can support an organisation and how this has to be managed to gain maximum benefit. Having briefly established that ICT can be used to gain advantage the chapter goes on to examine the role of MICT in this process and then looks at the general strengths and weaknesses of MICT applications. Given that organisations need to manage the process of MICT implementation if they are to maximise the benefit from it, and minimise the negative effects, the section then

examines the equipment, people and management issues which enable and constrain the use of MICT. The final section briefly places some of this content in the context of research into MICT use in policing.

### *Terms*

In discussing the use of MICT to support mobile work there is a range of terminology in use. This terminology is still evolving and is not settled with firm and agreed definitions. Among these terms, which are used are; ubiquitous computing, invisible computing, mobile computing, pervasive computing, everyday computing, nomadic computing and wearable computing.

A key term is the '*ubiquitous computing*' label – also known as UbiComp this is generally attributed to Weiser (Weiser, 1993; Weiser, 1996) who posited the concept of computing which was embedded into the everyday world and required little attention. Writing more recently Esler, Hightower et al. (1999) commented that the challenge for MICT is to:

*“build applications where the user interface is not on a computer, it is the computer; where users do not connect to a network but have their data travel on a network; where users are not commanding operations to be performed but agents are acting autonomously on their intentions”* (p. 260) (original emphasis).

In effect this is, according to Gallis, Kasbo et al., (2000, p. 3), the “opposite of a VR world – people use the devices unconsciously”. It is also linked with the multi-device paradigm (Press, 1999) and internet access as the centre of a *post PC* era (Press, 1999; Attaran and Attaran, 2002). Lyytinen and Yoo (2002) comment that the challenge for the future will “shift from demonstrating the basic concept to integrating it into existing infrastructure”. A point to note is that there is a significant difference in the availability of underlying infrastructures to support ubiquitous computing (Paulos, Anderson et al., 2004) with urban areas (Paulos' “Urban frontiers” (p.1)) being significantly better provisioned than rural areas. This division is also seen at an international level with rates of mobile broadband access, for example, being vastly higher in some countries than others (Ono and Zavodny, 2006).

Nomadic computing is a term where there is some discussion as to the nature of the concept – it is usually taken to mean people who move to a place and then work from that place rather than those who work whilst “*on the move*” and this is the definition offered by Helal, Haskell et al (1999) who state that nomadic computing users travel to a location and use a “Fixed connection – usually in a building”. Wiberg and Gronlund (2000), however, define this more broadly as “working on the move without relying on home bases such as offices factories etc.”.

Wearable computing is the term used for the proposition that the wireless future will incorporate the process of “attaching computation to the user” (Abowd and Schillit, 1997). There have been some specific trials of wearable systems in specialised environments such as that carried out by Guerlain, Lee et al. (1999) in the use of wearable systems in petrochemical plants. There is an issue raised here of when a handheld computer becomes a wearable computer (Smailagic, 1999), and Saunders (2004) notes the blurring of the line between handhelds and wearable

computers, citing portable hands free earpieces, and enhanced eyewear displays. He also notes that "No matter what form they take they will almost certainly share one feature in common – instant [intra device set and WAN] communication" (p. 1).

Pervasive computing is an evolution of invisible computing – where the information enabled devices are embedded in the world around us (Birnbaum 1997; Huang, Barton et al., 1999; Banavar, Beck et al., 2000; Fails and Olsen, 2002). Gallis, Kasbo and Herstad (2000, p.11) comment that "invisible computing is already with us – the average US home has 40 microprocessors – but they lack the pervasive communications system to make them talk and work together". He states that a key emerging trend is to have numerous casually accessible and often invisible computing devices and that this may well finally be a mix of UbiComp and wearable computing. Odlyzko\* (2002) is less convinced by this vision and suggests that "we will still be frustrated but at a higher level of functionality, and there will be more of us willing to be frustrated".

'Everyday computing' is a term coined by Abowd and Mynatt for their vision of the future of wireless ICT which "promotes the informal and unstructured activities that are typical of much of our everyday lives" (Abowd and Mynatt, 2000, p. 32). They argue that computing and the interfaces which control work task performed for us by ICT need to accommodate the everyday and they set out some basic rules which they suggest characterise normal human activity. These are that tasks rarely have a fixed start and finish, interruption is expected, concurrent working is natural, time is an important discriminator and associative models of information are needed. This is a pattern of activity and operation which fits well with the way in which many police officers work.

Mobile computing has developed as a more general term for the use of MICT. Helal, Haskell et al. (1999) maintain that a prerequisite for mobile computing is the existence of a wireless connection and Zimmermann (1999) argues that it is defined by the combination of the use of an information enabled device plus communication access, plus mobility of the whole. Esler, Hightower et al. (1999) suggest that in the future this general mobile computing/MICT area may move to be closer to pervasive or UbiComp with technology woven into the fabric of our lives, and potentially even into the fabric of our clothes and homes. Mountain and Liarokapis (2007, p. 424) state that mobile computing environments have three defining characteristics:

*"(1) mobile clients that have limited processing and display capacity (e.g. PDAs and smart phones); (2) non-stationary users who may use their devices whilst on the move; and (3) wireless connections that are often more volatile, and have more constrained bandwidth, compared to the "fixed" internet"*

and they point out that such demands mean that the provision of mobile computing can present more problems of deployment, maintenance and support than the provision of fixed devices. Bouchier (2001), on a similar note, comments that mobile devices are, almost by definition

impoverished devices by comparison with fixed computing alternatives and that, for the foreseeable future this is likely to remain the case, ensuring that mobile working and the mobile computing, communications and information systems which support it is a source of tension in working lives. A tension which comes out of having to reconcile the flexibility of 'anytime, anywhere' working with 'sometimes, some places' technologies. It is interesting to note that writers such as Mountain and Liarokapis (2007) and Bouchier (2001) both place the IT artefact, or in this case the MICT artefact, at the centre of their investigation and thinking.

A useful way for structuring these areas is that put forward by Lyytinen and Yoo (2002) who posit a structure for analysis based on levels of embeddedness and levels of mobility. They propose that (i) traditional 'fixed' computing has low levels of embeddedness and low levels of mobility, (ii) pervasive computing requires low levels of mobility but shows high levels of embeddedness, (iii) ubiquitous computing is high on both counts, and (iv) mobile computing is high on mobility, but low on embeddedness. Using this analysis, policing as a context will currently be moving from traditional computing towards mobile computing on a trajectory which will eventually take them towards ubiquitous computing.

### *ICT in organisations*

Olaisen (1993, p. 45) comments that the impact of ICT "has been a momentous change" and that "IT and information is no longer a business resource, it is the business environment". He identifies three key roles for computers in organisations in the future: as assistants, carrying out routine work; as advisers, searching for information; and as communication tools, spreading the information to where it is needed. Olaisen (1993) has proposed that if ICT is to be exploited to the greatest extent then its use needs to be planned as a central component of the organisation, and this will require the correct infrastructure, the correct skills to use the technologies employed and the correct management skills to exploit the potential of the technology. More recently, Watad and DiSanzo (2000) provide a case study of technology and automation in which they identify the requirement to control and manage all the components of the process – the overall strategy, the infrastructure to support the implementation, the skills to make full use of the technologies and the management skills to direct and control the process. Smaczny (2001) extends the argument and suggests that ICT is no longer simply an important part of the business mix but the dominant component of it for many organisations and that "as a result of this there is a need for a twin track approach to business strategy" (p. 800) giving equal weight to ICT and overall business strategy.

Earl (1987) sees the use of ICT as being a strategic weapon for organisations seeking to improve performance and gain advantage over competitors and, as we move inexorably into Toffler's post-industrial information society, there has come a new recognition of the value of the axiom that knowledge is power. This, in turn, has produced a significant amount of



academic literature extolling the virtues of knowledge management (Scarborough, 1988) which has drawn heavily on the use of IT to enable the process both at a macro level (Castells, 1996) and a micro level (Nardi and O'Day, 1999). There has also been a recognition that IT takes its place in an ecology within organisations (Davenport, 1997; Nardi and O'Day, 1999). In sum, technology and ICT in particular, is capable of helping an organisation to gain advantage – to perform in new and better ways than it does at present – and this is probably a necessary condition for much positive change in today's business and organisational environment rather than sufficient one.

### *Mobile information and communications technologies in organisations*

MICT is a relative newcomer to the ICT environment identified by Olaisen (1993), Earl (1987) and others as being so central to the operation and management of organisations. The drivers behind the use of mobile technology in organisations are, by and large, likely to be those identified by Porter (1985) and expanded on by Earl (1987) and others. The potential market is huge. According to Chen and Nath (2008) there will be 61 million mobile workers in the US alone by the end of 2009 and they also note that a 2006 survey found that 44% of companies planned to increase their population of mobile workers across the next five years. Axtell, Hislop and Whittaker (2008) state that "mobile work is increasingly prevalent, with workplace studies showing that office professionals now work between fifty and ninety percent of the time away from their desks" (p. 902) and McDowell (2008) reports that her research within Nokia suggest that "by the year end 2010 there will be over 350 million wireless users [of mobile working technologies] worldwide" (p. 26). Weilenmann (2001) estimated in that year that "within a few years mobile computers will outnumber fixed PCs" and this has been borne out by the latest ITU Report (2009) which estimates that, globally, wireless connections now exceed four point six billion.

According to Helal (1999) and Agrawal and Famoliari (1999), the key enablers of this explosive growth of information enabled mobile devices are the availability of the wireless connectivity which supports the main communication function and the development of miniaturisation to support the development of portable devices of sufficient power and sophistication to support real work in a mobile environment. Adam and Fitzgerald (1996) and Adam, Awerbuch et al. (1997) add a third component to the mix, claiming that the development of simple and effective interfaces was also a key enabler of the technology and its adoption as a mainstream part of our social and technological landscape. This emphasis on the nature of the devices and the manner of interaction with them is a recurring theme in current writing and Esler (1999) sets out three key factors in enabling the use of mobile devices to perform real work, arguing that we need to get the user interfaces right, the distributed services in place and a reliable, and invisible as far as possible, infrastructure in place before the full potential of mobile computing can be charted, let alone fulfilled. Marsic, Krebs et al. (2002) identify two key trends in computing as it is

applied in organisations which also act as drivers to the adoption of mobile wireless computing in support of mobile work. The first is the “movement from monolithic systems to individual devices” and the second is the “move to continuous collaboration with colleagues, not necessarily co-located” (Marsic, Krebs et al., 2002, p. 6). Despite these key trends there has been an emphasis in the literature to date on the stationary applications of computing (Kristoffersen and Ljungberg, 1999; Kristoffersen and Ljungberg, 1999; Weilenmann, 2001). Weilenmann (2001) also comments that this lack of research into MICT is not the only gap and notes that existing technologies for mobile working, such as the VHF radio and its use by organisations, are poorly researched. Another note of caution is sounded by Bellotti and Bly (1996), Kristoffersen and Ljungberg (1999) and Iacucci, Kuutti et al. (2000) who identify that mobile environments are qualitatively different from fixed computing and that they pose new variants of old problems, as well as raising new problems for those seeking to make best use of the technologies.

The area of mobile wireless computing to support mobile work is characterised in current writing by a real sense of possibility and frontiers to be explored. As early as 1994, Imielinski and Badranath (1994) identified that mobile applications were being used in vertical niche applications including mail-tracking, point-of-sale and taxi dispatch. They also identified that the major horizontal applications such as mobile mail and mobile database access via the web were the key to user acceptance and more widespread use of the technologies. Computing is already pervasive in our lives, very much as predicted by Weiser (1993). This idea that “Computing is everywhere but nowhere to be seen” is the vision set out by Thackara (2001) and ubiquitous computing is one direction for the technology. There is a confidence that “Mobility and portability will create a new class of applications and possibly massive new markets combining personal computing and consumer electronics” (Imielinski and Badrinath, 1994, p. 22). Yet here, as in the overall use of ICT in organisations, there are notes of caution. Weilenmann (2001) cautions that MICT will lead to a potentially detrimental blurring of boundaries between work and other activities and Kristofferson (1999c) comments that current platforms “do not realise the full potential of mobile computing as mobile work and IT use differ significantly from other settings”. They offer a range of scenarios of use including ‘consultant’ and ‘fighter pilot’ to illustrate the diversity of situations and requirements of MICT and suggest that these may become useful metaphors in the design of working systems. Lindroth, Nilsson et al. (2001, p.1) note that the “goal of traditional usability to increase learnability, efficiency, and memorability, need to be applied to new or modified methods in the mobile situation”. The use of the technology is currently mainly a white collar phenomenon (Brodie and Perry, 2001), and Nishibe and Waki (1998), dealing with MICT support for academic conferences, note that the majority of applications are small scale. They report on a range of contexts of use, but note that the challenge may not be to get small scale trials to work

but to scale this up to commercially useful levels. Perhaps the last note of caution or cynicism should be left to Odlyzko (2002, p. 6) who comments that "While information appliances will proliferate they will not lessen the perception of an exasperating electronic environment".

### *The nature of mobility*

In discussing mobile work and the technology available to support it, there tends to be an assumption that we know what is meant by 'mobility'. In the academic literature much attention is given to the technical mysteries behind the technologies that we use and less to the nature of mobility. Where attention has been paid to this issue, it has tended to concentrate on geographic mobility to the exclusion of other areas. Some writers have now, however, started to examine the nature of mobility and the impacts on the way we work more broadly. Kakiyara and Sorensen (2001), Kakiyara and Sorensen (2002a), Kakiyara and Sorensen (2002b), and Kakiyara, Sorensen et al. (2002) identify this emphasis and they, and other writers such as Green (2002) and Kristofferson and Ljungberg (1996), have started to extend the notion of mobility. Kakiyara and Sorensen have written extensively on the nature of mobility with regard to technology and argue that we need to examine more than the locations where people transact work if we are to get a true picture of the nature of the work and the impact and utility of technology in that situation. Kakiyara and Sorensen (2001, 2002a) present an initial framework which has been extended by their later work. They argue that people can be mobile in different senses. The first is geographic or spatial mobility which is much discussed in the literature but only really in terms of the movement of people. Kakiyara and Sorensen (2001) argue that this is a restricted view and that we need to look at a number of additional facets of this physical movement of people including, the mobility of objects, symbols and space as a result of symbolic travel on the Web. The second facet of mobility is temporal (Brown and O'Hara, 2001; Kakiyara and Sorensen, 2002c) and Kakiyara and Sorensen (2002c) argue that the availability of mobile technologies has altered the nature of temporal constraints on work. At the crudest level a mobile telephone allows you to call a colleague on the other side of the world and leave a message for them in the middle of their night and your day. On a slightly more complex level they also argue that this is in some senses a commodification of time and lead in to a discussion of monochronicity and polychronicity. Polychronicity being the divergent use of time rather than adherence to a pre planned order - monochronicity - and they note that MICT can increase both. This apparently contradictory position is reconcilable; MICT promotes polychronicity in that it can allow us to work on a number of tasks at the same time or outside of the normal time frame within which we would deal with them, such as taking a work call during a social event; it also allows us to summon up information or resources to allow us to continue with a task which, without MICT, would have had to be shelved until we returned to the office, or a fixed terminal. This notion of time flexibility and the compression of activity into shorter *soundbites* is a facet of mobility which is also noted by Green (2002). The third

facet of mobility which Kakihara and Sorensen (2001) discuss is that of contextuality. ICT allows people to be free of many contextual constraints; so, for example, it is possible to make a business call from a social context or check a stock price on a PDA at a birthday party but it also imposes the risk that others will not be sensitive to the context that you are in when they try to interact with you (Fitzmaurice, Zhai et al., 1993). If you go to a colleague's office and see them in heated discussion with a member of senior management you may consider that this is not the time to discuss your concerns. ICT allows few, if any of these cues other than the crudest one of using the 'Off' button on the devices which Green (2002) compares to an "electronic do not disturb sign". Kakihara and Sorensen (2002b) identify that while devices do allow some limited declaration of context to others there are dimensions of the use of MICT which can be detrimental. This is an area where a number of technical projects have attempted to signal context between users of ICT – such as the Aware Ware system discussed by Kakihara and Sorensen (2002c), GUIDE (Cheverst, Davies et al., 2000), InfoParco (Colafigi, Ineardi et al., 2001), COMRIS (Arcos and Plaza, 2001), Cyberguide (Long, Aust et al., 1996), ConNexus (Tang, Yankelovich et al., 2001) and the Smart Space system discussed by Abowd, Atkeson et al. (1998) and Abowd, Essa et al. (1998). In order to understand the nature of mobile interaction Kakihara and Sorensen (2001, 2002b) suggest that it can be considered in terms of regions, networks and fluids. Regions, with fixed boundaries and a sense of enclosure are a metaphor for the pre ICT organisation, networks is a metaphor which works well for physically connected ICT and the fluid metaphor is the one they use to discuss and analyse MICT. In discussing this, Kakihara and Sorensen (2002b) give an example of a delivery firm using a range of mobile technologies to manage a complex environment and act proactively to meet the constantly changing needs of their customers and Kakihara and Sorensen (2002a) of consultants working in a fluid way across a range of organisations balancing a range of tasks, locations and demands; a way of working which they characterise as 'post modern professionals'. They argue the need for an organising paradigm for mobile working and the use of technology within this mobile working environment to combat the dangers of detachment from reality and the increasing blurring of the boundaries between work and social life. They suggest the Japanese concept of 'Ba' as a place and space for generating, sharing and using information may be of value as such a paradigm.

Kristofferson and Ljungberg (1996, 1999c) identify three key modes of mobility which they argue can be used to start to understand the way in which people use mobile technologies. These three modes are travelling, visiting and wandering and are illustrated with examples of the types of activities which are undertaken in these ways and the technologies which are needed to support them; so the traveller requires the ability to move information but does not need to be able to manipulate that data en route, the visitor needs to be able to gain access to information from a range of fixed locations, and the wanderer needs to be able to access the

information on the move probably without fixed connections. An illustration of the wanderer is provided by Gallis, Kasbo et al. (2000) in a medical context where staff cannot guarantee to be able to access fixed technology and so need to be able to make full use of the potentials of MICT.

Green (2002) takes a humanist view of the use of ICT and suggests that we need to examine the rhythms and minutiae of use. The idea of examining the minutiae of use is also evident in the work of Luff and Heath (1998) who have examined the nature of the use of mobile technologies at the level of what they term 'micro mobility' - examining for example the manner in which a Personal Digital Assistant (PDA) prevents a doctor from managing a transaction with a patient in the same way that they would without the use of the PDA. They have used this detail level work to argue that it can be hard to identify exactly which bits of work to support with MICT and they argue that the nature of the mobile interaction is not well supported by systems yet and that we need to examine the impact of mobility on individual transactions at a very fine level of granularity if we are to understand how to make the best use of the technologies - and where and when not to make use of them. This view ties in with that put forward by Lindroth, Nielsen and Rasmussen (2001) who argue that it is vital to take account of the views and role of the non-user as well as users in the design of personal MICT, and that doing so takes account of the wider societal impact that Green (2002) identifies and helps to increase acceptance of the technologies. That the technologies can have a negative impact is clear from a number of studies; as an example Wiberg and Ljungberg (1999) report that mobile telecommunication engineers found that one effect of the technology was to engender a feeling of isolation in their working lives.

#### *Factors affecting use and effectiveness*

In considering the strengths and weaknesses of MICT this section looks at the general strengths and weaknesses which are associated with the technology as a whole. The factors which are associated specifically with each of the key factors in successful use of IT for business advantage - the right technology, the skills in the people to use the technology, the systems of work and the applications used and the management of the process - are then examined. The strengths and weaknesses discussed need to be examined within the overall framework of a successful project to implement MICT and systems developers and sellers need to "walk a wireless mile" in the shoes of users according to Morriss and Zeman (2001) who identified that there are a large number of cases where the technologies are imposed onto organisational settings which are not ready for them, even if the technical infrastructure is in place. Bouchier (2001) suggests that there are certain pre-requisite conditions for a successful system to be implemented in an organisation and he includes the need to look at future proofing in planning systems, open systems and software allowing for a mix of hardware and infrastructure, application software which must be data driven and systems which are configurable from the

centre using thin clients. In addition he identifies that there is a need for an enterprise wide view to be taken – and combined with business process re-engineering (BPR) (Bouchier, 2001). This view has much in common with Huang (2001) who adds that an effective implementation will bring devices to the forefront, minimize the features of devices beyond the basic and place functionality in the network not the device.

### *Strengths*

Several strengths of MICT have been identified. These strengths come from diverse applications in a range of settings and provide a general overview of the potentials of the use of MICT. As always there are some issues which are context and user-dependent. Perhaps the most obvious advantage of MICT is relatively under-emphasised in the literature – the equipment is small and portable and as Marcus and Chen (2002, p. 38) comment it is “to hand, always with you and portable to a range of settings” and it is this portability which provides the ability to “get outside the constraints of space and time” as identified by Nishibe et al. (1998, p. 35) in an application used to support an academic conference. The area that is most fully dealt with tends to be around the notion that MICT can do what CSCW can do, but better; and there are a number of recurring themes throughout the literature. A basic premise behind much of the literature in this field is that information sharing promotes human interaction and social group formation (Gaines and Shaw, 1994; Nishibe and Waki, 1998; Nishimura, Yamaki et al., 1998) and that MICT supports this function in a range of ways. One specific example of a situation where MICT has been used to promote the development of a community, albeit a temporary one, is in using MICT to support conferences by providing mechanisms to exchange information and facilitate interaction that would take far longer to develop without the technology (Dev, Salber et al., 1999; Okoli, Ives et al., 2002). In longer term applications both Kakihara and Sorensen (2002a) and (Wiberg and Gronlund, 2000) discuss the role of MICT in promoting and maintaining communities of practice among post modern professionals (Kakihara and Sorensen, 2002a) and among mobile telecommunications engineers (Wiberg and Gronlund, 2000). The technology incorporates, or can be developed to incorporate specific facilities to promote personal face-to-face interaction as well as virtual interaction – Okoli et al. (2002) describe a facility whereby attendees at an academic conference can identify individuals with specific interests and form a group to meet and discuss a topic at short notice with arrangements for notification of rooms, background papers and resource materials being managed on the PDA based system supplied. A more permanent application is proposed by Dahlberg, Ljungberg et al. (2000) and Dahlberg and Sanneblad (2000) who describe a proximity notification system (ProxyLady) which will alert the user to the presence in a given area of someone they want to meet with face to face. This system allows a user to set a level of ‘disturbability’ which can prevent their presence being communicated to another user, enabling the development of interpassivity and interactivity states on the PDA (Kakihara and Sorensen,

2001). Kakiyara and Sorensen (2002a) also note that the technology allows their "post modern professionals" to have significant flexibility in managing communication and coordination in their work practices, a flexibility which depends on the use of MICT to allow them to work across geographical, social, contextual and temporal barriers. Green (2002) comments that the technology can be used to try to control and manage the blurring of social and work lives as long as the social norms allow this and the technology facilitates it and Wiberg (2000) also notes that people using MICT evolved social norms and ways of working aimed at allowing them to manage interactions in a way that did not intrude and distract too much.

Organisations can benefit from the introduction of MICT both through efficiency improvements in existing processes and through changes made as a result of the nature of the technology. Watad and DiSanzo (2000) report that the effect of a MICT project with sales staff was to push the locus of authority and control from middle management to users and that this both reduced decision making time and increased organisational responsiveness. Closer customer relationships can also be developed as a benefit of MICT and this is cited both by Watad and DiSanzo (2000) and by Wiberg (2000). In terms of efficiency gains, Wiberg (2000) recounts the development of just in time parts delivery systems based on MICT and Watad and DiSanzo (2000) found that the organisation he studied was able to monitor staff more effectively, allocate staff activity to customer accounts more precisely and that staff had less paperwork and spent "less time in the office and more selling". There is also evidence that MICT can help organisations to manage contract employed staff more effectively; Kakiyara and Sorensen (2002a) note that the use of MICT allows organisations to make use of and manage a range of temporary or casual staff as they can coordinate business processes and use the distinct and specialist skills of non co-located specialist staff. At an overall organisational level there is also evidence from Watad and DiSanzo (2000) that the use of specific MICT applications helps to stimulate the rapid adoption of IT in other areas of the organisation and from Valiquette, Miller et al. (2000) and Gustavsson et al. (2001) that it can be used to enhance learning.

Efficiency in the use of time and in the scheduling of work and routes are also prominent in the literature as benefits from the use of MICT. Wiberg (2000) notes that the facility for route minimisation with engineers with unpredictable workloads was one of the main aims of the project he describes and Bergquist and Dahlberg (2000) also note the scheduling benefit for work teams of being able to communicate and share information from remote locations. MICT has been used to minimise delays and co-ordinate connections in a public transport system (Juhlin, 2000), in factories (Koudsi and Bylinsky, 2002) and in educational settings to assist in class and teacher scheduling (Jipping et al., 2001; Soloway et al., 1999; Abowd et al., 1998). Individual users can also make better use of time as result of MICT use (Mohan et al., 2001). Laurier (1999, online reference) comments that it allowed users to "disperse their workload and make use of dead time" and Watad and DiSanzo (2000) found that users were able to reduce the

time they spent on paperwork in the office and on commuting and that this freed up time for productive tasks. Some of these gains are from being able to communicate directly with others as in the case of the bus drivers in Juhlin's (2000) study, others are from being able to store or hold communication through the use of facilities such as voice mail and text messaging (Kakihara and Sorensen, 2002c).

The ability to consult others and to look up data real time is also a source of advantage for the individuals and organisations concerned with the use of MICT. Guerlain et al. (1999) identified that the access to real time communication and collaboration in the field was a major advantage of the mobile plant monitoring equipment they piloted. Bergquist (2000) also noted this in work with electricians on call as did Bergquist and Dahlberg (2000) in local government, and Pakanen (2001) found that this was especially valuable for heating engineers when faced with uncommon problems in the field. The ability to access data in the field is commonly linked with the ability to update information either as progress and job record updating or as information going into a corporate knowledgebase and Bergquist and Dahlberg (2000) identified this facility as a key advantage. Watad and DiSanzo (2000) also found that the facility to update corporate knowledge from the field increased both the efficiency and the accuracy of data entry. Cost is a factor in any ICT application and there are strengths associated with this in the area of MICT. Okoli et al. (2002) and Pom and Patrick (2002) comment that handheld devices are cheaper to purchase and support than full PC systems and Marcus (2002) notes that the devices are seen as 'affordable' by corporate purchasers, especially when compared to laptops. Return on investment and payback will depend on the specific application and may, in any case, be hard to quantify but Watad and DiSanzo (2000) give the example of a projected 3 year payback on the project examined and cites a specific incident where a \$300,000 account was saved for the company by the use of MICT to provide information which could not have been provided without it. The applications have also been placed into areas which are safety-critical in a study by Guerlain (1999) in a petrochemical plant and an advantage cited in that study is the provision of up-to-the-minute data, in a situation where minutes can be vitally important. This fast response is part of the ability to react and to present a professional image and this is reflected in the comment made by Okoli et al. (2002) and by Watad and DiSanzo (2000) that the use of MICT enabled staff to present a more professional image both personally and in the documentation and speed of response for customers. Green (2002) notes that the possession of MICT can be a benefit for staff in terms of personal safety, both as colleagues will know where they are, helping people to feel in touch, and enabling them to call for help in an emergency situation. A final, and almost completely uncritical comment, can be left to Watad and DiSanzo (2000, p. 98):

*"The program affected every level of the organization -at the strategic level the program helped the company maintain existing accounts, develop a new image, enhance relationships with clients, increase forecasting capabilities and improve responsiveness. At the tactical level the*



*program helped increase management control, improve resource management and promote accountability. At the operational level the program freed more time for sales this increasing productivity. It enabled high quality presentations, created a new information flow with clients and simplified business procedures. Any negative impacts on IS personnel and sales staff while costly, were only short term."*

### **Weaknesses**

Despite the many benefits associated with the implementation of MICT there are also areas of risk and potential weakness. Some of these come from the nature of the devices and infrastructure and some from the manner of implementation. It is likely that it is the manner of implementation issues which will be the most enduring as technology moves on to reduce the problems in devices and infrastructure and as interfaces are developed which suit the manner in which mobile work is supported by ICT.

Satyanaryanan (1996) set out what he considered to be the main issues with MICT at that time. He cited four key issues, the first being that mobile elements are resource poor compared to static elements; they tend to have small interfaces and small storage. The second factor is that mobility itself is inherently hazardous, and higher levels of loss or damage can be expected than would be the case with a static element of equivalent functionality. The third is that mobile connectivity is highly variable (Satyanaryanan, 1996; Alanko, Kojo et al., 1999; Ebling, John et al., 2002) and prone to disconnection due to factors outside the control of the user; as a result many mobile devices opt for on-device storage and redundancy, which makes the devices more resource hungry and expensive (Esler, Hightower et al., 1999; Aridor, Carmel et al., 2002; Jain, 2002). The final issue is that mobile elements rely on finite energy sources and batteries of limited duration and power – this militates against the always-on connections that would make the devices best able to use thin clients and to host data on the network rather than on the device (Aridor et al., 2002). Varshney (1999) also summarises the issues presenting challenges to the adoption of the technology and identified that many of the same issues are still extant. Varshney (1999) identifies that bandwidth is still a problem even though actual connectivity and coverage have improved and also comments that networks are still designed for stationary users and that this means there are significant transport protocol issues as well as system overhead in the tracking of location of mobile devices. Pakanen, Mottonen et al. (2001) reports that slow connection and low bandwidth still plague mobile devices and Varshney (1999) notes that the devices are still resource poor as a result of the drivers to minimize size and to manage information off the device. In practical terms this means poor memory, limited power, a cost penalty for the reduction in size of the device and the use of thin clients on the device (Bhagwat, Korpeoglu et al., 1999). An issue not identified by Satyanaryanan (1996), but emphasised by Varshney (1999), is that of security, and he argues that there are inherent risks in mobile networking for security of data, there are risks in user behaviour with mobile devices which would be absent within organisational premises and there are inherent risks of loss and damage

which are attached to the mobile nature of the devices. The final issue Varshney (1999) identifies is that a catastrophic failure can leave a vast number of people without service for an extended period of time while systems and networks are re-configured to deal with the failure.

In terms of specific issues, the one which gains most attention in the literature is that of the form factor of the devices with particular attention being paid to the fact that mobile devices tend to be harder to get data into and out of than stationary devices. This sweeping statement remains true particularly of most netbook PCs, with smaller-than-ideal screens and cut-down keyboards, and is made more acute as the devices reduce in size to the handheld and mobile-phone form factors. Marcus (2002) comments on the problems of input and output and notes that this is an issue for all of the technologies with a tension between portability and usability. With people using a range of platforms and software on different devices with different capabilities, the most important issues are display related (Gustavsson, Lundin et al., 2001; Aoki and Woodruff, 2000; Marsic, Krebs et al., 2002). The basic problem is well encapsulated by Nielsen and Sondergaard (2000, p. 12) as "Squeezing too much data into a small screen renders it unintelligible". On the issue of input as opposed to output there is a recognition of the constraints of small form factor devices (Jacob, 1996). Speech and pen input were raised by Imielinski (1994) as being the leading contenders for input options and several researchers (e.g., Citrin, Hamill et al., 1997; Acona, Doderio et al., 2000; Lai, 2000; Oviatt and Cohen, 2000; Buyokkoten, Garcia-Molina et al., 2001) discuss the potential synergy between pen and speech input.

Allied to the problem of physical display in small devices, is the issue of the display of data on a range of devices as the user shifts contexts. This was identified as an issue by Imielinski (1994) and has been reinforced since by many other writers such as Esler (1999), Smith, Mohan et al. (1999) and Dix, Rodden et al. (2000) who argue that we need to have generic application architectures to cope with wide range of hardware software and contexts. Marsic (2002) proposes that we need a unified, device-sensitive, approach to manage data in a range of displays. This issue of device and context sensitivity is also reinforced by Nielsen (2000) who emphasises the importance of displays showing the same data in appropriate ways, in work conducted across both stationary and mobile devices in a wastewater treatment plant; he notes especially that it is hard to provide a sense of overview with a small window on data (Nielsen, 2000). It is, however, not easy to develop content which works on a range of platforms according to Pakanen (2001) who, in working with mobile applications for heating engineers, was using both laptop and wireless application protocol (WAP) phone access to the data they required to do their jobs.

In addition to the physical issues related to the machines and the technologies which support them, there are also issues relating to the manner of their use. Mobility can be seen as intrusive

and unwelcome when it and its associated technologies are imposed on workers without agreement and consultation (Green, 2002). This is in part due to a fear of encroachment of work on social lives, what Weilenmann (2002) refers to as the “blurring of the boundaries”, and Green (2002) notes that mobile devices are often sold and promoted as “tools to engage simultaneously in work and leisure relationships despite distance or location”. The risk of being always on call is also noted by Kakihara and Sorensen (2002a) who identify that mobile technologies open up the communication channel to allow people to be disturbed at any time and they suggest that some groups of workers do not dare to be out of touch – the example they give is of the post modern professionals working across a range of temporal, organisational and social contexts for whom the telephone call or email they ignore could mean significant loss of income. This tension between access and disturbance is hard to resolve (Hudson and Smith 1996). Less extreme is the issue of distraction by the mobile technologies, both for the users and, as identified by (Herstad, Stuedahl et al., 2000) for non users. Herstad (2000, p.7) comments that “the use of personal mobile technologies in public alters the way that non users experience the world and react to users”. MICT is demanding of attention (Dahlberg and Sanneblad, 2000; Hudson and Smith, 1996) and this echoes the characterisation of persistent versus ephemeral and obtrusive versus unobtrusive communication. Brodie and Perry (2002) also note the potential of the technology to distract users as a result of the lack of cues to other users that the recipient of a communication would not want to receive it. Herstad, Stuedahl and Tan (2000) give the example of police motorcycle officers whose attention, when speaking to people, can wander to the hands free headsets they use to monitor the police channel and he also quotes Ling, (1999) as having noted a similar issue with dispatch riders.

This constant access to information can mean the mobile technologies have the potential to contribute to information overload (Kakihara and Sorensen, 2002a) both by pushing information at people and also by creating the expectation of a response. Kakihara and Sorensen (2002c) propose that systems developers need to see what can be automated rather than requiring action from users – so a phone call may be replaced with a text message, allowing the recipient to stack this and view it unobtrusively or access it in a moment of dead time.

Information being pushed to users and being received from them will eventually raise the issue of security and Badamas (2001) identifies that mobile devices are inherently more vulnerable than fixed devices and therefore need designed-in security, as well as actually making use of the security features available on systems, rather than switching them off for user convenience as he found often happened. Varshney (1999) raises issues of physical loss, poor system design and poor user habits and there is also evidence from educational and healthcare settings (Morriss and Zeman, 2001; Valiquette, Miller and Seeger, 2000) that such mobile systems are vulnerable to damage and loss.

While the potential payback from MICT can seem attractive there are also areas of reservation, Okoli et al. (2002) comment that the prices of handheld devices can seem high given the limitations of the devices and Watad and DiSanzo (2000) note that there is a potential for technical advance to mean that just as an organisation reaches payback on a system they need to replace it. The trade-off of cost against business advantage is not the only factor that management contemplating MICT need to take account of. Both Watad and DiSanzo (2000) and Bouchier (2001) state that an implementation is unlikely to be successful unless it is part of a process of BPR; this is, therefore, more than a bolt on addition to the existing ICT structure and strategy of an organisation. An integral part of such a planned introduction will also be the training needed to support users to get the best out of the technology that has been made available and to help them to adapt to the changed work conditions which will accompany the shift to mobile work practices. Handheld technology, in particular, tends to be unfamiliar to people (Jipping, 2001) and there is a tendency for the makers of the devices to make them more complex than necessary. Huang et al. (2001) quote Dan Carp, CEO of Kodak, on the subject of technology and usability where he stresses the importance of simplicity:

*“the industry has made picture taking more difficult.....one lesson 100 years of consumer marketing should have taught us – in the picture business simple trumps megapixels every time”*

### **Equipment and Systems**

A key factor in making any technology work is having the right equipment and for an organisation considering a the move to MICT there is a need to ensure that they specify and purchase equipment, software and infrastructure that will allow them to reach their organisational goals (Turisco, 2000). If any of these are not up to the task then, as in any chain with a weak link, the system will break down with all of the negative effects and affects that this implies. Possible uses of wireless devices include information, self enhancement, relationships, entertainment and m-commerce (Marcus, 2002). However, Thackara (2001) comments that “If you put smart technology into a stupid product the result will be a stupid product” and another note of caution was sounded by Odlyzko (1999, p. 8) who wrote that “building complicated systems that work is hard” and added that “building ones that work well and are user friendly is much harder”.

Equipment and software have to work together to meet business aims and organisations will have to consider the choices which face them in the form factor and functionality of the solutions available. There is a clear distinction for example between handhelds and laptops; handhelds are highly portable and have a lower cost of purchase and maintenance but also provide lower display capabilities (Okoli et al., 2002) as well as limitations on input (Nishibe et al., 1998). Many of the basic design decisions in mobile technology are driven by what is technically feasible rather than what will suit the needs of the users (Fussell and Benimoff, 1995) and Gallis (2000) states that there is no “one size fits all device”. However, the

technology is evolving rapidly (Bouchier, 2001) allowing users to balance ease of use against combinations of functions, size against price although Odlyzko (1999, p. 12) comments that "There is no trade-off between flexibility and ease of use that is optimal for everyone – there is not even a trade-off which will be optimal for a single individual for very long". These tradeoffs are perhaps affected by what Bouchier (2001) refers to as "techno push" from suppliers, resulting in a decision to purchase equipment with excess functionality. Esler and Hightower (1999) follow this trend in both mobile and stationary devices; "computers today are too complex as they try to be all things to all people" and there is a divide in the literature between those who suggest that devices will evolve as multiple-use devices which present information in myriad forms and accept input in flexible and natural ways and those who suggest that we will see a proliferation of specialist devices, interconnected and capable of communication but tailored to specific situations. Esler (ibid) offers the comment that "Today's desktops and palmtops are multipurpose tools – electronic Swiss Army Knives. But how many of us would use a Swiss Army Knife to prepare dinner?" and suggests that the multiple-device paradigm will win out. Guerlain et al. (1999), by way of contrast, experimented with the multiple-use paradigm, taking a basic computing and processing facility and adding a range of hardware such as sensors and readers to facilitate specific functions within a petrochemical plant.

In conjunction with the question of what the device should do is the issue of where data should be held and processed and whether it should be pushed to users or pulled by them as required. Whilst this is clearly an issue where situational and contextual factors will be important Jipping (2001) argues for a hybrid approach – suggesting that an organisation needs to determine what information has to be pushed to users and what is better left for them to pull as they need it; he is adamant, however, that both facilities need to exist. On the issue of where data is held and where processing takes place there is a school of thought which argues that the resource poor nature of mobile devices means that thin clients are the logical solution with the device holding and managing the minimum of processing tasks (Satyanaryanan, 1996: Varshney, 1999). This, however, can be a problem when poor connectivity and low bandwidth reduce response times or cut off access to data; this was a significant problem in Guerlain's (1999) study in a petrochemical plant and proved to be a major barrier to the effective use of the equipment designed.

People tend to use mobile access more often than stationary access, but do so for shorter periods of time (Imielinski and Badranath, 1994; Nishibe and Waki, 1998; Pascoe, Ryan et al., 2000) what Esler (1999) characterises as "bursts of activity". This may be due to the need to work with other demands or it may be a function of the different patterns of demand for information. A common criticism of MICT in the literature is that the systems don't support the flexible and unpredictable (i.e. context-mobile) nature of mobile working (Luff and Heath,

1998) and that equipment is often too complex (Huang, 2001). According to Huang (2001) systems and devices should bring the device to the front and push computing to the back, keeping the “features a user **must** learn” (original emphasis) to a minimum and providing intuitive interfaces to allow the devices to be used more readily in a range of situations. Lindroth et al. (2001, p. 4) comment that “We demand that they should work whenever, wherever, whatever. But constantly we find ourselves in situations where the usage of the gadgets is compromised” and note that it is not only situations which compromise the usefulness of the ‘gadgets’, but that users use devices in different ways in different contexts, including weather conditions and social situations among and that these differs from user to user. They attribute some of the problems to poor design, the temptation to place as much functionality on a device as possible at the expense of usability being one issue and another being the failure to test mobile technology in mobile settings commenting that “Labs are not good places to test mobile gadgets –they need to be used in the field” (p. 9). Marcus (2002), in a comment which echoes that of Odlyzko (1999) in relation to mobile technology as a whole, sums this up for the smaller devices; “[it is] difficult to make “baby face” devices, and harder still to make them useful”.

Although the technology is evolving and improving, there are still problems with the actual performance of the devices. Dahlberg and Sanneblad (2000) highlight some of the performance problems with a Bluetooth example and Imielinski and Badrinath (1994) identify a situation which Varshney (1999) re-iterated i.e., that the batteries available for mobile devices are not improving at same rate as the demands for power. Allied to the issue of power and other limitations is the issue of fragility and vulnerability of mobile devices. Adam et al. (1997) propose that “Fragility is a major concern in today’s mobile systems” and damage was reported by Valiquette (2000) and Jipping (2001). In considering the nature of the equipment it is hard to separate the equipment from the context in which it is being used, and there is some agreement by writers that context and location awareness enhance the use of mobile devices (Marcus, 2002; Dix, 2000; Nielsen, 2002) and that the facility of context sensitive systems to behave differently in different situations provides an alternative to the multi-device paradigm (Dix, 2000). Writers who suggest this, however, also recognise that context is a complex concept. The old test of “who what where when and why” is suggested by Abowd and Mynatt (2001), and Dix (2000) suggests that context is made up of infrastructure, task, user, system, domain and physical location, with location playing an especially important part of this. Context sensitivity can also imply making services available across a range of platforms, rather than different services on different platforms (Esler, 1999). Nielsen (2002), in work done across platforms in a wastewater treatment plant, comments that the device and context need to work together in order to provide cues which are useful in the context and gives the example of presenting a pie chart on a handheld on the plant for quick visual impact and a table with

detailed data on a fixed machine where it can be studied at leisure. Another area where there is development is in the supply chain for devices. In relation to this, Bouchier (2001) and Pom and Patrick (2002) note that for many organisations a barrier to the adoption of MICT lies in the fragmented supply chain where devices come from one source, connectivity from another and software from yet another.

### *People and ways of working*

The correct equipment cannot produce a net gain for an organisation unless there are people capable of using it. In introducing MICT organisations need to be aware that there are a significant number of people for whom technology per se holds many terrors, and that mobile technology may seem to be especially sophisticated and necessitate high levels of technical skill. If people are uncomfortable with a technology they will often try to hide it (Lindroth et al., 2001) and they will need time to get used to ways of working; Lindroth suggests that training is a shortcut to this. Watad and DiSanzo (2000) note that the implementation they described required "several days of general PC training and specific software training" to start with and that after this formal training users started to carry out their own informal training. This training was sourced not just from inside the company but also outside from people such as friends and relatives. Watad and DiSanzo (2000) note that this may be an issue for security, as is also identified by Badamas (1999) and Lee and Lee (2002) who comment on the inherent risks of mobility and the role of user habits.

A failure to train will, according to Juhlin (2000) lead to people being "intimidated by the technology" and this is sometimes best addressed by being able to get support from colleagues. Unsurprisingly people with existing ICT experience adapt faster to mobile systems (Watad and DiSanzo, 2000) but there can be a fear factor for some workers without ICT skills over and above the fear of the technology itself. Watad and DiSanzo (2000) report that two people were fired after showing during a training program for sales staff that they were unable to cope with MICT and Gray (2001) identifies the lack of mobile IT literacy as being a major limiting factor in future careers.

When people are capable of using the equipment they tend to do so in a different pattern from the pattern for fixed users. People using MICT are easily frustrated and tend to break the connection if they have to wait (Nishibe et al., 1998). They also work in numerous short bursts of activity with periods of disconnection (Imielinski and Badrinath, 1994). Some of the patterns of working may be a function of the equipment and its capabilities, and, whilst this is a factor to be accommodated, Jipping (2001) suggests that organisations need to beware of people changing the best way of doing things to fit the machine – the machine needs to fit in with, and support and enable, best practice. User involvement is often promoted as a panacea for the development of systems which suit users and this is also suggested for MICT. However, as is

always the case with user involvement this is a process which requires some care and precision and Fussell and Benimoff (1995, p. 231) comment, “[we] have to involve users in the design of applications but also have to be aware that “just asking” is unlikely to get all of the necessary detail”. There are also arguments that we need to get the views of non-users on the design of systems (Lindroth et al., 2000) in recognition of the fact that the use of MICT does have an impact on those around the users (Ling, 1999; Brodie and Perry, 2002). There will also be a need to consider how support is going to be provided to mobile users as Bergquist et al. (1999) note that MICT support is qualitatively different from support for fixed users. Support and social factors remain important in the way that people work with MICT and there is a demand for actual meeting places and spaces in addition to the ICT based communication channels. The home base still has a social value, in part because “Some things can’t be done over a phone line” (Wiberg, 2000; quote from a technician using MICT) although it may over time come to be augmented and partially replaced by a Community of Practice as happened in Wiberg’s study. Remaining in touch can be a mixed blessing for some staff. The risk of being always on call and being expected to be available (Bunch, 1997; Green, 2002) has already been raised and the use of MICT can be resented when it is seen as control. Watad and DiSanzo (2000) report that the use of MICT allowed monitoring of staff more easily and charging of time to right accounts and that sales staff disliked this level of control as it stopped them being out of touch and created an expectation of being in contact with the home base. Green (2002) has also reported that children who have been given mobile phones resent what they see as the use of ICT to “keep tabs” on them. Over time people do come to develop ways of working with the technology (Ljungstrand, 2000) – what Ling (1999) refers to as the “New manners” of mobile technology” – giving the example of the question “Where are you?” in a mobile phone conversation to start to establish the context of, and thus some of the boundaries on, the communication transaction. This is perhaps another example of Weilenmann’s (2001, 2002) ‘blurring of the boundaries’ in the use of MICT and underlies some of the resentment that some people feel when MICT is imposed on them (Weilenmann and Larsen, 1999; Green, 2002). Managers also perceive some benefits from the new ways of working – Watad and DiSanzo (2000, p. 96) lists a range of benefits including the more professional image of work, as well as the change of lifestyle for mobile staff who, in his study at least, spent “Less time in the office and more time selling”. He also identified that there were some unintended and unanticipated consequences of the shift to MICT for some staff; these included a more rapid adoption of ICT across the organisation as a whole, the development of some informal telecommuting, and enhanced knowledge management.

### *Management*

ICT in organisations can provide the basis for advantage through improved efficiency, better management and control or through innovation (Earl, 1987) and MICT can offer benefits at



strategic, tactical and operation levels (Watad and DiSanzo, 2000). These potential advantages, however, will not come about by the haphazard purchase and deployment of equipment but require a process which matches business strategy with an appropriate solution, which engineers the business processes to best fit the new environment and implements the project effectively. Such an effective implementation requires not only the right equipment and operator skills but also requires management support. Watad and DiSanzo (2000) state that essential success factors included top management support, training, fast response to problems, linking use of ICT to the organisational mission and giving the project a perceived high priority. According to Dhawan (1997, p. 55):

*“The mobile computing experience has been far more powerful for companies who have implemented the new technologies in conjunction with BPR than it has been for those who have attempted to implement a current suite of business applications in a mobile environment without re-engineering back-end business processes”.*

Dhawan (1997) also suggests that a return on investment comes from moving the organisation from the stage of mobilising existing systems via the stage of being *mobile aware* and appreciating the potential of MICT via the stage of hybrid mobile and static systems to the *mobile organisation*. This can be seen as analogous to the move from an informational to an informatic culture. On a day-to-day basis management may find that it is easier to monitor staff activity and Watad and DiSanzo (2000) commented that “management control over the field workforce increased dramatically as a result of the remote computing program”. A last word may usefully be left to Morriss and Zenjan (2001) who comment, in relation to a healthcare application that “the ability of the organisation to adapt to, and adopt, technology limits the take up”.

### **2.2.3 Research on mobile technology and policing**

As far as specific literature relating to the implementation of MICT in the Police is concerned there is a lack in the literature with few articles mentioning the application of mobile technologies to policing explicitly. There is recognition of the value of ICT generally and some reference has been made to the use, or potential use, of mobile technologies in maximising the value of existing or developing ICT systems. Colton, as early as (1979), identified the potential of MICT for policing and Nunn (2001) reported that Police forces tend to be major users of ICT and posited that the reasons for this are the normal business drivers of improving efficiency and effectiveness. Nunn (2001, p. 14) comments “at the simplest level IT is added in order to improve things” and points out that there may be potentials in making systems and resources more mobile. Hauck and Chen (2002, 2003) identify the role of powerful databases in modern information enabled policing at a central level, and also investigate the mobilisation of such data, both in terms of input and retrieval. Nulden (2000) suggests that, in policing applications pro-activity is encouraged by knowledge and that this is one of the gains which is hard to measure in terms of payback period or return on investment. He also suggests MICT may have

a significant role to play, via both information systems and learning systems, in increasing that stock of and access to knowledge for officers in the field. In evaluating the effectiveness of the ICT investment, Nunn (2001, p. 25) suggests that "the jury is still very much out" on the value of ICT. He identifies that the cost associated with ICT can mean that there are fewer officers to deliver services and higher average costs for technical personnel and comments that this may also be the case for MICT with the ability to show return on systems being a difficult problem. On a specific note, Oatley, Ewart, and Zelenikow (2006) outline the current and potential for police forces to make use of data mining techniques to develop knowledge of offenders and crimes. They note specifically that mobilisation of such information will need care – the data is hard to use and needs to be presented in a manner which is of use to those on the front line.

On the specific use of MICT, the literature goes back to Colton (1979) who was one of the first to highlight the potential of mobile systems. After Colton there was relatively little discussion of the use of MICT as a central focus of research for over a decade. At the end of this time articles started to appear with a primarily technical focus. These articles were primarily US based and discussed, in the main, the technical issues of developing systems for use in police cars. Typical examples in the early to mid 1990s are Nunn (1993) who covered the development and use of mobile terminals in police cars, Bruegge (1996) who examined the technical feasibility of integrating data services with existing radio services to terminals in vehicles, and Iomio (1996) who examined an implementation of mobile data in police cars for vehicle recovery. All of these articles recounted implementations which the authors felt showed promise but which were fraught with technical problems. Of the three, only Iomio (1996) addressed the issues of user reaction at all, noting that the technical problems of the system produced dissatisfaction and suggesting that even if the technical issues had been resolved they would merely have left space for users to raise other issues with regard to the interfaces and integration of the mobile systems into their working practices.

As the technical problems of getting data from back office systems to terminals in vehicle receded, so emphasis started to move to the use of the systems as opposed to the technical challenges of getting them to work. Nulden (2000), working with a Scandinavian Police Force, made one of the first attempts to categorise and understand where the impacts of mobile data and mobile computing might be seen in the organisation, and he suggested three dimensions of mobile ICT design for policing (Central/Local provision of services, Pro/Reactive management of tasks, and Control / Support for officers). One of the first articles to address MICT in a UK context was by Tatersall (2001) who highlighted the potential of the then embryonic Airwave TETRA system to deliver data services to the handsets and vehicle radios to be used by the police when the system was fully introduced. He pointed out that the requirement for the system to handle data had been an integral part of the specification for the system and also noted, in one of the earliest mentions of handheld computing, the potential for data services to

be delivered to handheld terminals as well as to vehicle sets. Malladi (2002), again in a US context, also commented on the potentials for data services to be delivered to portable devices rather than in vehicle devices – which he notes had been the dominant paradigm up to this point. Hauck and Chen (2002, 2003) discuss the use and provision of the COPLINK system, again in a US context. COPLINK is a sophisticated database system allowing for rapid identification of people and Hauck and Chen highlight the potential gains in the mobile implementation of such a system; they also note the importance of understanding user requirements of such a system and designing it carefully to provide a useful and usable interface for users. This emphasis on usability and user requirement is relatively rare. Agrawal (2003) reviews the actual and potential use of mobile terminals in the US and suggests that there is now concrete evidence that such systems can improve response times and information quality, although he does not provide concrete measures. This emphasis on benefit, design and the wider implications of systems is continued, and articles in the early part of the 21<sup>st</sup> century treat design and user issues as much as the technical challenges. Iomio (2003), in this vein, examined the impact of mobile systems on the users as a secondary issue and highlights that the organisation also needs to consider that there are impacts and effects which are wider than just patrol officers; such systems also affect back office functions and wider business processes. Kun et al (2004) investigated the issues of design for the integration of systems and services in police vehicles in the US and evaluated, as a part of the work, the impact beyond the technical system itself. They identified (p. 39) three key areas beyond the technical; the first is the need to build on user experience and move from the known to the unknown, the second is to appreciate the lack of primacy of these systems in the users' universes and the final one is that users will adapt to systems as well as systems having to adapt to users. In a study of the impact of mobile email in a UK police force, Allen and Shoard (2005) discuss the changes to the rhythms of use of users and the potential downsides of the technology in contributing to information overload. This was one of the first studies to highlight potential losses at an organisational level as a result of the move to mobilisation of information and work – up to this point almost all of the issues raised as potential problems took the technical system as their starting point. Allen and Wilson (2005), in a study examining the use of mobile technology (laptops) with two groups in a UK police force, highlighted the importance of the overall social context as one implementation failed whilst the other was successful. This work was also a part of the basis for Norman and Allen's (2005) work (which drew on Allen and Wilson's (2005) study), as well as further work involving more applications in the same police force. This article sought to highlight some of the areas of attention in the larger systems and context which would affect, and be affected by, implementations of MICT. It also sought to highlight some of the factors affecting the ability of implementations to deliver the benefits set out as the rationale for their development. Pica, Sorensen and Allen (2005, p.1) also sought to identify the impact of mobility at a more abstract level with a paper which aimed to:

*“advance the idea that mobility is linked strongly to work conditions and that in order to increase such state within organizations, we must use a triangulated analysis to understand both the relation with the environment of work as well as the relation with information”.*

Pica, Sorensen and Allen (2005, p. 9) reported that:

*“according to most official reports (e.g., Povey, 1999), the police are expecting two distinguishable benefits from mobile technologies; better-informed officers, and improved coordination of limited resources at both individual and organizational level. Overall, they expect a better service to citizen in the form of a faster and more informed response to crimes”.*

In another piece of work, Sørensen and Pica (2004) analysed the role of mobile technologies for operational policing. They focussed on front line officers and found what they termed *rhythms of mobile use* - “five general activity types particularly pertinent for the coupling and decoupling of mobile technologies” (p. 22). One of the most recent articles on this theme of use of information has been Wilson, Allen, Norman and Knight (2008) which sought to highlight the use of Activity Theory as an analytical tool for understanding mobile information use in UK policing. It should be noted that, while research on established services and technologies such as in-vehicle computing and handheld computing, has moved from a concentration on the technical to an emphasis on the social and contextual issues of use, there is a healthy literature which still deals with the technical issues of providing new technologies and services, a specific example is the development of context aware services as discussed by Bouwman (2008).

In summary, therefore, we have seen relatively little research into mobile technologies in policing, and even less in the UK context. The work that has been done has moved (for established systems and services such as remote database access) from an emphasis on the technical challenges of systems to more of an emphasis on the context and manner of use, benefits, and the wider ramifications of implementation. At the same time, there have been new areas of investigation opened up by new technologies (e.g., WiMax) and services (e.g., context aware systems) and the literature in these areas is still primarily technical.

### 2.3 ACTIVITY THEORY

Activity Theory is one of the tools I have selected to help me in structuring my understanding of the situations, people and technologies I observed and explored in the police force I worked with. In this section of the literature review I aim to provide a background to the development and current state of Activity Theory as well as providing an overview of its use in a range of settings. I set out some of the strengths which are ascribed to it and, equally, some of the areas where it has drawn criticism or where weaknesses have been pointed out. Halverson (2001, p.4) points out, however, that we choose theories in the knowledge of their effects;

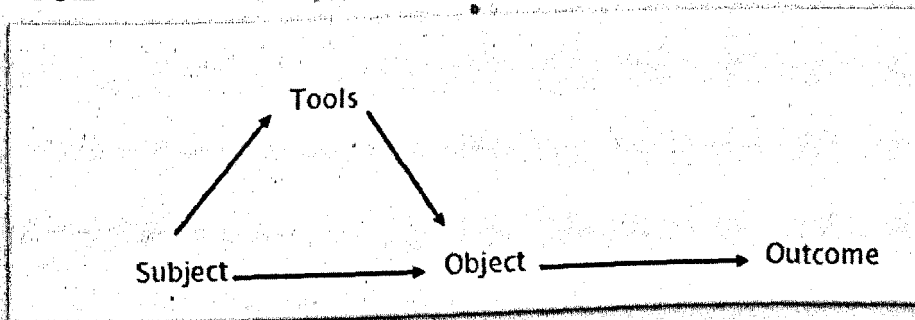
*“From this point of view, theories are more like a pair of dark glasses. We put them on and the world is tinted. The change brings some objects into sharper contrast, while others fade into obscurity”.*

I have chosen Activity Theory for its strengths and I believe that it is an appropriate and effective tool for me to use in this situation.

### *Development of Activity Theory as used today*

Activity theory has its roots in the 1920s and 30s in the work of Vygotsky, Leontev and Luria. It came out of an attempt, largely successful despite the eventual end of the communist experiment in the Soviet Union, to create a Marxist psychology. Vygotsky is widely accepted as being the originator of the theoretical approach although as Wilson (2006) notes the contribution of the founders of activity theory is so intertwined that is to try to disentangle it is unproductive. The approach, in contrast to the dominant mentalist tradition of the time, "posited the unity of perceptions, speech and action" (Gay and Hembrooke, 2004, p. 59) and was based in the Marxist idea that nature is revealed in change (Vygotsky, 1978). Activity theory, as currently conceptualised and used within the social sciences, has gone through a number of iterations since that original attempt to place purposeful human activity at the centre of a process which is mediated by both physical and psychological artefacts and Daniels (2001), in common with others, identifies three distinct stages, initially described by Engestrom (1999), in what may be termed the mainstream development of activity theory between 1980s, when it was first picked up and used in Western social sciences, and the early years of this century.

### *First generation*



*Figure 2.1: First generation of Activity Theory*

First generation activity theory drew heavily from Vygotsky's concept of mediation and is normally represented as a basic triangular structure as shown in the figure above.

The basic triangular structure shows a subject (which may be an individual or a larger group) working on and with an object (which may be a person, a physical construct or a mental objective) with the aim of transforming it into a particular outcome. At the apex of the triangle we have the mediational means (which have come to be termed tools) through which the subject, acting on the object achieves the outcome. 'Tools' has become common shorthand but should not be taken to mean physical tools only; the concept is a wide one and includes language and abstract structures such as musical notation as well as physical tools. Collins et al.

(1999, pp. 7-9) present a taxonomy of tools in the context of knowledge authoring, illustrating the range in this context. Such tools carry meaning with them and Nardi (1996, p. 38) says that "artefacts carry a culture and a history". Not illustrated, but implicit within this representation of activity, is the fact that the activity will have a motive, and this motive may be shared by the subject and object. This representation of human activity mandates a recognition of the fact that human activity relies upon the tools which are used to mediate that activity and, recursively, the tools themselves are constructed at a level of abstraction as part of the process of achieving the outcome. Thus, a tool is not a fixed concept. Butler, the 19<sup>th</sup> century diarist is quoted in Bannon and Bodker (1991) on this topic to good effect;

*"The essence of a tool, therefore, lies in something outside the tool itself. It is not in the head of the hammer, nor in the handle, nor in the combination of the two that the essence of mechanical characteristics exists but in the recognition of its unity and in the forces directed through it by virtue of its recognition. A complex machine, if intended for use by children whose aim is not serious, ceases to rank in our minds as a tool, and becomes a toy."*

The original work of Vygotsky was extended by both Luria and Leontev; with Leontev in particular being credited with developing the model. This work was further developed by Leont'ev (1978) into a more practical approach taking account of the community, and cultural and historical context within which purposeful activity takes place which provided a framework for a "complex multilayered unit of analysis" (Gay and Hembrooke, 2004, p.71). Gay and Hembrooke also describe Leontev's (1978) model as being "less a representation of reality than a heuristic aid for identifying and exploring the multiple contextual factors that shape or mediate any goal directed, tool-mediated human activity" (p. 73). This development, with its emphasis on mediation in context, may fairly be said to have provided the basis for the second generation of activity theory.

### Second generation

As already mentioned activity theory was picked up, based on the original work in the 1920s and 1930s, by Western social science in the 1980s. The first conference on dealing with activity theory was, in fact, held in Berlin in 1986. One of the first areas of research and investigation to recognize the potential of the approach was education; given that much of Vygotsky's work and Luria's work in particular were concerned with language acquisition and development this was a logical and appropriate domain for activity theory. Activity theory was also appropriated as a means of studying work and work processes, notably by Yrjo Engestrom, a Scandinavian researcher into work and work processes. Basing his work on the original structures as developed and extended by Leontev, Engestrom (1999) argues that the focus of the study of mediation should be on its relationship with the other components of an activity system and advocates the study of artefacts as "integral and inseparable components of human functioning" (p. 29). His expansion of the original triangular representation formalises, and represents accessibly, the concepts of division of labour, community and rules and norms. His model is, therefore, not so much a step change from the original Vygotskian model as expanded by

Leontev as it is a placing of the model into a modern context. The emphasis is on the analysis of the interactions between the various elements of the model and, in particular, on the tensions and contradictions which arise within the activity system. Engestrom (1995, 1997, 1999) identifies such contradictions and tensions as being a key driving forces behind development and change in activity systems and Engestrom (1995, p. 410) comments that “activity systems are in constant imbalance and development; actions shape development and are shaped by it”. He characterises this process of development and change (Engestrom, 1997) as a process of expansive learning cycles. The figure below is an illustration of the accepted form of this model:

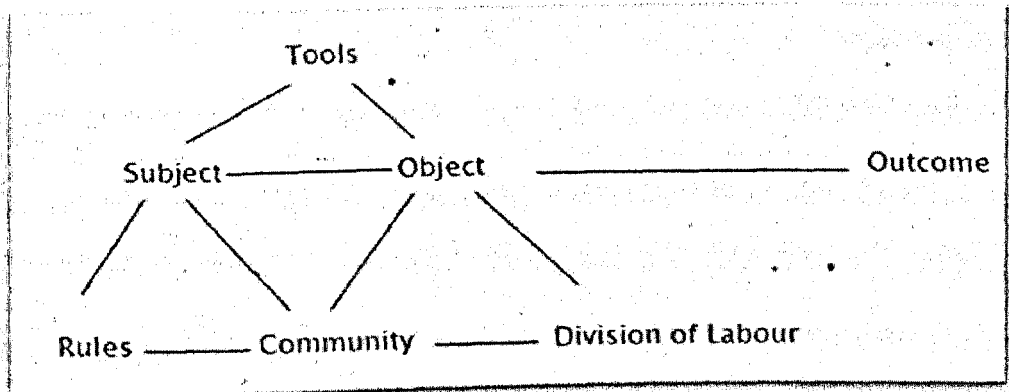


Figure 2.2 Second generation of Activity Theory

At this point, therefore, activity theory has been moved forward theoretically into a model of collective activity, with an emphasis on tensions and contradictions, a recognition of the central role of artefacts, and a basic tenet that it is in the interrelationship between the elements of the system where development and progressive change must lie. Benson, Lawler et al. (2008, p. 459) characterise this as a shift “from tools, to tools, rules and roles”. Integral to such a model of collective activity is the idea, first brought forward by Leontev (1978), of the hierarchical nature of activity in a collective, as opposed to individual activity. In Leontev’s model there are three levels in a model of collective activity as illustrated below:

- Activities are undertaken for an **Object related motive**, and they are achieved by
- Actions** which have particular **Conscious goals**. These actions are made up of
- Operations** which take place under **Given conditions** using the tools of the action at hand.

In order to illustrate this, I offer the following example. A police officer may decide, having stopped an individual to run checks on them to determine their identity and whether they are a ‘person of interest’. In such a case the activity may be characterized as *Response policing* within this activity, the motive for which could be to determine whether the person can be arrested or not, there will be a set of actions of which a representative action may be *Run a person check on PNC*. This action, aimed at the goal of finding out if the person is wanted or has a criminal record, will involve a number of operations depending on the channel used. If

the channel is familiar these will be automatic and require little, if any, thought; so an officer used to carrying out checks on the voice radio system will do so with little attention to the mechanics of making the call and receiving the results. The same officer when introduced to the use of a handheld computer may find that the use of the device, at least at first, is not automatic and requires positive attention at a level above that of an operation. In this case the subject of the activity is the officer, the object/outcome is the person and check on their status, and the activity is mediated by the use of tools including attitudinal and psychological tools (stop, questioning, eliciting information, making a judgement as to whether to carry out a check) as well as the use of software and firmware (PNC, local CIS, bearer channels) and hardware (radio, car terminal, hand-held terminal) to mediate the transaction.

At this point, also, activity theory has been used in a wider range of domains than had originally adopted the model upon its re-emergence into Western social science. It had originally been taken up in education, had been transferred into psychology, was adopted by scholars studying work and by the late 1990s had also been used within Information Systems and in examinations of the human computer interface. These situations raised issues of complexity which helped to set the stage for the development of a third generation of AT. This can, in itself be used neatly to demonstrate some of the explanatory power of AT in that perceived tensions in the model as constituted (with regard to its ability to accommodate dialogue, multiple perspectives and networks of activity systems among others) provided the impetus for a development of the model to accommodate and resolve the tensions.

### Third generation

Kaptelinin and Nardi, writing in 1997, set out six principles which they, as active researchers using activity theory in the context of HCI, saw as being central to activity theory. These principles are; the unity of consciousness and activity, object orientation, internalization / externalizations, mediation, the hierarchical structure of activity, and development. These principles are worthy of some attention at this stage as they both validate the state of AT to this point and set a foundation for its further development. The unity of consciousness and activity is a basic philosophical tenet based on the premise that 'mind' (Kaptelinin, 1995) only exists in the context of interaction with the environment; a mind without interaction does not have any impact on itself or on the situation it is in and may as well not exist as far as that situation goes. Object-orientedness is a key premise and draws on the notion that the world has an objective reality with which we interact, whether that objective reality has a physical expression (PDA) or an abstract expression (Missing Person status). Internalization and externalization expresses the inevitable consequence of interaction with reality by a mind; that the mind affects the world around it by action and activity and that the world, in turn affects the mind and its conceptualisation of reality. Mediation deals with the means by which activity and action are realised – principally by the means of tools and Wilson (2006) comments that such tools,



pervasive in the activity system, are “constructs through which our interaction with the object may be construed or assisted” (p.8). The hierarchical structure of activity has been discussed above and helps to explain the dynamic nature of activity systems as concepts shift; to take an illustrative example, within the activity system of learning to drive the action of using the clutch descends, over time, to the level of operation as it becomes automatic and loses the conscious goal it once had. Finally and importantly, the principle of development states that it is necessary to place the activity in a cultural historical context in order to understand how the activity within the system has been set in its context.

This third generation of activity theory posits the action of (at least) two activity systems on a shared object, thus recognising the “need to develop conceptual tools to understand dialogue, multiple perspectives and voices, and networks of interacting activity systems” (Engestrom, 1999, p. 61), a concept which is echoed in Yamazumi’s (2007, p.35) characterisation of the intersection of activity systems producing “an expanded, shared object”. It also, in Hasu and Engestrom’s (2003) article, gives emphasis to the importance of routines in “carrying organisational memory” and thus, helps to examine the issues of resistance to change within activity systems. It is normally illustrated as below:

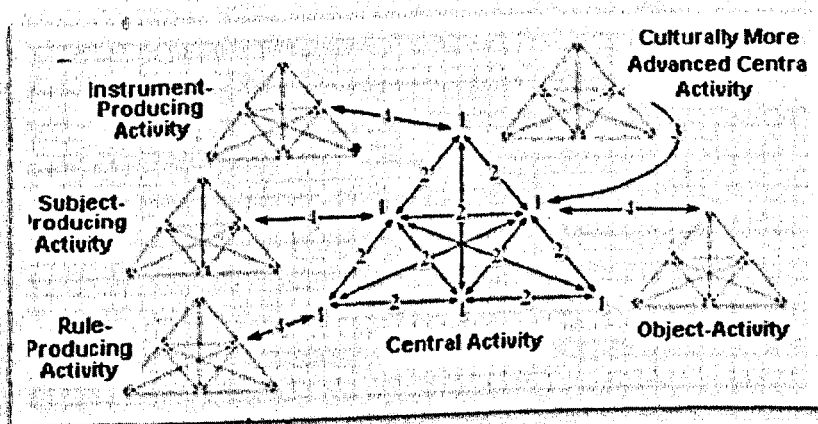


Figure 2.3: Third generation of Activity Theory

An example may be of use here; in the activity system of response policing an action may be the investigation of a burglary and can involve (at the level of action and operation), the involvement of scenes of crime officer to look for evidence. Their involvement shares an object with the police officer who attends the burglary, but has different context and interactions in it which differentiates it while allowing it to be a part of the activity system of response policing. Nardi (1996, p. 44) comments that “situations may be the same, what differs is the object and what is then different is the intent, interest and knowledge”.

AT has, thus, at this point moved on to a developed stage, still consistent with the basic principles, where it accommodates a wider range of situations and influences than the previous two generations. It has also moved on in terms of areas of use, with studies in information behaviour, strategy and information seeking being undertaken and reported.

### Current use

It should be noted, at this point, that the development as charted by Engestrom (1999) through these three stages has been only one strand of development. At the same time as Engestrom took forward the theoretical developments which concretised second generation AT and laid the basis for the third generation as outlined above Bedny (2003) set out a framework of *systemic structural theory of activity* (SSTA) which was arguably (Wilson, 2006) closer to the original theory.

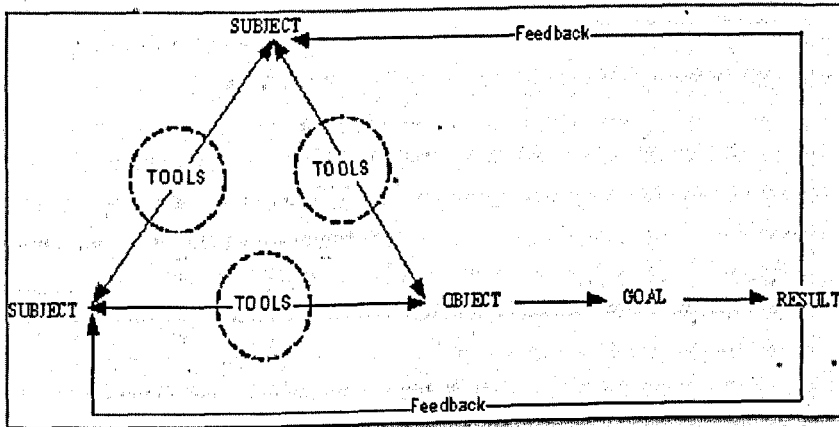


Figure 2.4: Bedny's Systemic Structural Theory of Activity

This representation gives a level of emphasis to the pervasive nature of tools, something which Kaptelinin and Nardi (1996) hold to be axiomatic but which is perhaps missing from the visual representations of AT as developed by Engestrom, as well as highlighting the mechanism of feedback – again something which is held to be implicit in the Engestrom developments but which is expressed and explicit in Bedny's representation. The division of the subject makes explicit the division of labour and the potentially collaborative nature of action. This model has attracted attention recently from Wilson (2006) and he has outlined a structure to bring the two models into alignment and produce a harmonised version of Activity Theory which provides a recognition of the strengths of both models. Wilson (2006, p. 8) comments that "I became rather dissatisfied by the rather static character of the diagrammatic representations" and goes on to say that "certainly flows of action, information, influence etc. are represented in the arrowed lines, but the *process* is not altogether clear" (original emphasis). In order to address this, he developed an interim model which sought to bring Bedny's and Engestrom's representations together. In a further iteration of this model he places goal with motivation. It is this model, which Wilson (2006, p.9) terms a *Process Model of Activity* which has been the basic tool I have used in collecting and analysing data. The model can also be represented as below:

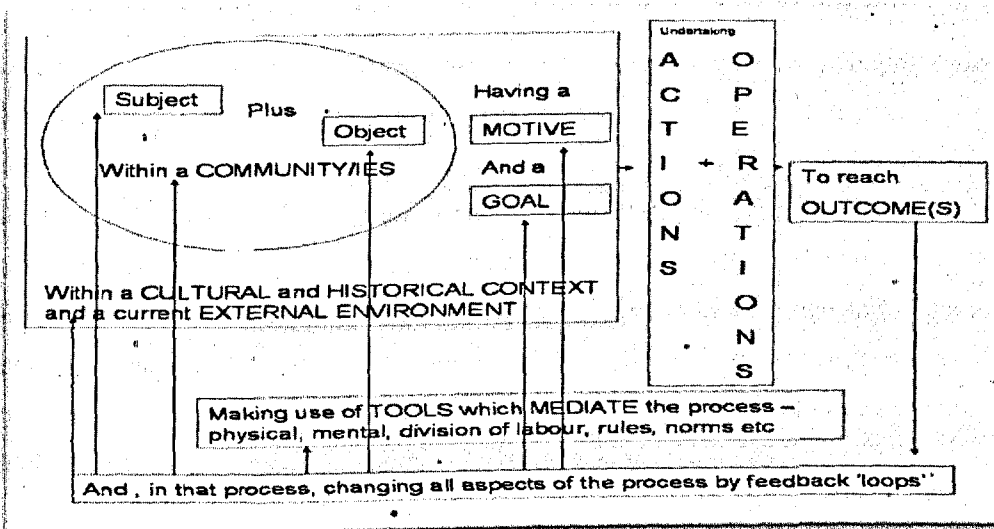


Figure 2.5: Process model of activity

### Areas of use

As has already been briefly noted, AT has seen wide acceptance since its re-emergence in the 1980s and there have been a number of areas of use. In a recent paper Wilson (2008) reviewed the areas of use of AT and charted its development and use across the fields of education, psychology, the study of work, information systems, information seeking, and HCI among others. Other authors have also charted the range of use and Barthelmeß and Anderson (2000) provide examples of the use of Activity Theory in a diverse range of settings as does Nardi (1996, 1999). In this section I aim to provide a sense of the breadth of use, rather than a definitive review.

Educational work has been a key user of Activity Theory as an approach and has been used by prominent writers in the field such as Geertz, Mead, Dewey, Fiere and Bateson. Their use has drawn heavily on the issues of language as well as in work on zones of proximal development (McMahon, 1997). Education was an early adopter of AT and the use of the approach in learning settings inevitable started to bring it into contact with the world of ICT as the use of technologies in learning developed. This bridging has also provided the basis for further development by Engeström (2004) of the concept of co-configuration work in learning and the role of expansive learning cycles in this process. He identifies that there are three key areas of expansive learning; transformative, horizontal (or dialogical) and subterranean.

Engeström has to be seen as a central figure in the evolution of AT as we know it today and much of his work has been centred on the study of work, and the relationship people have with work and the work environment; much of his early work taking place in a medical context. It is in this arena of work study that we saw the concretisation of the second generation AT model, and Engeström's (1993) extensions to the model in terms of recognizing the manner in which

collectivity is mediated by rules and the manner in which labour is divided, as well as the concept of expansive learning cycles by which the tensions and contradictions which are an integral part of activity systems are resolved. This is another bridge to the world of education with Engeström's studies, in which he developed the concept of expansive learning cycles, also linked to McMahon's (1997) work on more knowledgeable others and zones of proximal development of learning. In a more general work context, Rizzo, Marchigiani et al. (1997) identified the use of Activity Theory in work analysis and in work design and suggested it as a bridge between theory and method in the field – helping to “structure analysis without prescribing it”. Rizzo (1998) commented that it will not provide a hard design specification but will add materially in many situations to the richness of the requirements elicitation process.

Activity Theory has been widely used for studying Human Computer Interaction, and information systems. Redmiles (1996) identified a range of papers looking at themes including: collaboration (in software and KM environments); mediation; communities of stakeholders; tensions and conflicts (between communities or groups, over time, as a source of requirements capture); and interventions which have been made as a result of themes in Activity Theory analyses. Nardi and a range of collaborators (Nardi, 1996; Nardi and O'Day, 1999; Nardi, Whittaker et al., 2002) have written extensively on activity theory and its application to HCI situations and Nardi, with others, has carried out studies (Nardi and O'Day, 2000) based in an activity theory perspective in a wide range of settings including virtual environments and schools. Most recently she has used activity theory to underpin an analysis of the individual's links to what she characterizes as “intensional networks” (Nardi, Whittaker et al., 2002) and to help to understand the complexities in the role of new forms of organization formed around personal work or social networks. Collins, Shukla et al. (1999) provided an example of an attempt to use the process in a technical authoring environment and emphasise the level at which users concentrate on mediating artefacts as much as they do on outcomes. In their study this, in turn, informed and enriched the requirements process for the development of new tools and approaches.

### *Strengths and weaknesses*

AT, as Halverson (2002) recognises and discusses, is a theory which researchers choose to use and Halverson argues for an informed choice of theory, likening the choice to the use of tinted glasses and bringing some things into focus and sharp relief while others assume less prominence. Much of this effect is based in the specific strengths and weaknesses of a theory. These are the determinants in many cases of how well a theory will perform for a given user in a given situation. AT, as would be expected, has had its share of critical attention and in this section I aim to explore and highlight some of the strengths of the approach as well as some of the issues and challenges which have been raised.

AT produces rich data, giving detailed descriptions of situations and encouraging researchers to take a broad view on the activity system they are investigating (Redmiles, 1997; Spasser, 1999) and in doing so it explicitly encourages a recognition of the stratified nature of the world through the use of the principle of hierarchy (Spasser, 1999). Barab et al. (2004) note that this stratification as an analytic tool also coherently integrates the individual and the environment. Nardi (1996) also comments on the integration of the individual in the environment as a strength and also emphasises that this means that the system is viewed from the points of view of those within it, saying that "AT seems the richest framework for studies of context in its comprehensiveness and engagement with difficult issues of consciousness, intentionality and history" (p. 46). Nardi (1996, 1999) also provides an overview of what she sees as other key benefits from the use of AT; the approach, requiring as it does some level of involvement over time, avoids the danger of seeing only a snapshot of a situation; it offers researchers (both within a field as well as across fields) a common conceptual vocabulary as well as the unified structure which the approach provides; it provides a focus on activity in context and links the two explicitly and it offers researchers the ability to take the subject of the system at a group level or an individual level. Worthen (2001) also attempts to summarise what she sees as the key gains from the use of activity theory as a framework for analysis of situations (in the context of the study of workplace industrial relations issues) and cites the key gains from the use of the approach as being, firstly, the development of a common language to describe diverse situations and, secondly, the availability of a framework which allows diverse approaches to be accommodated within a larger theoretical framework. Jarzabowski (2003, pp. 25-26), in a study of strategy as practice also notes a specific strength of AT as being the ability to focus on practical activity and on tools mediating action and thus making practice, as an abstract construct, visible and amenable to examination and analysis.

There are, of course, also challenges and issues which have been raised. A very practical one is the point made by Redmiles (1997) that AT is not accessible and can be hard to explain, especially to those in the field who are not social scientists and have no wish to be. Bannon (1995) commented that the approach is functionally based and, therefore, does not present a clear methodological prescription for the description or analysis of behaviour, he also noted that, although the levels in the model are clear, they themselves are not functionally based and so are heavily dependent on individual interpretation. On a similar theme, Wright (1996) commented that there is a lack of agreement on the definition of key terms and especially that of the concept of object within the overall theoretical approach. There is widespread recognition (Redmiles, 1997; Bannon, 1995, Rogers and Scaife, 1997) that Activity Theory is a framework of assumptions rather than an explanation in its own right and, as such, Nardi (1999) commented that it can be hard to operationalise – but does suggest (Kaptelinin and Nardi, 1999) a checklist approach as a first stage in ensuring that the areas of attention suggested by Activity

Theory are accommodated in research work. A related point raised by Rogers and Scaife (1997), is that there is no single method or method-set which flows logically from the use of Activity Theory as a lens, which means that researchers lack guidance on methods. They do, however, point out that:

*"methodologically... the ideal data for an application of AT [activity theory] consists of longitudinal ethnographic observation, interviews and discussions in real life settings, supplemented by experiments"* (Rogers and Scaife, 1997, p. 21).

They also noted that it can be hard to determine the level of activity and provided the example that homework for a child could be an activity or an action within an activity depending on the level of the activity system being taken as the basic unit of analysis. Kaptelinin (1999) noted that the original work on which the approach is based (although not as extended by Engeström and later theorists such as Bedny, and later Gonzalez) has an individual focus which distracts from group settings and that the approach takes a narrow view of culture as being a function of geographic and organizational surroundings. This tends to make the approach less immediately relevant to the virtual organizations and settings which are increasingly important. Two specific issues are the suggestion (Minnis, 2001, p. 308) that the theory "does not resolve well at the level of the individual person" and Jarzabowski's (2003) point that she found, in use, that the theory as currently set out is weak in explanation of how contradictions are generated, sustained and changed.

### ***Methodological accommodation***

One of the issues raised above as both a strength and a challenge is the lack of prescription in AT of methods of use. The approach has, as Rogers and Scaife (1997) have identified, no single set of tools from which researchers should select. In part, as a result of this lack of prescription, there have been a wide range of approaches used. Nardi (1999) has identified that there are a number of areas where the Activity Theory framework is being further developed and highlighted several illustrations (e.g., Christiansen's (1996) work in using ethnography framed by Activity Theory; Holland and Reeve's (1996) work on the concept of perspective as a way of linking activity systems together as well as to social structure; Zinchenko's (1996) spiritual development model to deal with the mediation of internal versus external activity drawing on psychoanalysis, literature and mythology; and Engeström and Escalante's (1996) work combining Activity Theory with network analysis). Nardi (1999) also identified these as being areas of development where Activity Theory can be used to provide a unified framework within which it is possible to examine natural behaviour using the methodology from a range of disciplines. She argued, in effect, that this is a pragmatic rather than a doctrinaire approach and suggested that it is broad enough to accommodate many base disciplines and flexible enough to do so within an overall framework which provides a common set of concepts and vocabulary.

There have been a number of illustrations of the ability to move AT across domains and method and I have illustrated some of these below. Artemeva and Freedman (2001) used activity theory as the basis of an analysis of the development of tensions within a business environment. They used the concepts of tensions and conflicts, drawing on Bodker (1996), to understand the organizational shifts and highlighted the ways in which the catastrophic change involved could have been avoided or handled more effectively. As a specific application of the approach, Hasan and Crawford (2003) suggested the use of AT as a framework for the examination of and design of Knowledge Management environments and did so within an educational context – they used the work of Engeström (1995) on expansive learning cycles as being key to KM being informed by, and able to gain from, Activity Theory analyses. Rogers (2008) also recognises and deals with this issue of customisability of the approach and she provides the examples of Spasser (1999, p. 1136), who allied AT with realism to undertake an evaluation which was “real, realist, and realistic”; Halloran (2002) who developed the concept of the activity space, Artemeva (2001) blending AT with genre theory, and Petersen (2006) who draws on the Warawski concept of secondary artefacts. Halverson (2002, p.14) sees this ability for the framework to accommodate a range of adaptations and customisation as a benefit:

*“AT has rhetorical power, not because it names things-in-the-world, but because it names conceptual and analytical constructions with which any analyst looking at a collaborative system has had to struggle. Naming a category “mediating artefacts” focuses the analyst’s attention around those objects used by the subjects of the activity system. Naming helps communicate to others – particularly when they do not understand the particular domain.”*

In part, as result of its breadth of accommodation there has been a suggestion, commented on in Minnis and John-Steiner (2001) that activity theory can become a unifying theory to provide a “germ cell for reorganizing and integrating Western Social Science”. This is based on the character of activity theory in treating “as a continuous field of study what most Anglo American readers would regard as several distinct disciplines” (Minnis and John-Steiner, 2001). Prominent among those putting forward this suggestion is Engeström (1997, 1999) whose work to develop activity theory as an operationalised approach to the study of work as an activity system, places him in a strong position to comment on its use in wider areas. A specific suggested evolution of AT has been put forward by Gonzalez (2006), who proposed the concept of intermediate level of hierarchy being represented as *working spheres* or areas of *engagement*. Whilst this has been accepted readily by a number of writers (and, in fact was one area of focus for a special edition of *Interacting with Computers* in 2008) it has also attracted some comment with Bedny (2008) suggesting that the concept, while valuable, needs further refinement with regard to the centrality of task in the model. Engestrom (2008) has also commented on the model and suggested that it requires further development in the area of engagement while Diaper (2008) commented that the development of intermediate levels was, effectively an illusion, stating that “Where AT’s value may lie is in identifying and categorising intangible things in a systems model ... [and this] should rely on the expertise of analysts to

select an appropriate number of levels for a given project” (p. 265). We have, therefore, in AT an approach which accommodates a broad range of methods and has shown itself to be durable in a number of domains of use. Perhaps the last word of caution can usefully be left to Grudin (2002) “if you develop a theory it can be like your toothbrush – fine for you, but no-one else seems interested”.

## 2.4 RESEARCH GAP

Although MICT is not new in organizations, it has been underdeveloped in the Police Force which means that this area has received little attention as a research topic. Although AT has been used a lens through which to examine a wide range of domains of activity from education to computer interfaces it has had limited use in the study of MICT. This means that my research, (which involves using AT to explore the effects and impacts that mobile technologies have on the work of police officers in respect of three stages of the introduction of mobile technologies; technology proof of concept, systems proof of concept, and trial prior to full roll out) helps to fill a gap with regard to both the implementation of MICT with front line police officers and the process of studying it.

## 2.5 SUMMARY

In this chapter, I have reviewed literature on MICT, on MICT and policing and on Activity Theory. The key points are that:

- The rhetoric of NPM (and associated pressures including media attention) has been applied to the police as with much of the rest of the public sector, and MICT is seen as a part of the way to address some of the issues and imperatives this places on police Forces.
- There is a lack of precision and definition around the terms associated with this area – ‘mobile working’, ‘mobile data’, ‘mobile ICT’ being examples.
- Much of the literature, particularly earlier literature, takes a technical perspective and, if it considers users, considers that if the technology is right in technical terms, it will be adopted and used.
- Where consideration is given to users it is often in a short term ‘snapshot’ study rather than in the context of a process of change and development with technology, organisation, individuals and social circumstances in a complex and recursive relationship.
- Technology often takes the centre stage rather than task. So, studies address whether the technology works in a setting rather than addressing the activity of which the technology is a part.



## Chapter Three: Methodology

### 3.1 INTRODUCTION

This chapter discusses the methodology which I used to carry out my research. It covers the research aim and objectives, approach and framing tool, participants, access, ethics, research methods and procedure, and data analysis.

### 3.2 AIM/OBJECTIVES

I aim to explore the introduction of MICT into a Police Force and its effects on the work of front-line police officers from their perspectives, with specific reference to four areas of attention – equipment and infrastructure, work practice, relationships and organizational capability. My research objectives are to:

- explore the nature of the MICT equipment, police officers' perceptions of the equipment and the training and support they received to facilitate their use of the equipment
- explore police officers' perceptions of how MICT changed the way they undertook their job roles
- explore police officers' perceptions of how MICT changed their relationships with people
- explore police officers' perceptions of the added value the kit could give them in relation to undertaking their work roles
- devise a theoretical framework to understand and facilitate the successful introduction of MICTs in front-line policing.

### 3.3 APPROACH AND STRATEGY

#### *Qualitative, Interpretative and Longitudinal*

My research is qualitative. Falconer and MacKay (1999, p. 288) describe qualitative researchers as studying “things in their natural setting, attempting to make sense of, or interpret, phenomena in terms of the meaning people bring to them”. I choose a qualitative approach because I was seeking a rich understanding of the effects and impacts of MICT on front-line police officers from the perspectives of my participants and believed I would gain this by going into their natural setting (i.e., the police station, police vehicles, and out in the field where they undertake their day-to-day work) to conduct my research.

My research is based in the interpretive paradigm. Orlikowski and Baroudi (1991) comment that studies in this paradigm “assume that people create their own subjective and inter-subjective meanings as they interact with the world around them” (p.5) and that researchers “attempt to understand phenomena through accessing the meanings that participants assign to them” (p 5). This paradigm is fitting for my research because my inquiry is concerned with

exploring participants' experiences of the MICT in their work context. Research based in the interpretive paradigm focuses on the "complexity of human sense making as the situation emerges" (Kaplan and Maxwell, 1994) and, in the case of my research, my task was to make sense of the impacts and effects of introducing MICT into a particular Police Force. The Police service is a complex environment, and there are factors within the environment which make researching it using the interpretive approach appropriate. For instance, the Police context is one in which there are multiple realities to deal with and police officers are acutely sensitive to having an 'outsider' in their company (Nulden, 2004, p.1). Nulden (2004, p.1) suggests that it is necessary to build trust with officers before being "allowed backstage [to the] hidden transcript, a discourse not meant to be publicly uttered or printed", and I believed researching within the interpretive paradigm would give me more opportunity to access the back stage and gain greater insight into the context and practice of the officers than could be obtained otherwise. Orlikowski and Baroudi (1991, p.14) explain that an interpretive researcher "avoids imposing externally defined categories on a phenomena ... [and] attempts to derive his or her constructs from the field by in-depth examination of and exposure to the phenomena of interest". This describes my approach to data collection and analysis which I believe was appropriate because my literature review revealed a lack of research in the field and so it was not possible to import categories as they may have been totally irrelevant to the perspectives of the participants. Taking the point above, I did, however, establish four areas of attention to investigate (i.e., equipment and infrastructure, relationships, work practices and organisational capability) as a result of my previous research in mobile technology in policing and the observations I made at the outset of my research as these were areas I wanted to focus my research on. This is in line with Orlikowski and Baroudi's comments in the sense that this is not a pre determined structure but a set of guidelines for attention. Foley (2000) noted that interpretive research recognises the role of the researcher as a part of the process. I used my experiences and expertise when planning and conducting my research and when analysing the data. I decided to research the aforementioned four areas of attention because of my prior experience and I used my previously acquired skills and knowledge in data collection and analysis. For example, as a professionally qualified and experienced teacher and consultant my social skills are well developed and were brought to bear on accessing the organisation and gaining sufficient rapport and respect to be allowed to conduct my research until its completion, and my decision to use computer software when analysing my data was based on my prior experience of using such software and observing the benefits of doing so firsthand.

My research is in the form of a sequential set of three case studies of a particular Police Force and, within this, I have used direct observation, individual in-depth semi-structured interviews and focus groups to collect data. I researched three specific stages of the process of the introduction of MICT into the police force studied - Technology Proof of Concept (TPOC),

Systems Proof of Concept (SPOC), and trial prior to full roll out (trial). Therefore, in respect of the *activity*, my research is longitudinal.

### ***Framing Tool - Activity Theory***

Following my data collection at the TPOC stage of the project, I used Activity Theory to provide a framework for understanding the effect of the introduction of MICT on front line officers at each phase of the project within an overall cultural and historical context. I chose Activity Theory as a framing tool because it is not a prescriptive methodology (Bannon, 1995; Nardi, 1999) and offers what Rogers and Scaife (1997) describe as the *looseness* of a “framework of assumptions in its own right”. Rogers and Scaife (ibid) list these assumptions as being (1) that human activity always takes place in a purposeful context, (2) that actions within such an activity system will be oriented towards the attainment of an outcome, and (3) that actions are mediated by tools (i.e. artefacts or mentefacts).

The analysis of my findings at the TPOC stage illustrated the relevance of these assumptions to my research. Activity Theory predisposes researchers to using it as a framework to look at certain methods in particular and combining them in a manner appropriate both for the framework and the setting under consideration (Nardi, 1999; Engestrom, 1993, 1996; Bannon, 1995; Bodker, 1997). The framework is primarily qualitative, interpretive, and concerned with the analysis of action over time and as such fits the approach I have adopted for my research.

Some writers have offered prescriptions for the successful use of Activity Theory in research settings. For example, Engestrom (1995) has suggested the following three key principles researchers should bear in mind – (i) the collective activity system is the unit of analysis, (ii) using internal contradictions as the driving force behind disturbances, innovations and change in the activity system is the key to providing insights into the system and, (iii) analysing the activity and its component actions and operations historically is an integral part of the process of analyzing the system as it is and as it could be. Nardi (1999) proposed four principles which need to be taken into account. Firstly, she identified a need to use a research time frame which is adequate to allow users to understand objects – requiring a process in stages rather than a single snapshot analysis. Secondly, she urged researchers to pay attention to patterns of data rather than narrow episodic fragments and thirdly, she suggested that the approach is suited to the use of a varied set of data collection techniques – interview, observation, video, document analysis – without undue reliance on any single one. Finally, she noted that the key underpinning principle is that researchers should have a commitment to understanding things from the viewpoint of the user. Kuutti (1999) suggested a similar set of key precepts for researchers seeking to use Activity Theory. She proposed that the activity has to be the basic unit of analysis – providing the motive for the *object-outcome* change is restated; she noted that activities are static and need to be appreciated and situated in a cultural and historical

perspective – a point reinforced by Bakhtin and Holquist (1982). The manner in which artefacts mediate activity is of key importance in Kuutti's (1996) view and she also noted that activities have a basic structure described by mediated relationships at the individual level. These sets of guidelines have a level of commonality in that they all suggest that it is necessary to have a picture of the Activity System in its context and they imply that to do so it will be necessary to take a flexible and creative approach to the collection of data and in a time frame which allows for understanding the objects of the system and the issues which disturb and distort the system. In addition, they all promote the use of the activity as the basic unit of analysis. I am researching police officers undertaking their work and, in this context, it is the Activity System that is my focus of the analysis. I am not researching the introduction of MICT out of context, therefore, my research practice fulfils this key component of Activity Theory that is necessary for it to be successfully applied.

### *Grounded theory*

I have used techniques which draw on grounded theory and which are underpinned by qualitative analysis. These techniques have been used to complement the broad meta-framework of Activity Theory and have operated within the broad areas of attention identified by the use of AT. Strauss and Corbin (1998) explained grounded theory as being where “A researcher does not begin a project with a preconceived theory in mind ... Rather the researcher begins with an area of study and allows the theory to emerge from the data” (p 12). My research is unique and, as there is a lack of research into the effects of MICT in policing, I did not have a pre-conceived theory in mind. As I was not testing hypotheses or assessing a given theory, allowing theory to emerge from the data was appropriate. Strauss and Corbin (1998, p. 12) pointed out that “Theory derived from data is more likely to resemble the ‘reality’ than is theory derived from putting together a series of concepts based on experience or solely through speculation (how one thinks things ought to work)” and I believe that reflecting reality will make the emerging theory applicable, useful and relevant to theorists and practitioners. Furthermore, grounded theory provides a systematic approach to the development of theory grounded in data which has been systematically gathered and analysed (Myers and Young, 1997) is inductive, contextual and processual (Orlikowski and Gash, 1994), requires an iterative approach to the collection and analysis of data and constant comparison across evidence to control the conceptual level and scope of the analysis and I believe these factors provide rigour to the research process.

### *Research strategy – Case studies of a Police Force*

Hartley (2004, p. 323) described the case study as a research strategy “consisting of a detailed investigation, often with data collected over a period of time, of phenomena within their context”. This description matches my chosen strategy. I have used a set of three sequential case studies of a single police force (hereafter referred to as the Force) as the focus of my

research; the three case studies are the TPOC, SPOC and Trial stages of the project of the implementation of MICT into the Force (see Chapter One above for an explanation of these stages). Thus I have researched the phenomena (i.e., the impacts and effects of MICT on the work of front-line police officers) in context (i.e., the natural setting in which the officers used the MICT). Hartley (2004, p. 324) pointed out that:

*“Although a case study may begin with only rudimentary theory or a primitive framework, the researcher needs to develop theoretical frameworks during the course of the research which inform and make sense of the data and which can be systematically examined during the case study for plausibility.” (ibid)*

She suggested that “without a theoretical framework, a case study may produce fascinating details about life in a particular organization without any wider significance” (ibid). When I began my research I collected data in the TPOC stage using the four areas of attention (i.e., equipment and infrastructure, relationships, work practices and organisational capability) to guide my research – this was my primitive framework. However, as my research progressed I utilised Activity Theory as a framework to help me make sense of the data, and to develop my model to give my research wider significance.

The Police Force I selected as my case study organisation was chosen because it gave me the opportunity to have *front line uniformed officers* as my main participants as this is the largest single group of people employed in Police Forces and, as such, will be the largest users of MICT that are introduced. This Force has approximately 3,000 staff, approximately half of whom are warranted police officers with the balance being police staff and Police Community Support Officers (PCSOs) who do not have the full powers which come with the status of a warranted police officer. Warranted Police Officers fall into the following categories in rank structures:

- Chief Officer Group: Chief Constables, Deputy Chief Constables (DCC), Assistant Chief Constables (ACC)
- Senior Management: Chief Superintendents and Superintendents
- Middle Management: Chief Inspectors and Inspectors
- Supervisory / Junior Management: Sergeants
- Officers with full police powers: Police Constables.

Police staff are ranked in a similar way with senior financial and resources managers being regarded as members of the Chief Officers Group. PCSOs, lacking full warranted powers, are ranked below Police Constables. Police Constables, PCSOs, Sergeants, and Inspectors are front line uniformed officers. Of these Police Constables are, by far, the most numerous.

The work of the Force is diverse and much of it is reactive. The work can be categorised into the key areas summarised in Table 3.1 below. The table indicates the area of work, a brief

explanation of it, contextual information, and the type of staff who undertake the work. The key areas of work relate to policing tasks rather than the administrative functions which support them.

Table 3.1: Key areas of work undertaken by the Force

Key Areas	Nature	Context	Staff
Neighbourhood Patrol (also known as Community Policing)	The function which identifies a team of officers (usually a team of PCs and PCSOs) with an area. Areas are broadly, town centre, housing, estate, rural and industrial. Responsible for forming and maintaining community links and addressing local and community priorities.	The Force has approximately half of its uniformed officers deployed in NPT. This is above the national average and reflects a set of local priorities. NPT is run within Divisions of the Force and is supported by a central team at the Force HQ which is responsible to the Chief Officers Group for the setting and management of policy for NPT in the Force. The Force makes use of Restorative Justice, Problem Oriented Policing and SMART objective setting with NPT staff.	Uniformed front line staff. Mainly PC and PCSO with some Sergeants and Inspectors whose role is primarily (although not exclusively) NPT
Incident Management and Response	The function which deals, in the main reactively, with incidents which arise during a shift. Officers are usually vehicle based and will have extensive contact with the Force Control Centre which will allocate and manage jobs	The Force uses Response Officers to deal with incidents which arise and also tasks them with geographic patrols to increase visibility as well as with Crime Management Tasks which tend to be based around certain key Individuals and networks. Officers are usually double crewed in a vehicle. The radio is the key means of communication for such officers.	Uniformed officers – in the main PCs – backed up by Sergeants in Police Stations and by senior staff in Police Stations as well as in the Control function. In the case of a major incident command can escalate as far as Chief Officer Group.
Roads Policing and Traffic Management	The function whose aims include 'denying criminals the use of the roads', enforcing safe standards of driving and vehicle maintenance and ensuring compliance with laws relating to vehicle use such as tax and insurance.	The Force maintains a specialist Roads Policing Group (with staff operating from specialist facilities in the main, under the control of a Division) as well as a Motorway Patrol Group which has a central location and is attached, mainly for administrative purposes, to a single division. Extensive use is made of Automatic Number Plate Recognition – mainly from camera equipped vehicles, although the Force also has a number of fixed ANPR points. Minor enforcement of roads policing issues (tax discs for example) will also be carried out by NPT or response officers. PCSOs have some limited vehicle related powers, mainly with regard to parking and taxation. Much of the work of the roads and traffic policing staff is in dealing with accidents where serious injury or death has resulted.	Mainly uniformed officers and mainly vehicle based. There are a few unmarked camera vehicles in use and a number of unmarked vehicles are also used on Motorway Patrol duties.  Many routine duties of the Motorway Group have been taken on by the Highways Agency Traffic Officers (HATOs) who have limited powers and carry out traffic management duties such as assisting broken down vehicles and providing escorts for abnormal loads.

Volume Crime (also known as Criminal Investigation)	The function which carries out investigation into linked series of crimes such as vehicle crime, burglary or fraud. Commonly known as CID.	The Force organises volume crime investigation on a divisional basis with a supporting headquarters function. Serious crimes and organised national level criminality will also often involve liaison with the Force Major Crimes Unit or regional / national units such as the Serious and Organised Crimes Agency (SOCA).	Usually plainclothes staff. Traditionally police staff have played a small role in this work but under recent workforce reorganisation initiatives there has been a move to making use of police staff to set up and manage investigations with full warranted police officers being used mainly to carry out arrests and interviews under caution.
Scientific support (also known as Scenes of Crime or Forensic support)	Scientific support for the examination of scenes of crime and the application of forensic techniques to evidence gathered and to evidence gathering	Organised centrally with Forensic specialist services being managed from a headquarters function. Scenes of Crime Officers are located regionally and attached administratively to a Division. Handling of images has become a major part of the work and this is set to increase with additional digital imaging and CCTV / Video being made available.	Police staff working primarily with uniformed officers but supporting all aspects of the work of the Force
Specialist Units (e.g. Helicopter, Dog Handlers, Underwater Search, Accident Investigation, Major Crimes Unit, Firearms)	Carry out specialist functions to support investigations and operations	Tend to be organised as a force-wide resource. May be locally based or based at Headquarters	Range of police staff and specialist officers. Some uniformed staff but also some plainclothes or covert.

The Force polices a County area which includes several motorways, a ferry route, an airport, several major towns and two cities, a major tourist area, industrial areas in traditional manufacturing industries, some high technology manufacturing and several football teams. The locality has significant areas of both wealth and deprivation in urban and rural settings and areas with a significant ethnic heritage population where there has been racial tension. Thus the Force is typical in its span of operations and activities.

The Force is organised into five divisions which cover broad areas with the exception of one division which concentrates on the major tourist area. This division calls on additional staff during the tourist season and operates at a reduced capacity in the off-season. The Force headquarters is located in the central division area.

The Force has a history of using technology and some of the key areas of technology use include:

- Radio communications over the dedicated public safety network – *Airwave* – which is a secure Terrestrial Trunked Radio system (TETRA) to both personal and vehicle radios. This is a system which is being adopted by Fire and Ambulance staff and which is open to others with a Public Safety remit. It is not open to any commercial or other Government users.
- Incident Management and Command and Control systems tied in with call handling and with the radio system.
- Database access to national, regional and Force databases including the Police National Computer (PNC), the local Force Intelligence database, Violent and Sexual Offenders Register and warrants systems.
- Force secure networks providing IT access and secure email as well as office functions and many of the forms required to record and manage crime.
- Scientific and forensic services covering a range from digital imaging to DNA testing.
- Automatic Number Plate Recognition (ANPR) tied in to vehicle specific databases including ownership, tax, insurance and MOT status.
- Closed circuit television (CCTV) and surveillance systems run by local authorities, highways agency and others such as private firms.

The Force has a history of being seen as an innovative Force in technology terms and also has historically been well rated on its use of technology during inspections. The Force has a significant in-house capacity for technical development and support and has contracted out less of its support and ICT management work than many other Forces. There is a high level of bespoke applications which have been produced in-house or which have been tailored to the needs of the Force. One area of development where the Force does not have a significant capacity is, however, in location technology which could support the location of officers (Automatic Person Location Systems, APLS) or vehicles (Automatic Vehicle Location Systems, AVLS).

### **Case study 1**

The first case study was of the Force implementing the first stage of its project of introducing MICTs into the Force. This stage was the technical proof of concept (TPOC) stage and took place from March 2004 to November 2004 with the Road Traffic Policing Unit. I conducted my research from July 2004 to November 2004. The purpose of the TPOC stage of the project was to prove the ability of the Force to get information out of *back office* databases and on to mobile devices. The mobile devices were four handheld devices and two mobile data terminals (MDTs) which were located in police vehicles (i.e., vehicle mounted computers). They were



deployed with the one geographic division of the force in large part because this is where user enthusiasm had been generated early on in the project.

Although this was a technology proof of concept it was a proof of concept in context rather than a purely technical proof of concept which did not have user involvement. The Force had, therefore, to use systems which officers needed to access and use as a part of their everyday work. To that end they provided officers with access to some of the key systems which officers make use of and which they would normally have to access in person at a police station or via an information intermediary (ordinarily the Force Control Centre, or phone-a-friend at the police station). These were; access to the Police National Computer (PNC) for both vehicles and nominals (i.e., people) and to the Force criminal intelligence system (CIS) which holds more detail than PNC but only on people within the Force area, access to the Force Incident Control and Dispatch (ICAD) log for an incident, access to the Force intranet providing them with internal contacts for colleagues and departments (including email address, Airwave radio number, mobile phone number, home station) and information as to duty rotas and shifts (known as *duty states*). Access and facilities were the same between the handheld and MDTs (although they used different technologies to provide this access). Email access was available but limited to read only and with limited attachment handling.

### *Case study 2*

The second case study was of the Force implementing the second stage of its project of introducing MICTs into the Force. This stage was the systems proof of concept (SPOC) stage and took place from November 2004 to April 2005 and I conducted my research across this full period. The SPOC stage was designed to build on the TPOC which had successfully shown the ability to transfer data to and from mobile devices and validated, in broad terms, the choice of applications made available to officers as being, at least initially, valuable ones to have on mobile devices. Because the TPOC stage revealed significant issues with interfaces and with the manner of use of the equipment in the field, one of the challenges for the SPOC stage of development was to provide systems which gave officers resilient, reliable and secure access to the information they needed in a manner which they found at least acceptable, and ideally better than the status quo ante. The mobile devices were twenty-five XDA2 (hereinafter referred to as XDA) handheld devices.

As a proof of concept, designed to show that systems were of use to officers and were robust enough for operational use, the Force built on the systems and applications which they had made available to the users in the TPOC. They provided the same functionality as they had done at the TPOC stage but adjusted the interfaces to improve display and input. An example of the changes was the addition of a timer screen to show how near a search was to completion, rather than officers having to guess, and a chime to alert users to the completion of a

transaction. Much of this was cosmetic change at this stage without real re-engineering of back office systems and, as a proof of concept, there were areas where full interfaces were not built between systems but the functionality was achieved (as far as the users were concerned). In addition to the changes to interfaces the Force added four key new facilities at this stage. These were: the ability to complete a Missing Persons report in the field and update records with regard to action on a missing persons investigation, the ability (in a limited subset and after the start of the SPOC) to use the cameras built in to the devices to take pictures, and the ability to access the Crime Management tasks and profiles which guide officers as to key targets (people, places, priorities) in their own and other areas of the Force. The Crime Management system was a part of the Force intelligence system but it was a part which had not been accessible in the TPOC. The final upgrade was in the area of improved email access with improved attachment handling, limited write access to complement the pre-existing read-only access and more complete synchronisation between mobile and static accounts.

### *Case study 3*

The third case study was of the Force implementing the third stage of its project of introducing MICTs into the Force. This stage was the trial prior to full roll out (termed the Trial) and was designed to take the experience from the TPOC and SPOC stages and use that within a larger setting. The Trial stage took place from August 2005 to January 2006 and the original intention was that this should come to a *soft close* with equipment being left in deployment as the Trial converted to a full roll out with this deployment effectively becoming the first of five geographic roll outs of equipment across the Force. I conducted my research across the full duration of the trial. The mobile devices deployed in the trial were one hundred and twenty five XDA handheld PDAs. The XDAs were almost identical to those in the SPOC in functionality although, as a result of a version change by the manufacturer, there were minor differences in some connections, switch positioning and stylus storage.

There were three key targets which the Force ICT Department identified for the Trial. The first two related to the manner of use of the equipment in the field and the third to the back office architecture which supported the functionality. The first target was in the incorporation of some of the learning from the systems proof of concept in relation to user behaviours and device characteristics. These were, however, regarded as incremental and evolutionary changes rather than significant and fundamental changes to functionality. The second, and arguably the potentially more significant target with regard to use of the equipment in the field, came from the fact that the trial was a larger scale deployment which covered the majority of officers within a geographic division than occurred in the TPOC and SPOC stages of the project. This meant that there was some scope for changes to management and supervisory practice as a result of the widespread availability of mobile devices and mobile technologies to the front-line police officers in the division. Supervisors and managers received additional training and

officers were expected to use the technologies in their everyday work. The third target was to use the Trial to prove changes which had been, and indeed were still being, made to the back office architecture of the systems. As proof of concept (POC) stages the TPOC and SPOC had both been relatively small scale in comparison to the trial and had been intended to demonstrate functionality rather than to deliver this functionality in a robust, sustainable and cost effective way. As a result the TPOC and SPOC were resourced quite heavily in terms of support, and had compromises and work-arounds used to deliver functionality to officers. This level of support, and the work-arounds used, would not be reliable, or cost effective in a larger deployment. The Force had been fully aware of this and a parallel development to the two POC stages in the Force was the development of a strategy and plan for the changes required to the back office systems. Some of the cheaper and simpler parts of this development plan had been put in place at the later stages of the SPOC. At this Trial stage, with the POC stages being seen as having delivered proof of technical ability and system use, and with the Trial being intended to segue seamlessly into a Force-wide roll out, major changes were made to back office systems architecture. These changes, which were intended to be invisible to all but the technical functions within the Force, were aimed at making the systems robust, reliable and efficient to a level which would support mobile data and technologies. Key among them was a move from a range of information gateways to a new single gateway, designed to facilitate the interrogation of back office systems by, and the rapid, secure and robust return of information to, mobile systems. This was being heavily sponsored and promoted by one of the Force's key technical partners and they provided significant resource to work with the Force on this move.

Functionality in the Trial was virtually identical, from the user perspective, although the Missing Persons reporting facility had to be temporarily withdrawn. This was due to the requirement from the Home Office that all police Forces should move to use a new form which was significantly longer and more complex than the one my case study Force had been using. This form could not easily be completed on the XDA and did not support partial completion. This did not remove access to the Missing Persons actions and tracking but did slow down initial reporting of such incidents. Email handling was improved with better attachment handling and synchronisation. It should be noted that the lack of change to functionality on the surface of the Trial was not reflected in a lack of change to back office systems.

### 3.4 PARTICIPANTS

My participants were *front line uniformed* officers consisting of police constables, PCSOs, sergeants, chief inspectors and inspectors. Overall, sixty one people in the Force participated in my research.

At the TPOC stage there were five participants whose primary role was in Road Policing and Traffic Management, they were all old-in-service and experienced in their primary role. These

participants were male and four were police constables and one was a Sergeant. All five were users of the technology. The Sergeant was an unofficial champion for the MICT being trialled and described himself as a technophile, indicating that he was very comfortable with, and enthusiastic about, technology. Three of the police constables described themselves as being comfortable with technology in their working and personal lives and one described himself as a technophobe, meaning that he had an aversion to technology; although he used technology required for his work he said he did not do so extensively in his personal life. He had a mobile phone of a basic model and although he had a computer at home he said he had hardly ever used it, preferring to get other members of the family to undertake any tasks involving computer use for him. The five participants represented the total population of officers who participated in the TPOC stage of the project.

At the SPOC stage there were twenty-five officers in the total population (i.e., those who participated in the SPOC project) whose primary roles were in Neighbourhood Patrol and/or Incident Management and Response. Twenty people participated in my research. The twenty research participants comprised:

- fifteen users (four females and eleven males) including one manager and two supervisors. Two of the females were young-in-service and two were old-in-service, and three of the males were young-in-service and eight were old-in-service.
- two supervisors, both were old-in-service and male
- one manager who was old-in-service and female
- two members of the project support personnel who were old-in-service, one of whom was male and one who was female

All participants who were old-in-service were also experienced in the roles.

At the Trial stage of the project there was a total population of 125 officers who primarily worked in neighbourhood patrol and incident management and response policing. Thirty-one of the officers participated in my research. The research participants comprised:

- twenty-three users (six females and seventeen males) including one supervisor and two managers. Of the six females, two were young-in-service and four were old-in-service. Six of the males were young-in-service and eleven were old-in-service.
- two managers, one female and one male, both were old-in-service
- one supervisor who was female and old-in-service
- two members of the project management team, one male and one female, both of whom were experienced in their roles and old-in-service
- three members of the project support team, two male (one old-in-service and experienced in the role, one experienced in the role but young-in-service) and one female, experienced in her role and old-in-service.

### *Criteria for selecting participants*

The criteria for selecting participants were firstly that they had to be users or have involvement in the use of the new MICT equipment and, secondly, they had to be available and willing to for me to observe and/or interview. As far as possible I tried to have a representative sample of age, time in service, sex and race.

### **3.5 ACCESS**

When the Force decided to undertake the project to introduce MICT, its senior ICT management, together with their key technology partner, approached PITO to inform them of their project and to offer facilities for PITO to observe and disseminate the project. PITO, which already had links with the University of Leeds, in turn approached the University with a suggestion that this could be a useful setting for research assistance and I was asked to undertake the research. The nature and scope of the research was agreed with PITO, the Force, my University PhD supervisor, and myself.

Policing, as a context, presents some significant barriers to access and three which are particularly important in this project were the requirements on the police to keep information secure and confidential, the requirement on a researcher to recognise and accommodate the fact that policing is reactive and can be dangerous, and the requirement to fit in with the officers' work patterns.

With regard to the requirement to recognise that the police deal with sensitive information, much of which has to be confidential, I already had security clearance in other Police Forces but as this does not automatically transfer between Forces, I had to go through this process again with the Force with which I was working. This meant that there was a delay between my agreeing to undertake the work and being able to work with officers. This security clearance meant that I undertook to keep any confidential or restricted information I should be given, confidential. It did, however, allow officers to show me screens and details where this was useful. I did not record any of this sensitive information and erased names and other identifying details from recordings and transcripts as soon as possible.

As a result of my previous work in police setting, I was aware that appointments could be hard to keep due to the reactive nature of officers' jobs. To that end I used a pattern of data collection (expanded on below) which involved going to a police station at the start of a shift and staying to the end of the shift. During this time I would aim to carry out observations, interviews and focus groups on an agreed schedule but in the full expectation that this might have to be changed, or even abandoned. Safety is also an issue tied in with the nature of the officers' jobs. To that end I was required to complete both University and Force procedures with regard to safety. Briefly these were that I should:

- make an ongoing risk assessment of the overall situation in which I was working and withdraw from it if I felt that it represented a danger I could not accept or mitigate, even if the Force did not require me to do so
- keep my University of Leeds supervisor informed of the nature of the situations in which I was working and the dates and times of visits
- address the issue of safety in specific situations firstly with the relevant supervisor in the Force involved in the activity I was researching, and then in instant cases with the officers involved
- comply with Force requirements with regard to the situations I could be involved in observing
- comply with reasonable instructions with regard to clothing (such as body armour )
- comply with instructions given to me by officers in the interests of safety.

I attended police stations for full shifts on either morning or evening shifts. These were typically 6.00am to 4.00 pm and 3.00pm to 11.00pm. This included an overlap between shifts for briefing and handover. I did not attend during any night shifts (10.30pm to 6.30 am) because the Force felt this could be hazardous due to the lower levels of staffing. In practical terms, officers also indicated that they would not have much time to deal with a researcher during a night shift.

I found that there was a significant difference between access being allowed by managers and access being given by officers on the ground. Nulden (2004), echoing the work of Goffmann, notes that there is a 'back stage' and a researcher needs to get police officers' trust before being given access to what he terms the *hidden transcript*. In order to practically gain access to a research setting, and be allowed backstage, at least to some extent, I found that I needed to undertake some practical steps. Firstly, I needed the on-the-ground contact to be a Sergeant or a Constable – being introduced by an Inspector or above can initially promote suspicion. Also, in practical terms it is the Sergeant or PC running a team who can facilitate access, and who will know the team well enough to identify officers who are appropriate to observe or interview. In order to do this I would usually arrange to visit the Sergeant or PC before making an arrangement to undertake a full observation. On the one occasion when I did not do this, I spent forty very cold, dark and wet minutes outside an inner city Police station at 5.30am, unable to gain physical access to the station as the public reception did not open until 9.00 am. When I did gain access (having called the FCC and found the duty Inspector, who I knew) the officers explained that they were very sorry (they weren't), had not been aware that I was visiting (they were), and all had their duties for the day and, as they were now leaving the station to undertake their duties it was not possible for me to go with any of them at this stage. This never happened when I had made direct contact with the Sergeant or PC beforehand. Secondly, I needed to be very open about my role and make this known very quickly; I spent the first part of one morning

in a Police station with officers clearly avoiding me after the briefing session at the start of the shift (where I had only been introduced as “We have a guest with us today – the gentleman at the back”, having been asked to sit at the back, and told that the officers knew about my role). When one officer asked me if I would like a coffee, ‘Sir’, I realised that they had not been briefed at all, and in conversation I explained who I was and why I was there. The relief was instant; “Is that all? We all thought you were from Professional Standards”. This, it turned out, was the Sergeant’s practical joke on the team; Professional Standards are the people who investigate complaints and the Sergeant commented that ‘instead of hanging out here everyone who could high tailed it out like a scalded cat after the briefing’. Professional Standards officers are mainly experienced officers, of about my age, and they tend to wear plainclothes as I was. Thirdly, I needed to show I was willing to keep officers hours, and contribute. So, I attended mainly for full shifts – being in the station at 5.45am showed I was really interested and not just showing up for an hour or two. It also meant that I was in the milieu for the day and picked up conversations and opportunities to talk to people about their roles and their experiences of the technologies. I also found that taking a box of chocolate biscuits to put in the area where officers made drinks and snacks went a long way to being accepted and allowed back stage. On a relatively minor, but I felt important note, I also discovered that I needed to vary dress code; senior officers at HQ got a dark suit, sober tie and white shirt, neighbourhood patrol PCs in a small station got just-above-smart-casual; enough to look smart, but not formal enough to look like someone in authority (as police officers tend to assume that anyone in a police station has the right to be there, especially if they are in a suit, and carrying a document folder and laptop bag). In the entire course of this research I was never challenged as to my identity once I had got past the initial station security processes.

### 3.6 ETHICS

Research must be conducted ethically (Bell, 2006) and when conducting my research I followed appropriate ethical procedures and conduct in line with the British Sociological Society (2002). This code, which is still the society’s most recent code, required that participants were:

- informed of the purpose and nature of the research
- assured of anonymity and confidentiality
- informed of their right to withdraw at any time
- given my contact details so that they could contact me at any point
- offered transcripts of interviews to check.

All participants were volunteers and hence there was no pressure placed on participants to participate. Because the research was carried out with a Police Force, I had to apply the following additional practices:

- At the planning stage of my research I specifically discussed issues of confidentiality with the senior officer who ran the Mobile Data Group of the Police Information Technology Organization (PITO).
- I asked the officer if I should be aware of any areas which were likely to be sensitive areas for participants in order to be able to address these appropriately.
- Prior to the start of an interview I informed participants that they could refuse to discuss any area, and that names or identifying details from any exemplars of client/subject records would be removed from notes and transcripts. In addition, I expressly asked permission to audio-record interviews, focus groups and observational data.
- The interim results and reports identifying issues of note needed to be made available to the Force.
- My supervisors and I had to sign confidentiality agreements with the Force.
- University procedures to restrict access to the thesis (if this should prove to be desirable) were identified.

To ensure I addressed all the relevant issues with officers I used a briefing sheet which is provided in Appendix 3.

In order to ensure confidentiality and anonymity I did not record officer names but did record details of rank, sex, time in service, role if appropriate and an identifier for an interviewee. So, for example, a given interview, of a female PC working in response and having over five years policing experience would be shown as PC F OIS R 1.

### 3.7 DATA COLLECTION

I used individual in-depth semi-structured interviews and focus groups (i.e. group interviews) and direct observation to collect data. The interview is “the key research tool for those who use qualitative methods” (Cassell, 2005, p. 167) and I have utilised this method to allow participants to express their views and, as I was researching their perceptions of the effects and impacts of the introduction of MICT into the Force, they needed to be able to express their views. Walsham (2006, p. 323) advises that “interviews be supplemented by other forms of field data in an interpretive study” and that direct observation is a further source. I used direct observation to: (i) gather contextual data such as the role the officers were performing, (ii) see officers using the MICT tools in their normal work environment and, to some extent, to see them, operating backstage, (iii) develop relevant questions and areas for discussions at the interviews and focus groups, and (iv) triangulate the data collected by interview and focus groups.

There were some participants that it was either not appropriate to observe (e.g., the project manager or members of the project support team) or not possible to observe (e.g., officers who



were dealing with emergency or dangerous situations, or who I could not observe due to scheduling). I conducted direct observation at both the early TPOC and SPOC stage, to acclimatise myself to the context and police setting. During these observations I was able to ask questions and discuss any information I needed as background.

In total, I conducted sixty one interviews (forty-four with operational users, eight with supervisors, managers and champions, and nine with project staff), six focus groups, and thirty observations (twenty six of officers at work, plus four observations of officer training sessions).

I conducted:

- Interviews in the station (or in the case of the project team, at the HQ buildings), typically lasting for forty to sixty minutes for each interview.
- Focus groups in the station, typically lasting between an hour and an hour and a half.
- Interviews coupled with observations when accompanying officers on their shifts whilst they undertook their daily work. Typically I would stay at a station for a shift of about eight hours and undertake two or three interviews across a day, coupled with substantial time (e.g., approximately five hours) spent with officers on patrol or on enquiries or other tasks out of the station such as bail checks.
- Observations without interviews, particularly at the start of a stage. These were typically full shift observations.

Table 3.2 below gives details of data collection methods at the TPOC, SPOC and Trial stages of the project and summarises the data collection methods used across the research as a whole.

*Table 3.2: Data collection methods at the TPOC, SPOC and Trial stages*

Stage	TPOC	SPOC	Trial	Total
<b>Data collection method</b>				
Observations of use	4	9	13	26
Observations of training		2	2	4
<b>Observations TOTAL</b>	<b>4</b>	<b>11</b>	<b>15</b>	<b>30</b>
User interviews	6 All male, OIS	15 Four female, two YIS. Eleven male, three YIS.	23 Six female, two YIS. Fourteen male, five YIS.	44
Supervisor interviews	1	2	1	4
Manager interviews		1	2	3
Champion interviews	1 Informal champion	N/a		1
Project team interviews	2		2	4
Project support interviews		2	3	5
<b>Interviews TOTAL</b>	<b>10</b>	<b>20</b>	<b>31</b>	<b>61</b>

Focus groups (start of implementation)	1 Three people, all PCs, all male, all OIS.	1 Five people, all PCs, three male, all OIS; two female, one YIS.	1 Five people, all PCs, four male, one YIS; one female, YIS.	3
Focus groups (during implementation)		1 Four people, three PCs and one Sgt; three male, all OIS, one female, OIS.		1
Focus groups (at, or near to, the end of the implementation)	1 Three people, two PCs and one Sgt. All male, all OIS.		1 Four people, three PCs and one PCSO. All male, PCSO is YIS.	2
<b>Focus groups TOTAL</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>6</b>

Key: OIS= Old in Service – greater than 5 years policing experience, YIS = Young in Service

### *TPOC stage of the project implementation*

When I started my research at the beginning of the TPOC stage of the project implementation, I undertook direct observation accompanying MICT users conducting their daily roles. At this stage of the research my observation was focused on collecting data that helped me understand the context of the work undertaken by the MICT users and become familiar with the terminology they used and the tasks they undertook.

Following the period of initial observation I used four areas of attention as themes to guide my data collection; these were: equipment and infrastructure, work practice, relationships and organizational capability. I used these broad themes in my first interviews, focus groups and observations. I used these broad areas because I wanted to open up the area giving the participants the opportunity to determine more specific areas of importance to them rather than being prescriptive. Having analysed my collected data, I further developed the four areas of attention into the following five more specific areas to use as my “interview guide” (King, 2004, p. 15) for data collection and these guided my next observations, interviews and focus groups:

1. What is the nature of the kit and what they think of the kit;
2. What they think of the infrastructure i.e. training, support and allied services;
3. Whether the new technology has changed the way they do their job and If so, how;
4. Whether using the new technology has changed relationships with the following people and if so, in what way:
  - colleagues
  - the wider team
  - supervisors / managers
  - the public as victims of crime
  - the public as perpetrators of crime
5. Their perceptions of what a device like this could provide in the future.

The first area of attention directly concerns the technology itself and is designed to explore participants' initial reactions to the technology. The second is indirectly concerned with the kit, because without the appropriate infrastructure participants may not be able to operate the kit as effectively as they could do thereby reducing the perceived effectiveness of the kit. The third area is concerned with how the kit has changed, and is changing, the job for the officers as individuals and as a group. Area four is concerned with changes to relationships. The fifth area of attention explores possibilities for change in the future; I believed this was important because it may have been the case that the technology could have a greater impact than was materialising and this is concerned with organizational capability. Although, I have categorised the areas of attention as stated above, there is interdependency amongst them and I acknowledge that some could be placed in more than one category, for example, the area of attention addressing the infrastructure (area two) could also be concerned with the relationship with the wider team and the work practice. The classification, therefore, represents the main area. I termed these areas as *areas of attention* rather than set a rigid set of questions because, in line with the view of King (2004, p. 11), I expected my participants to "actively shap[e]... the course of the interview rather than passively responding to ... pre-set questions".

#### ***SPOC stage of the project implementation***

Having analysed the findings of the TPOC stage of my research, using the four themes I had developed, I realised that I needed a broader structuring device to help me to place these findings in a wider contextual frame. After conversations with colleagues, and having reviewed literature on, and examined, Structuration Theory, Actor-Network Theory and Activity Theory I noticed, and pursued, a match between my findings and Activity Theory as a framework. This led me to realise that the key focus of my research was concerned with purposeful activity and hence I decided to use the Activity Theory framework to guide the next stages of my data collection. My decision was based on the advantages it offered me, namely that it:

- was compatible with the broad approach taken to investigating the use of the technology in the TPOC stage of project implementation and could be mapped to the seven areas of attention I developed as listed above
- provided a structure which placed purposeful activity at the centre of the study rather than placing the technology, social norms or organisational structures at the centre, and did so while encouraging a broad awareness of the cultural and historical context of the use of MICT in the police context
- provided an emphasis on the tensions and contradictions which were among my findings in the implementation of the TPOC phase

- provided an organising structure for data collection to provide insight into the overall Activity System and which incorporated the qualitative methods which I had decided to use for my data collection
- provided an emphasis on the activity system over time which reflected the duration of my research, which spanned three stages of the development of mobile ICT in the organisation.

In applying Activity Theory framework to my data collection, I was guided by the Kaptelinin and Nardi's (1999) checklist and Mwanza's and Engestrom's (2002, 2005) eight-step approach and decided to give consideration to the following:

1. characterisation of the activity system analysed – which required a judgement as to level of analysis (e.g., *policing as a whole, making a check on a motorbike MOT, or somewhere in between*)
2. the motivation for undertaking the activity
3. the component parts of the activity (i.e., subject, object ,outcome)
4. the recognition of the role of tools (e.g., physical/mental; software, data bases, radio, computer, local knowledge)
5. the recognition of the impact on, and of, the communities involved (e.g., us and them, local area, the team, the station, the division)
6. the rules and norms which condition and control the manner in which the activity is carried out (e.g., laws to enforce, warn/arrest/caution, end of shift behaviours, known problem areas/people)
7. the division of labour in the activity before and after the introduction of the technology (and developing on a trajectory) which covers officers, information intermediaries (radio room, phone a friend), supervisors and managers (formal and informal supervision and management), colleagues in teams (local and extended) and colleagues in policing (specialist teams, scientific support, custody staff, fingerprinting staff, intelligence functions). Potentially, in the longer term, the division of labour will also include others in different communities as the process of “extending the police family” continues.

Using these ideas as a basis, I focused on the following areas:

Table 3.3: Areas of attention linked to Activity Theory

Item	Prime areas of AT linkage: <i>‘Within an Activity Theory approach this is primarily concerned with.....’</i>
Overall purpose of the policing role and activity at this level of analysis - which was taken as a broad area of policing activity such	Activity system, subject-object-outcome, and

as community policing, response policing, road traffic policing within a broader system of front line operational policing.	motivation.
Views on the effectiveness and appropriateness of what officers term "the kit". This is a composite term covering the hardware, the back office systems consulted, the carrier technology and the middleware and security protocols and systems as a minimum.	Tools, and subject-object-outcome.
Views on the effectiveness of two of the key components of support for the adoption and use of the technology: Training for initial and ongoing use, Technical support for problems with kit	Tools
Relationships:  Officers in the immediate team – usually taken to cover PCs and PCSOs on the shift and the informal level of supervision / management / resource provided by Sergeants.  Officers and the wider team – usually including the radio operators and others such as SOC staff, traffic accident investigation, PNC bureau, crime recording bureau etc.  Officers and the formal supervision / management processes. Usually, excepting cases of conspicuous heroism or stupidity, limited to Sergeants and Inspectors on a day to day basis .  Officers and the public as victims of emergency / crime / anti social behaviour– coming into contact with the police only relatively rarely and doing so usually when upset and or vulnerable.  Officers and the public as perpetrators of crime or lesser anti social behaviour – coming into contact, even if unwillingly, with the police on a more or less regular basis.*	Community, Division of Labour, and Rules and Norms.
The adaptation made to ways of working to accommodate / take advantage of the affordances of the kit supplied, and the limits to this under the current context	Tools, Division of Labour and Rules and Norms.
The actual or potential changes to wider organisational capability as a result of the availability of this technology, together with appropriate business change.	Outcome and Motivation.

\* In the case of traffic officers this category is sub divided into "respectable" people and "proper criminals". Speeding and minor violations are often in the category of respectable people but some violations (lack of insurance, drink driving well beyond the technical-transgression level for example) will move such people into the proper criminal category – normally populated by people with either a history of major transgressions with regard to vehicles (repeated uninsured driving, taking and driving away for example) or people who use vehicles in the commission of other offences (drug dealing, burglary for example). Officer attitudes and approaches differ markedly between the two.

To facilitate data collection by interview around these areas, I further developed the interview guide, shown in 3.7.1 above, into the following interview guide which I used to structure the interviews in this SPOC stage of the project:

#### Equipment and infrastructure

1. Generally, do you think the XDAs have been a benefit or not?

Probe: If yes, why? If no, why not?

How do they fit into the basic work of policing for you?

2. Specifically, what do you like about the actual piece of kit itself?

Probe: Include comments about the size, weight, and battery life

3. What would make it better?

Probe: Equipment, accessories, applications

4. Are there any problems which couldn't be improved at all?

5. How good have you found the infrastructure around the equipment?

Probe: include the training, the support arrangements, the databases accessed  
which areas were particularly good?  
what could have been improved?

Work practice

6. Has the equipment changed the way you work at all?

Probe: If it has, can you give some examples of how it has changed the job and how you now work?  
Are these changes for the better or worse?

Organizational capability

7. Has having the XDA added any completely new abilities to the way you work?

If so, what are they?

8. Looking ahead a bit, what would you like to see a device like this being able to do for you:

Probe: in the next year? Why?  
five years? Why?  
sometime? Why?

Relationships

9. Has having the XDA changed your relationship with colleagues on the team?

Probe: Give examples

-With other officers and support staff such as control?

Examples?

-With supervisors? With managers?

Examples?

-With the members of the public (both as victims of crime, and people involved in it) you deal with?

Examples?

General

10. Have you any other comments about the kit as it is?

In the observations I was specifically seeking evidence of issues raised by participants in the interviews either as actions or words, for example, power failure can be observed and if an officer can make a check more quickly using MICT than they would have done using the radio the officer may comment to that effect. I particularly sought examples of:

1. use of the device e.g., reasons for use (replace existing transactions, additional transactions); ease of use (log on, access to systems, entering and reading information); problems encountered (screen size, quality, layout, log and access issues, battery life, charging, portability, security of device and information); and benefits observed (time out of station, reduce dependency on others, new capabilities).
2. activities in which the devices were used e.g., issues with regard to when it is appropriate to use the handheld and when not; what sort of systems are available and not available; systems accessed (PNC, intelligence, crime management, intranet information); and features of the equipment used (camera, phone, diary, SMS, voice recording).
3. infrastructure issues e.g., coverage, training, and support – these are partly evidenced by facility with, and knowledge of, the device together with officer comment, and by direct observation with regard to things such as lack of coverage for GPRS.
4. adaptation of practice e.g., doing the same thing but in a different way because of access to the MICT, and the differences between solo use and double crewed / group use.

5. the devices having some level of impact on relationships e.g., opportunities to interact more or less, better, faster, more informed; appropriateness of format of information; attention/inattention to people; and officer safety.
6. integration of the handheld with other tools e.g., physically (such as carrying); informationally (such as direct checks rather than radio checks); operationally (such as use in incidents / encounters).

### *Trial stage of the project implementation*

At the trial stage, I collected data using questions 1-10 listed above and the observation schedule described above because I found, from using them in the SPOC stage that they worked effectively, were valid, and gave plausible results indicating that they were reliable. While the areas of attention did not differ I was more practiced as a researcher in the context by this stage and was, therefore, able to more easily accommodate interviews with observations in the least intrusive manner I could when spending time with officers.

### **3.8 PROCEDURE**

When researching in this context there are barriers to access, as noted above, with officers being unable to guarantee to keep appointments and to be available when and where they said they would be. Most of my data was collected by spending time in the police stations and being able to go out with officers (either individually or in pairs or groups) as they went about their work. Because police officers work to shift patterns this often meant starting early ('early turn') or staying late. As noted above, I arrived at the start of a shift, having made contact (preferably face-to-face) beforehand with the Sergeant or PC running the team. I would agree an outline of the sorts of data I needed with this officer, but had to be prepared to be flexible as officers were allocated jobs with variable times needed to complete them, came in at different times for breaks, or were *pulled off* onto other duties. I also discussed arrangements such as any required clothing (e.g., body armour, fluorescent jackets, boots), my security clearance status, confidentiality, the aim of the research and the processes I would use, prior to the first day spent on site.

A typical first day at a site (once I had learned the survival rules) would last for about eight hours and involved arriving for the briefing – and trying to do so a bit early so as to be able to spend a few minutes with the Sergeant or PC supervising a team so he/she could introduce me to the first person they thought I should accompany or interview. I would attend the briefing unless there were any confidential issues to be covered (this only happened twice and both times the officers involved told me the issue involved covert operations), sit at the front so I was seen not to be making notes during the session, and make sure I was either introduced, or had the chance to say a few words myself. After the briefing I would meet the officer(s) first allocated

and make sure they had not changed arrangements. Most first visits would start with observation (which could be in a car or on foot, sometimes wearing body armour if the risk assessment so dictated) during which I would walk or ride with an officer or officers. If in a car I would make notes as we travelled, having asked permission and explained the process before we left (an example of the briefing sheet I used as a prompt is in Appendix Three), I would also use any opportunity when officers were out of the vehicle (I was sometimes asked to wait in the car while officers went in to an incident either because they were not sure about safety, or because of confidentiality and sensitivity – such as post domestic-violence visits) to talk impressions, comments and events into a voice recorder for later transcription. If walking, I had less opportunity to make written notes or voice notes and so had to try to do this on the return to the station or when officers were dealing with people during the shift. Wherever possible I would try, across such a day, to meet as many officers as I could and talk generally to them about the job, the area, the technology and the research. I would aim to stay until near the end of the shift – the last half hour or so is usually concerned with people packing up, changing, moving cars and doing last minute administration and at that stage I was in the way and did not want to be seen as a nuisance, and so either left or attempted to secure some time with the supervisor to thank him/her for the day and outline or agree the next visit. The aim of such a first day was to become acclimatised to the station, the team, the area and the ways of working. In many ways it was a very *low key* day with much time spent walking, chatting, sitting in the canteen and drinking coffee with officers. It was also a two-way exchange, with officers quizzing me about my background, the research, details of the equipment they had or were going to get, and my experiences of other Forces and settings. I also tended to get asked to *pull some strings* to get better / faster / more equipment for the team and had to explain that I was unable to do that. Undertaking the procedure described above enabled me to develop a rapport with officers and participants, exchange information about my role and their roles, and acclimatise myself to the workplace and work environments, the work undertaken by officers, and the nature of the equipment being used in the project.

On subsequent visits I ensured I had an outline of what I wanted to do on the day agreed and would arrive before the briefing and try to spend a few minutes with the supervisor to see if it was still possible. Knowing the station and the team, even if only minimally, allowed me to greet people and be more pro-active in talking to people. After the briefing I would usually try to observe an officer (or officers) in a work setting. This was often subject to negotiation with the officer(s) concerned; if they had a lot of paperwork to do, or a court appearance that would change the planned schedule. Once a suitable officer(s) were identified and had agreed to work with me we would usually leave the station; this was a combination of interview and observation in that I would have the interview schedule either to hand or in mind (depending on whether I was in a car or walking) and, in the course of the time spent with the officer(s), I



would steer the conversation round to the areas on the schedule. The natural flow of the work meant that following the interview schedule rigidly was never an option – but I had a pro forma which I would complete as the topics came up in conversation or as I observed practice. When I had the opportunity I talked observation notes into a voice recorder as well as making notes; this was more frequent when in a car than when on foot. Most officers return to the station for refreshments (referred to as *refs*) during the day and I would usually accompany them. In some stations there was a canteen and in others there was a small kitchen area and a small seating / recreation area, often referred to as a *ready room*. If I had completed the interview areas while out with the officers I would then try to move on to someone else for the period after refs, if not I would try to get some time with the officers I had been out with during their ref time in the station to fill in the gaps. This was quite an opportunistic environment with officers passing me on from situation to situation and colleague to colleague, with some ongoing negotiation on my part to try to get as wide a sample as possible and do so in the most efficient way I could. However, inevitably, such settings involved quite a lot of waiting in police stations, cars or, on one occasion, by the side of a motorway for three hours. Waiting time was not always wasted time by any means; it was often an opportunity to fill in gaps in my data collection with officers, or to clarify something from an earlier interview session; sometimes I could attach myself to someone who had not been on the original list, and I was in a position to hear a lot of casual chat about policing which helped me to get a broader picture of the officers' worlds and working lives. Once I had become familiar with the roles and the team there were opportunities to undertake interviews in the police station and when that happened I was able to work more systematically through the interview schedule. Such occasions were sometimes because an officer was on light duties (that is to say restricted to administrative work, usually at the station, after an accident or illness) and sometimes because of the timings; with forty minutes to go on a shift, or before lunch, the supervisor might ask the officer to spend that time with me rather than spending ten minutes getting ready to go out and then almost immediately coming back in again to put the clothing and equipment away again. I was also able to use the familiarity I gained with the station setting to organise focus groups on an ad hoc basis (as agreed with the Force supervisors), as well as the ones which I had planned and agreed in advance (which often suffered from people not being available at the time of the scheduled focus group). Of the six focus groups I ran in total, three were planned and run as per plan and three were planned and then re-arranged as circumstances offered an opportunity.

### **Recording data**

I mentioned above that I took notes and also audio recorded interviews and focus groups and also my observations. This was with the express agreement of the Force management and the individual participants. Where participants agreed to be taped I offered them a copy of the transcript and / or .wav file and explained that the audio recording would be destroyed once the

data had been used for the research. The advantages of audio-recording have been clearly articulated by Walsham (2006, p. 323), the key ones being that it frees the researcher to be able to “concentrate on engaging with the interviewee”, there is a “truer record of what was said compared with taking notes”, being able to “return to the transcript later for alternative forms of analysis”, and being able to pick out direct quotes from participants when writing up. Walsham (2006, p. 323) advises that the interviewee may be “less open or less truthful” when audio-taped. I also observed my participants as they undertook their work I was able to use this to cross check my findings, so that I could ensure that taping did not adversely affect the extent of openness or truthfulness. Another factor which may have influenced participants’ openness and truthfulness was the assurance of confidentiality and anonymity together with the assurances that I would keep the audio files safe and secure and would erase them when I had transcribed the data. I chose to audio-record for the advantages stated by Walsham (2006). There were times when audio-recording was not practical (e.g., when the officers were using the telephone or receiving information they needed to listen to, and this is why I utilised the dual approach to recording data. I also made notes as a back-up in case my recorder for some reason did not record the material clearly. I utilised Dragon software when transcribing the data which gave me advantages of speed and manageability in respect of storage and transcribing the data. I offered participants the opportunity to check the transcripts and to have a copy of the .wav file in respect of the individual interviews.

### 3.9 DATA ANALYSIS

My decision to locate my research in the interpretive paradigm and use a grounded theory approach affected the way I analysed the data. I have used a hermeneutic approach; the hermeneutic circle is predicated on a movement “from the whole to the part and back to the whole” (Gadamer, 1976) which is intended to “try to make sense of the whole, and the relationship between people, the organization and the information technology” (Myers, 1997). I analysed the data with the help of a computer programme, Atlas.ti. The package can “accomplish the tasks associated with any systematic approach to “soft” data which cannot be analysed by formal statistical approaches in meaningful ways” (Atlas, 2000). Atlas-ti software uses techniques and approaches of grounded theory and takes a *hermeneutic unit* of text or graphic resources as its base. My resources are in the form of Word documents transcribed from the interviews with officers and my records of observations. When analysing the data, I used line-by-line analysis (Strauss and Corbin, 1998) to identify what Atlas-ti terms quotations (i.e. pieces of verbatim text) which I wanted to use as pieces of data and then I allocated codes to them. Open, axial and selective coding is central to using a grounded theory approach. Strauss and Corbin (1998, p. 102) explain that:

*“Broadly speaking, during open coding, data are broken down into discrete parts, closely examines, and compared for similarities and differences. Events, happenings, objects, and actions/interactions that are found to be conceptually similar in nature or related in meaning are grouped under more abstract concepts termed ‘categories’.”*

They refer to axial and selective coding as “later analytical steps” (p.102) in which “data are reassembled through statements about the nature of the relationships among the various categories and their subcategories” (p. 103) and explain that the “statements of relationships are commonly referred to as “hypotheses” and that “the theoretical structure that ensues enables us to form new explanations about the nature of the phenomena” (p. 103).

The codes built up into coherent categories for analysis. This process was iterative and, as I formed new codes and categories I went back through the data refining my coding structures as necessary. This process of axial coding allowed me to build up categories and sub categories in the data analysed and to identify areas where further information and data are required to further develop my understanding of the phenomenon. The process is, therefore, one where the “two analytical techniques of theoretical sampling and constant comparison” (Hughes and Howcroft, 2000, p. 187) are the basis on which theory is built from the data collected.

When I started coding, using the data collected from the TPOC stage, I had an initial framework in mind (based on the four key areas of attention (i.e., equipment and infrastructure, work practice, relationships and organizational capability which I had taken into the study but I did not impose these on the data and was open to areas emerging from data that did not fit into the four predetermined areas. I worked through the data once I had completed the first set of observations and interviews and developed codes, mostly open coding at that stage, to reflect the areas which were evident in the documents I had assigned to Atlas-ti (i.e., the transcripts). Having done this I reviewed the areas coded and then developed themes based on these codes. These themes became areas of attention in coding later documents as they were added.

As I assigned more transcripts to Atlas-ti and analysed them I expanded the coding structure by adding new codes, and then developed the structure further using axial coding to add depth to categories and codes already determined as well as selective coding to identify (by iteratively revisiting documents) further instance of newly identified or *nuanced* codes. By a nuanced code I am referring to the situation where an idea or code is found, on later exploration, to be more complex than its original coding recognises. To take a simple example – one of the areas of attention I developed was on the issue of the equipment and, while I later combined this with infrastructure issues (to reflect the holistic manner in which users characterised the systems they were using as ‘kit’), some of the data I allocated codes to initially I later found to be more complex than my original coding recognised. For instance, I initially coded screen quality as a positive or negative perception of screen quality, but further into my research I found screen quality to comprise several factors including screen size, levels of visibility under differing conditions and appropriateness of the display for different tasks. Thus, I later developed a single coding area in multiple directions with a common link between them.

When naming the codes I used a prefix so that I could easily identify the concepts to which codes related plus any other useful information, followed by a name that captured the sense of the quotation or group of quotations. The prefixes to codes allowed them to be identified more easily than would have been the case if I had used the code-families facility within Atlas-ti.

Network diagrams allow the visual display of the data analysis and shows categories and subcategories and relationships. I formed network diagrams to assist me with the data analysis and so that I could display the results visually which I found was an asset when explaining the findings presented in Chapters four, five and six which follow. I have used four types of relationship labels in these diagrams are - *is part of*, *is associated with*, *is a*, and *contradicts*. These relationships are Atlas-ti terminology. I have used relationships to help structure my findings. for example, I have used: *is part of* to indicate that component parts are part of a larger entity (e.g., ideas are part of a sub-category, a subcategory is part of a category, a category is part of a theme); *associated with* to indicate an association between ideas; *isa* to indicate belongingness (e.g., and idea reported is an advantage, or a disadvantage); and *contradicts* to indication where ideas contradict each other.

One of the key advantages of Atlas-ti is that it allowed me to keep an audit trail of the data so that I could track which quotations were allocated to codes, categories and subcategories, which gave rigour to the processes of coding, presentation and analysis.

### 3.10 SUMMARY

In this chapter I have discussed the methodology which I used to carry out my research. I have explained that:

- My research is qualitative, based in the interpretative paradigm, and is longitudinal
- I have used a grounded theory approach, and Activity Theory as a framing tool
- My research is based on three consecutive case studies (TPOC, SPOC and Trial) and I collected data through in-depth, semi-structured interviews, focus groups and direct observation
- my participants were primarily *front line uniformed* officers consisting of police constables, PCSOs, sergeants, chief inspectors and inspectors .
- In total, sixty one people in the Force participated in my research. I also interviewed members of the project teams and management.
- I gave special attention to access and ethical issues
- I analysed my data with the help of Atlas-ti software and I used codes with prefixes to help categorise and track the data. I developed network diagrams so that I could form visual representations of the data and findings.

## Chapter Four: Technology proof of concept – findings

### 4.1 INTRODUCTION

This chapter reports the findings of the first phase of the research which took place at the technology proof of concept (TPOC) stage of the introduction of MICT to the Force. This stage was intended by the Force to prove the technical ability to get data from the back office systems on to handheld and mobile devices, to access, add to or manipulate information on handheld devices, and to return data to back office systems from mobile devices. My research focused on investigating officers' perceptions of the actual and potential impact the introduction of MICT had on the work of the officers and to understand the process by which the MICT was introduced and the impact this had on its acceptance, adoption and use. My research at this stage contributed to the following research objectives:

1. explore the nature of the MICT equipment, police officers' perceptions of the equipment and the training and support they received to facilitate their use of the equipment
2. explore police officers' perceptions of how MICT changed the way they undertook their job roles
3. explore police officers' perceptions of how MICT changed their relationships with people
4. explore police officers' perceptions of the added value the kit could give them in relation to undertaking their work roles

The objectives are concerned with my four identified areas of attention - equipment and infrastructure, work practice, relationships, and organizational capability - and I have reported the findings under these areas.

### 4.2 EQUIPMENT AND INFRASTRUCTURE

In this section I have reported findings on the nature of the technology provided to the officers and the participants' perceptions of what they termed *the kit* and the infrastructure (i.e., the training and support) provided to support their introduction.

#### 4.2.1 *The nature of the kit*

There were two sets of equipment distributed within one policing area and provided to traffic officers to be deployed in the TPOC stage of the project. The first set of kit (with two installed) was a vehicle mounted computer known as an MDT (shown in Figure 4.1 below) and the second were handheld computers, known as Personal Digital Assistants (PDAs) and handhelds, of which there were three types:

- Toshiba (shown in Figure 4.2 below)
- Panasonic - toughened Panasonic unit *Toughbook* (shown in Figure 4.3 below) and one conventional commercial Panasonic - essentially the same unit without the protective casing and *ruggedised* components.

- O2 (HTC) XDA (shown in Figure 4.4 below).

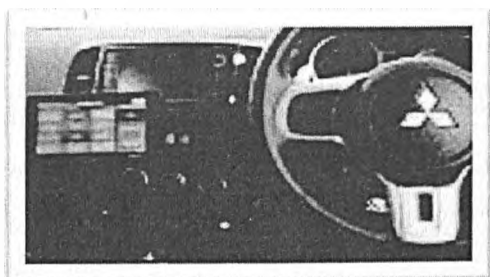


Figure 4.1: In vehicle MDT



Figure 4.2: Toshiba PDA



Figure 4.3: Panasonic Toughbook



Figure 4.4: O2 (HTC) XDA

In total there were five PDAs issued – one Toshiba, one of each of the Panasonics, and two XDAs. The five handheld computers were all based on the Windows CE operating system. Although the two sets of equipment were physically quite different the functionality, in terms of the applications provided and the information which could be obtained, was virtually identical. Both the MDTs and the PDAs are quite complex systems with a number of common component areas, for example they have:

- Hardware capable of sending, receiving, storing, processing and displaying data with a means of input and a means of output/display
- An application layer providing the interfaces required to allow users to access key systems (primarily the Police National Computer, Quick Address System, local Force intelligence system, local intranet information such as diaries, phone contacts and officers' duty rotas, and incident logs)
- A security layer controlling access to, and by, applications in line with user accreditation and Force policies
- A carrier allowing data to be transmitted to and from the remote computer with an associated security layer which authenticates the user for billing purposes as well as providing encryption for data against interception
- An interface layer which controls and manages access by the remote computer to the back end systems which contain the information required by officers
- A set of applications providing officers with access to back office systems, telephone, e-mail and to short message systems.

Thus the systems were not simple. They had a number of component areas and a number of layers which allowed them to perform the tasks designed.

#### 4.2.2 Officers' perceptions of the kit

Police officers are not technologists and so, when presented with the MICT equipment they perceived and treated them as they would any other new piece of equipment – this was evident by comments made by officers that *“it’s just another piece of kit isn’t it?”* and that *“It’s a tool that we can use just like a car or a radio or a set of handcuffs”*. Participants explained that *“kit”* is the term officers use for almost anything from a new car to a new pair of boots. Their use of the term encompasses two approaches to the MICT *kit* being discussed. Firstly, participants were evaluating it in a policing context, which was taken to mean *harsh usage*. The need for kit to be able to stand *“hard usage”* was commented on by several participants. One participant who was a senior officer explained the issue about harsh usage by saying *“You can put a police officer in an empty room for an hour with two ball bearings and at the end of the hour he’ll have lost one and bust the other”*. Secondly, and perhaps most importantly, the kit was evaluated by participants in its entirety and was not disaggregated as matter of course, thus it either worked as an entirety, or it did not. This meant that dissatisfaction, or satisfaction, was directed at *the kit* as a whole. This was evident by users who did not routinely distinguish between poor interface design, low network speed, cumbersome security protocols or issues of hardware design but simply made a judgement that it is a *“good piece of kit”* or *“not a good piece of kit”*. The judgement was sometimes qualified by comments that it would be better *“if it was faster”* or *“if the screen was a bit bigger”* or *“if the battery life was a bit better”*. Nonetheless, participants made the judgement of its overall use on the system as an entirety, as a piece of kit.

When encouraged to disaggregate the kit and comment on specific aspects of the kit, officers raised a range of issues which I categorised into four areas – Positive aspects of the kit, Limitations of the kit, Me-factor, and Human-computer interface as shown in Figure 4.5 below.

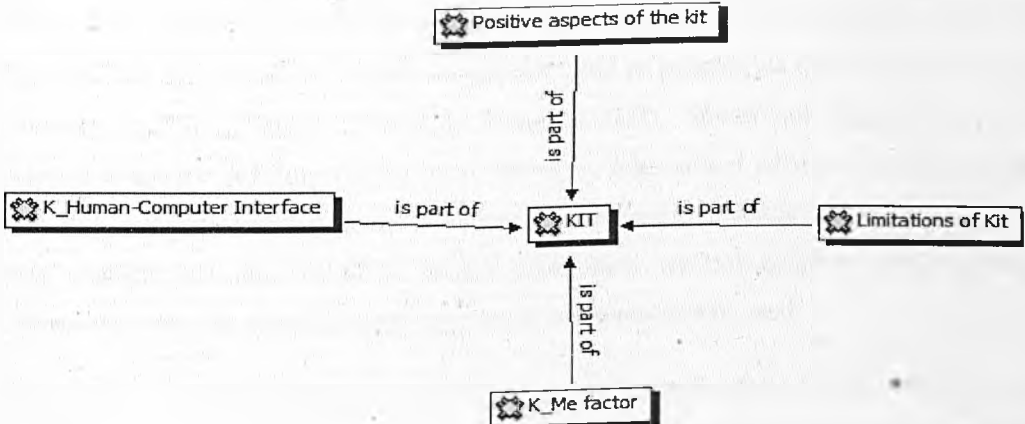


Figure 4.5: Officers' perceptions of the kit – Overview (TPOC)

As can be seen in Figure 4.5 above, the areas the police officers mentioned when asked about the kit were what they perceived as the positive and negative aspects of the kit, and these comments formed the vast majority of the comments made. There were also, however, a few officers who indicated that these limitations and positive factors affected their use and, in turn, their expectations of the kit (what I have termed *Me Factors*). A few officers also mentioned factors relating to the detail of the human-computer interface.

### Positive aspects of the kit

There were many comments made about positive aspects of the kit from which I formed categories. A summary of how I categorised responses is shown below in Figure 4.6.

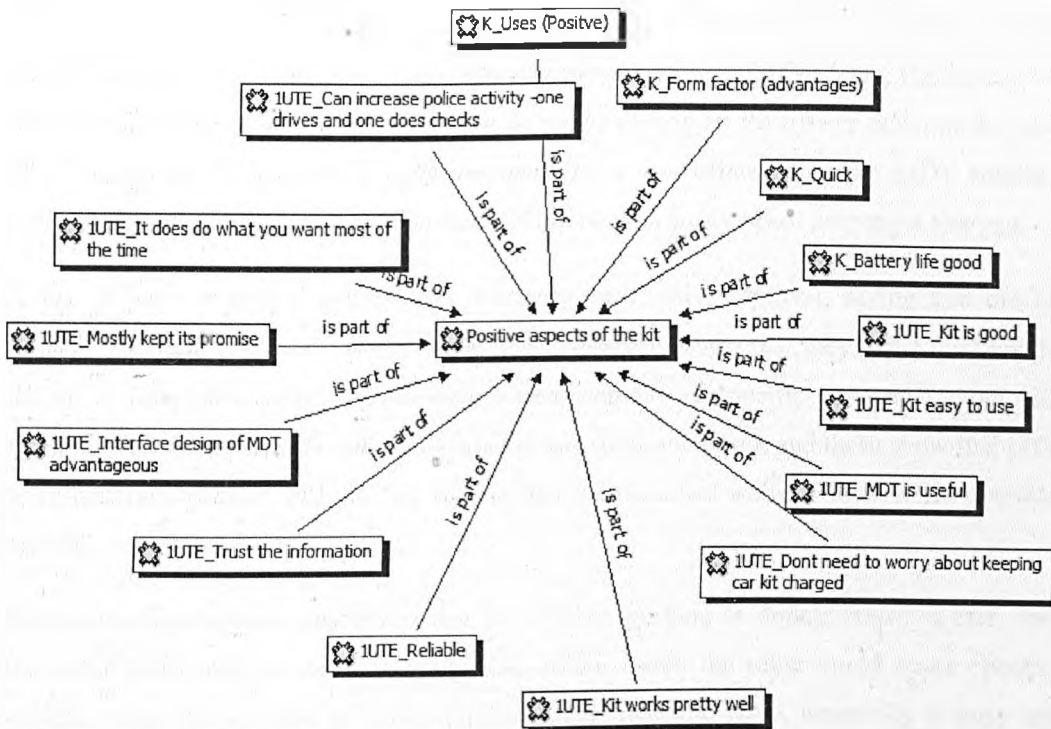


Figure 4.6: Positive aspects of the kit (TPOC)

The most frequently mentioned positive aspect of the kit was in terms of the uses of the kit, i.e., what users could do with the kit, and I categorised them as *Uses (Positive)*. The officers reported that they could do “checks on vehicles” and on people (via the PNC), that they could “access logs” (i.e., details of incidents being handled), “duties” of other officers, and the internal telephone directory. Effectively, therefore, when asked what they thought of the kit, they responded by outlining the tasks the kit allowed them to undertake independently, and they also characterised this ability to access information without recourse to an information intermediary such as a control room operator as being positive in itself.

The second area about which comments were frequently made, albeit a lot less than the number relating to uses of the kit operationally, was the *form factor* and I have termed this category *Form Factor (advantages)*. In particular, there were comments that the kit was “light” and



"not too bulky", the size was "fine" and the kit was "robust". The fact that the MDT had a touch screen was positive. These comments indicated that the small size of the handhelds and the larger screen size of the MDT were appreciated by some officers. Some officers pointed out that the MDTs were fast and PDAs, although slower than the MDTs, were also fast enough to be usable in most cases. This speed of response was seen as positive because it minimised the time spent waiting for responses both by the officers and the people with whom they were dealing.

The battery life on the PDA was mentioned, and considered good, by a few officers and I categorised comment reflecting this as *Battery life good*. Officers commented that the battery allowed the PDA to last for a shift, which is all that is needed and so this was considered to be a positive aspect of the hardware. Although only mentioned by a few officers, the battery life is important because without it the kit cannot be used and may let the officer down in the process of a transaction. There was a comment made by a few officers that the MDT simply got plugged into the car which meant that they did not need to worry about keeping it charged.

A few officers expressed general and relatively unfocussed approval, saying that the kit is "good", "easy to use" and "useful"; and these comments show that they generally thought of the kit in favourable terms. There were a small number of specific comments about the kit working well, being reliable and doing what it was supposed to do; and these show that officers were generally pleased with the kit, feeling that it functioned well for them in an operational setting.

One interesting comment made was that for officers working as double crews in cars, the kit increased police activity because while one officer drove the other could make checks on vehicles which they would probably not have made over the radio, especially at busy times, which meant that more work was done than would have been the case if the kit had not been available.

Overall, there was significant comment expressing satisfaction when officers were asked what they thought of the kit.

#### Limitations of the kit

Despite there being a good level of satisfaction expressed by officers when asked what they thought of the kit, there was also dissatisfaction expressed in the form of their perceived limitations of the kit. There were slightly fewer comments against this area, but not a significant difference. The limitations expressed are summarised in Figure 4.7 below.

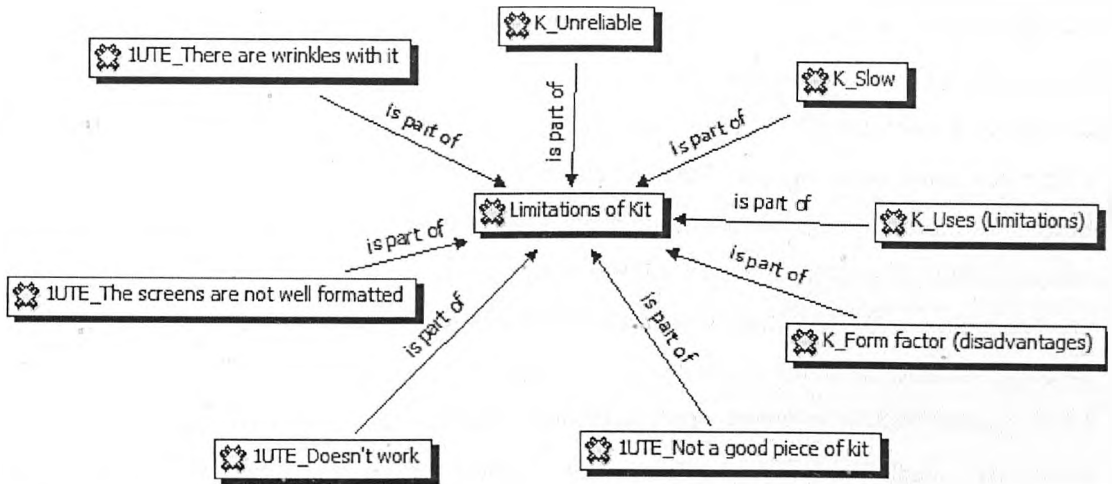


Figure 4.7: Limitations of the kit (TPOC)

The most frequently mentioned limitation was the unreliability of the kit and I categorised them as *Unreliable*. Although reliability had been mentioned as a positive aspect of the kit, it had attracted a relatively low level of comment and it was clear that not all officers found the kit to be reliable. Some officers mentioned the unreliable nature of the kit generally whilst others mentioned the specific nature of the unreliability such as the equipment “falls over”, and that it “wouldn’t erase when I was putting a misper[i.e., a missing person] in”. Unreliability due to the connectivity and poor management of the networks were also mentioned. Such a lack of reliability is of key importance because equipment needs to be reliable if it is to be relied on. One user commented that “It’s like a car, first time it lets you down you just live with it, [its] one of those things. Second time you start to worry, and if it keeps doing it you get rid.”. Although the speed of access to systems had been mentioned by a few officers as a positive aspect of the kit, it was also noted by many officers that they found the response times slow, and this was a key limitation for them. I categorised such comments as *Slow*. In some cases the handhelds were “too slow and you find yourself standing around waiting to do something on here [i.e., the handheld] that you could have done far faster by going on the radio” and so sometimes the “radio is quicker”. The handhelds were perceived as “just not fast enough” certainly for some of the time and some of the users. The comments about the speed of the kit indicate that the officers were expecting a speedy response at this stage in the process and resented having to wait for connections and responses. In my observation of the officers I saw a level of *watched kettle* in their approach to the waiting times for responses from the systems. I observed that the waiting times when officers were getting responses from the Force Control Centre over the radio were often longer than the waiting time on the PDA – but the PDA system was perceived as being slow and having excessive waiting times, in part because attention was being paid to it – i.e. like a watched kettle. Another frequently mentioned limitation was in relation to the restricted number of uses that the kit could be put to and I categorised these as *Use (Limitations)*. Firstly, this was due to software restrictions. For example, the kit could not give

warrants and bail conditions, gave limited results in terms of PNC markers (information providing detail about people on the PNC – which can include warning markers for issues such as potential violence, use of weapons or drug use) and the handhelds did not retain field data in, for example, location fields requiring re-entry of data on each occasion. Other comments which indicate the officers saw restrictions in the uses of the kit included the issue that single crewed officers in cars “*can’t check vehicles on the move*” and that you have to have two officers in the car to be able to do checks. Regarding this point an officer commented “*If you were on your own in a vehicle then really this [i.e., MDT] isn’t going to get any use at all because if you’re moving you can’t use it*”. A few officers mentioned form factor as a disadvantage and I categorized these comments as *Form factor (disadvantages)*. For example, there were comments that the PDA screens cannot always be seen, especially in bright light, and are “*a bit fiddly*” and small. In relation to the small screen it was noted that:

“*A lot of the stuff we get back is set up for a proper screen - a big screen rather than this - and so you have to scroll about ... and you have to look for information that would just jump out [of] the big screen*”. (PC M OIS 1)

Other comments about the form factor were that the hard case provided with the handheld makes the kit “*heavier and bulkier*”. There were data entry issues as officers learned to use the small virtual keyboards on the PDAs and came to terms with their limitations, and there was a perception by one officer that the kit would not be durable and that people could “*just bump you and smash it*”. Overall, there were many limitations mentioned which indicate that, for some officers, the technology as provided was fraught with difficulty.

### Me Factor

A few officers indicated that their personal situations and experience affected their use and, in turn their perceptions of, the kit and this is what I have termed *Me Factor*. This is a small category but holds some value in analysis. This category is shown in Figure 4.8 below.

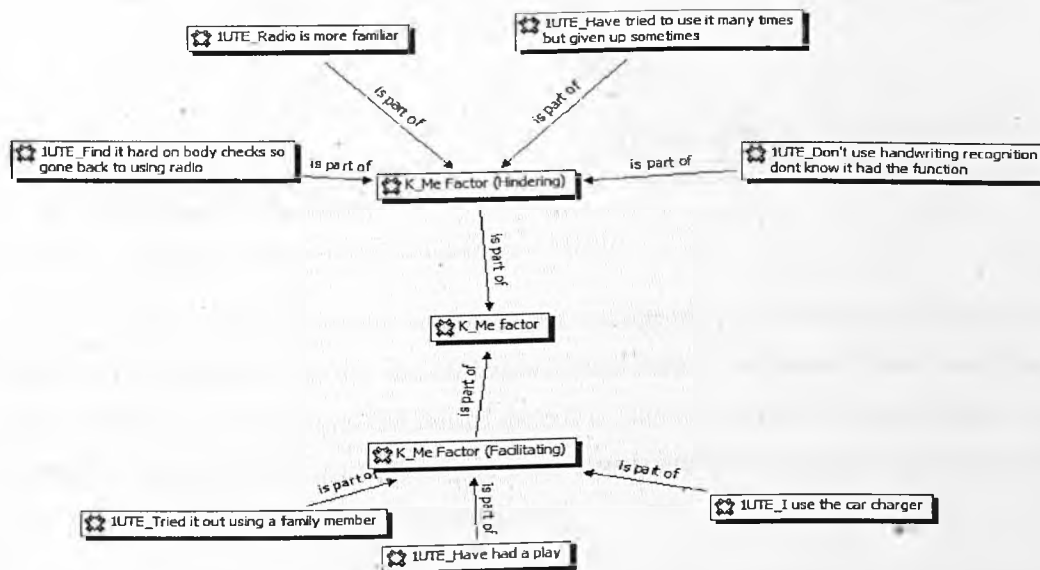


Figure 4.8: Me Factor Category (TPOC)

As can be seen in Figure 4.8 above, some of these *me factors* helped the police officers to have positive perceptions of the kit and I have categorised these as *Me Factors (Facilitating)* whilst others affected the officers' usage perceptions of the kit negatively and I have categorised these as *Me Factors (Hindering)*. For instance, one officer tried the PDA out with a family member and generally “*played*” with the kit. These actions gave him practice using it and, therefore, he was more able to use it to good effect and be predisposed to it. Another used the car charger to ensure the batteries were charged rather than simply saying that he could not use the equipment because the batteries were low. Thus, these actions were facilitative in that they enabled the officers to have positive experiences and, in turn, positive perceptions of the kit. On the other hand, there were a few officers whose actions hindered their use, and perceptions, of the kit - for instance, one gave up using the kit and returned to the familiar radio, another found the kit difficult to use and so returned to the familiar radio, and another did not use the handwriting recognition because he “*didn’t know it was there*”. Although the *Me Factor* category is small, it recognises the importance of the officers’ personal actions and inactions in determining the use and effectiveness of the kit.

### Human-Computer Interface

Figure 4.9 below displays the issues about the *Human-Computer Interface* category which I formed. It is concerned with problems with the technology because of the environment in which they was being used. The area attracted relatively low levels of comment overall.

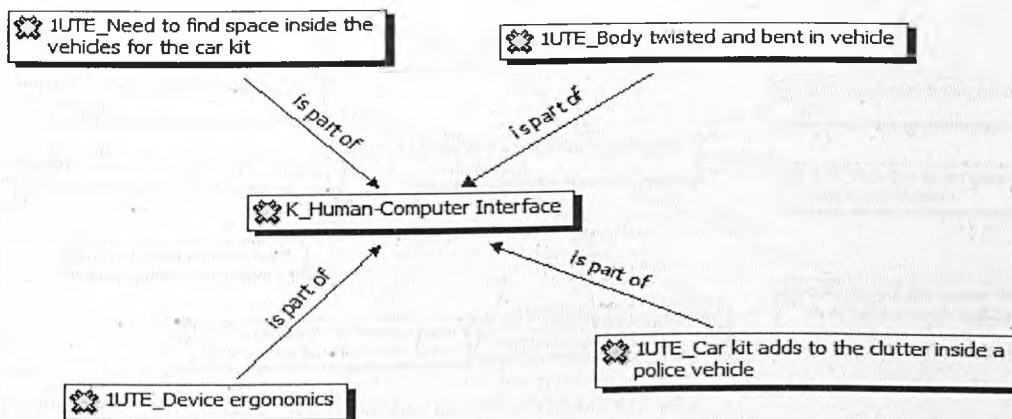


Figure 4.9: *Human-Computer Interface Category (TPOC)*

Issues related to human-computer interface were mentioned by a few officers in relation to the MDTs. The complaint was that the car hardware had been “*shoehorned*” into the car but that the ergonomics were not right, and caused them difficulty in using the kit; specifically in terms of being cramped and having to twist and bend their bodies awkwardly to access the system. This was summarised by one participant who said:

*“You are balancing it [the keyboard] on your knee and you are trying to enter information when the car is moving or when you’re cramped up and half turning round to deal with somebody in*

the back and that isn't ideal, so you need a better way of getting information into it." (PC M OIS la)

I believe this is an extremely important issue because it potentially affects officer's health. There was also an issue about the space the kit was taking up inside the car and that it "adds to the clutter inside a police vehicle" as officers pointed out that even although the cars (which were M Class Mercedes) are quite roomy by normal standards, there is a lot to carry in them and "finding a slot for these [car terminals] is a bit of challenge". During my observations I observed the issues described by the officers.

### 4.2.3 Officers' perceptions of the infrastructure

Officers' perceptions of the infrastructure in terms of the training and support they received was relatively polarised, falling into one of two categories in that they were either positive or negative about the training and the support they received. This can be seen in Figure 4.10 below by the categories *Positive about training and support infrastructure* and *Negative about training and support infrastructure*.

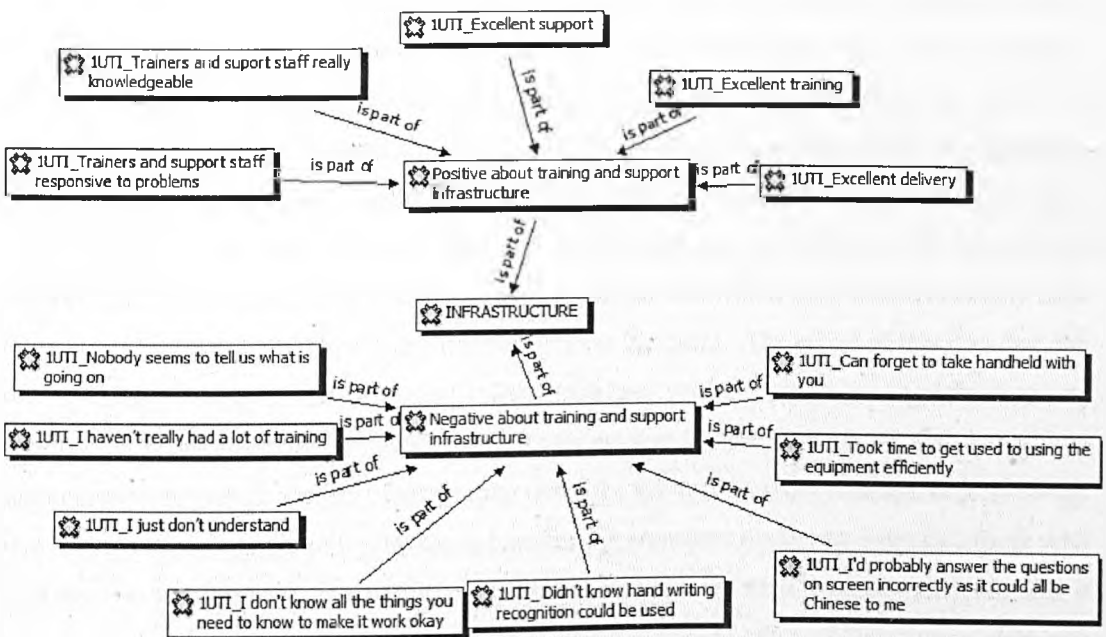


Figure 4.10: Officers' perceptions of the infrastructure (TPOC)

Those who were positive about the training and support infrastructure thought the training and support were "excellent", and that it "could not be faulted". Some said they received daily support indicating that the support was always available. It was also noted by one officer that the trainers and support staff were very knowledgeable and, in respect of this, he said they "really know their stuff". Another officer commented that the trainers and support staff were responsive to the problems experienced by the officer, even if they were unable to resolve them, and an example was given regarding a time issue. Here the officer commented "Have fed back

*the time it is taking but says it can't be speeded up*" (the "time it is taking" referred to the speed of accessing information using the kit).

Those who were negative about the training and support commented that "*nobody seems to tell us really what's going on*" indicating that those concerned felt "*left in the dark*" and "*left behind*". One officer felt that he had not "*really had a lot of training*" whilst another commented "*I don't know all of the things that you need to know*" indicating that the training received was insufficient. The insufficiency of the training was indicated by another officer who, when asked if he used the handwriting recognition, replied "*No - didn't know it was there*". There was also a lack of understanding about how to use the kit expressed and this was evident in the following comments:

*"So if there's a question on the screen I'll probably give it the wrong answer because it might as well be in Chinese a lot of the time as far as I'm concerned."* (PC M OIS 2a) "*I just don't understand*". (PC M OIS 3)

There were two interesting comments which, although they did not directly mention the infrastructure in terms of training and support, I believe are related to this. Firstly, an officer recounted his experience in starting to use the PDA on a vehicle stop at the side of the road, which was that "*It took a bit of time to get used to it because to start with we all put in the search and then stand there and wait*" but over a period of about two weeks he and others realised that, instead of standing and waiting for the information, and thinking that it is taking a long time, they could use the waiting time to walk around the car and do a visual check on the stopped car. This visual check was a normal process but one which they would normally have done after requesting, and receiving, information over the radio. The effect of this was that one officer commented that, once they had started to adjust working practices "*mobile data and traffic work go together like ham and eggs*". It was evident from the comments that the training did not encompass such aspects of integrating using the kit into the daily practice, or how the kit may change aspects of the job. The second interesting comment made was from an officer who said that it is easy on occasions to fall into the usual routines and then "*you can forget to take it [the kit] with you*". Given that the officer could forget to take the kit with him, it was clear that there was no process in place to remind the officers to take, and use, the kit. This is important because if officers forget the kits they cannot use them and if they do not use them they do not become proficient with them, or indeed gain the potential benefits of their use. These two comments relate to the infrastructure that is required to help the officers to integrate the kit into their daily practice.

The differences in perceptions about the training and support infrastructure could reflect the fact that not all officers received the same level of training and support or had the same starting point in terms of attitude to, and familiarity with, technology in general and ICT in particular. For example, some officers explained that they were able to attend the formal training sessions

whilst others had the training informally cascaded by their peers, some had formal support from a member of the project team who called into the station most days, whilst others could not benefit from this due to other work commitments or their shift patterns. In respect of their starting points in terms of attitude to, and familiarity with, technology some described themselves as being “pretty IT literate”, “a bit of a gadget freak” and had personal PDAs, mobile phones and high specification home computers while others said they were “pretty stone age when it comes to this sort of stuff”.

### 4.3 WORK PRACTICE

To explore police officers’ perceptions of how the technology changed the way they undertook their job roles the officers were asked whether the new technology has changed the way they do their job and, if so, how? This area of interest attracted many comments from participants and the results are summarised in Figure 4.11 below.

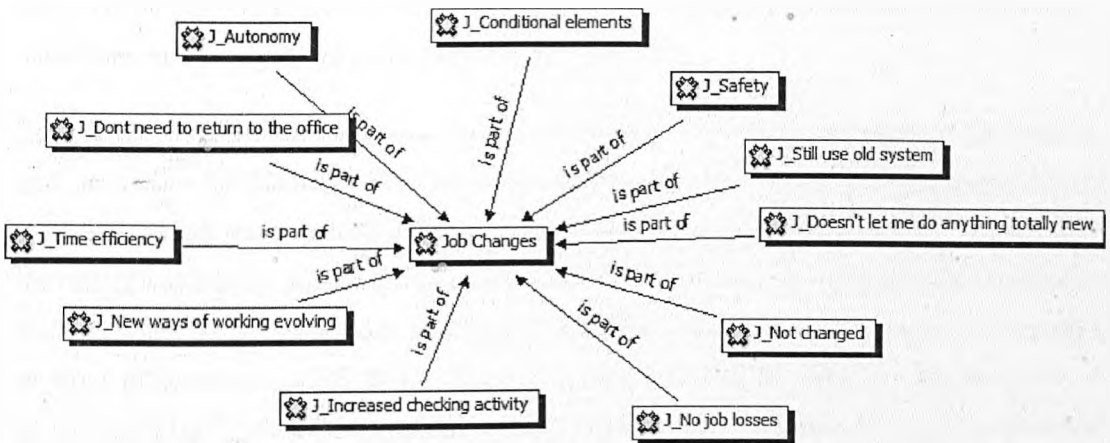


Figure 4.11: Changes to officers’ job roles (TPOC)

Firstly, there was a feeling by a few officers that the technology did not let them do anything new and did not change the job, for instance, one reported “It’s not a fundamental change in the way that you’re working” whilst another said “No, seriously it doesn’t [let us do anything new] because all of the things that we can do on here [the PDA] we can do anyway”. By these comments the officers indicated that, in their opinions, the technology did not give them new capabilities or major change to their jobs; it only allowed them to replicate functions that could already be done using the existing systems and ways of working. The limited scale and scope of the pilot was also expressly noted by one officer who commented that the technology has not changed the job because “there are only a few of these things [i.e., PDAs and MDTs]”. In other words, there are not enough of them to cause a change to the officers’ work.

Coupled with these ideas are two key categories of comments – *Conditional elements* and *Still use the old system*. The category *Conditional elements* is firstly about the idea that user frequency determines whether the technology changes the job as indicated by the following

quotation from a participant *"it has changed the job for those of us who come into contact with it a lot"*. Secondly, it is about the technology not being sufficiently embedded into the Force for it to change the officers' jobs. One officer, for instance commented that *"when they're just a part of the way that we do the job"* they will then change the job, whilst another commented that it will have changed the nature of the job *"when you are not really aware of their existence, but you just use them"*. To illustrate this, he gave the example that desktop computers are now so embedded into the routines of police work that they are not noticed:

*"I suppose it's a bit like desktop computers they just disappeared really, not that I mean they're not there because they are, that's exactly what I mean, they're there and you just use it. You don't think of it as using a computer you think of it as doing the paperwork. You think of it as checking duties, you don't think I'm going to use a computer and so really it's gone and what's left is what you can do with it."* (PC M OIS2a)

A third issue is that the use of the equipment changing the job is conditional upon the reliability of the equipment. This is a key issue because, in the words of one of the participants, *"If it really comes down to it then we have to be able to rely on the things that we use completely"* and if they cannot rely on the equipment they will not use it.

The category *Still use the old system* simply reflects that the officers still used the old systems, and the reasons for this range from avoiding using the new technology to having to use the old system because it was necessary to do so. For instance, it was necessary to use the old system if the officer was driving and was single crewed in the vehicle (e.g., *"if moving you do a check on radio"*), when the new equipment could not be used for a particular task because of limitations in terms of access to systems (e.g., *"Have to ask for warrants anyway, so often no point to using this[PDA]"*), when the equipment was not working (e.g., *"they do fall over and you need to be able to go back to the old ways of doing things"*), and for safety reasons. Using the old system for safety reasons is an interesting and important point because, as one participant stated, *"sometimes you want to keep all of your attention on the person in front of you"*, and using the kit means that the officer cannot do this.

Despite the perception from some that the technology had not really changed the job, in that they were still doing the same things, just in a different way, there were others who believed that it did and it was implicit in some of the comments in the category *Conditional elements* above that it could change the job for officers. The main change was that the officers would undertake checks themselves rather than relying on using the radio to ask others in a control centre to do this for them, and that they could access information and update information on the system themselves. This is represented on Figure 4.11 above by the category *Autonomy*. By being able to do the checks, and access and update information themselves, the police officers were given autonomy to undertake these tasks when they wanted to do them, they also had the autonomy to decide whether to do checks themselves or to use the radio to ask for them to be



done by someone else, perhaps for reasons of safety as noted above. Having this autonomy, in turn, changed the following five aspects of the job.

1. They could be more productive and this is represented in Figure 4.11 by the category *Increased checking activity*. The officers can be more productive when undertaking the checks themselves due to the pressures of the old system in terms of the officers not being able to have checks done for them because the radio was busy (e.g., "if the radio is busy then something that perhaps you wouldn't call in now you'll do on here [i.e., the kit]"). The officers can also "do more checks on the move" and the increased checking activity has "led to arrests".

2. Being able to undertake checks themselves, has led to efficiency in how officers use their time. This is represented in Figure 4.11 by the category *Time efficiency*. There were two aspects to the efficient use of time. One is concerned with officers being able to access and input the information they need themselves rather than relying on an operator in the control centre, and this is supported by the ability to have the information they need returned to them quickly. For instance, officers pointed out:

*"being able to put mispers [i.e., missing persons] on as you are going that frees up a lot of time - gets information out faster" (PCM OIS 3) "... being able to do the checks on here and get them moving without having to wait for a gap on the radio is great." (PC M OIS 4)*

The other aspect of the efficient use of time is that the officers did not need to waste time returning to the office to put information into the system so the new technology "cuts out the travelling time" and instead of travelling back to the office the officers could continue with other tasks. The ability to input Missing Persons reports was seen as a good example of this:

*"If you can put the details in on here[PDA] from the scene that saves a whole load of time because before we had them you'd drive out to the job, fill in the form, drive back to the station and then put the information from the form into the computer if there's one free. And that could take an hour or two, easy." (PC M OIS3)*

3. The idea of not having to return to the police station as an office was also mentioned as a change in the job. This gave officers increased autonomy in working but was not associated with increased productivity or time efficiency. It was simply that the place of work had altered and there was no need to return to the office as the equipment allowed more mobility in respect of where work took place.

4. Due to being able to undertake checks autonomously the officers had to find new ways of working; this is represented in Figure 4.11 by the category *New ways of work evolving*. This idea is typified by some of the officers changing their ways of working to integrate the new technology into their practice, for example, one officer reported:

*"It took a bit of time to get used to it [i.e., the kit] because to start with we all put in the search and then stand there and wait. Now we know that we're going to have to wait so we can do something else, we can go and look around the vehicle and see if there's anything obvious there,*

*just the usual visual walk round, and by the time you've done that then your result should be back.*" (PC M OIS1)

This is indicative of work practices evolving to accommodate the new technology.

5. Officers' safety, represented in Figure 4.11 by the category *Safety*, was an important issue. There were two aspects to safety – a positive and a negative one. The positive aspect was that a few officers felt safer when undertaking the checks using the car MDT because they could take the suspect out of his/her own car, which as one officer pointed out, "*converts neatly to a deadly weapon*", and into the police vehicle which is an environment "*where the only way they're getting out if they get stroppy is to come through the front, and that's not happening*". Although this practice is not reliant on the new equipment, it was the use of the new equipment that gave rise to it and which the officers felt increased their safety. The negative aspect of safety was that some officers felt they would be a target if they were using a PDA e.g., "*I don't know if I'd use one of these if I was on the beat, if I was walking around, because for one thing it makes you a bit of a target*", because some people would "*like to take one off you*". By this the officer meant that the piece of kit was desirable and would be stolen by others. As noted above officers also raised the issue of paying attention to the computer rather than to the person – in the old system officers would request information which would be provided to them by radio and that could be done without the officers looking away from the person they were dealing with. The fear here was that, "*if they [i.e., the persons the officer was dealing with] want to they could do one [run], or even have a go at you, and you'd not see it coming.*"

In summary, some participants did not perceive the equipment to fundamentally change their job roles, however, for others there were significant changes to how they functioned in their jobs. The increased checking activity represents a change in capability whilst the other changes discussed above represent changes in practice.

#### 4.4 RELATIONSHIPS

Having explored, in general terms, whether the use of the new technology had changed relationships with the people they worked with and, if so, in what way, I found that there were the following five categories of people whom the officers worked:

- immediate colleagues
- the wider team
- supervisors / managers
- the public as victims of crime
- the public as suspects (i.e., potentially perpetrators of crime).

Immediate colleagues, the wider team, and supervisors and managers are people officers worked with directly and are internal colleagues, whilst the victims of crime, suspects and the general

public are external to the Force. The findings in relation to the internal colleagues are summarised in Figure 4.12 below.

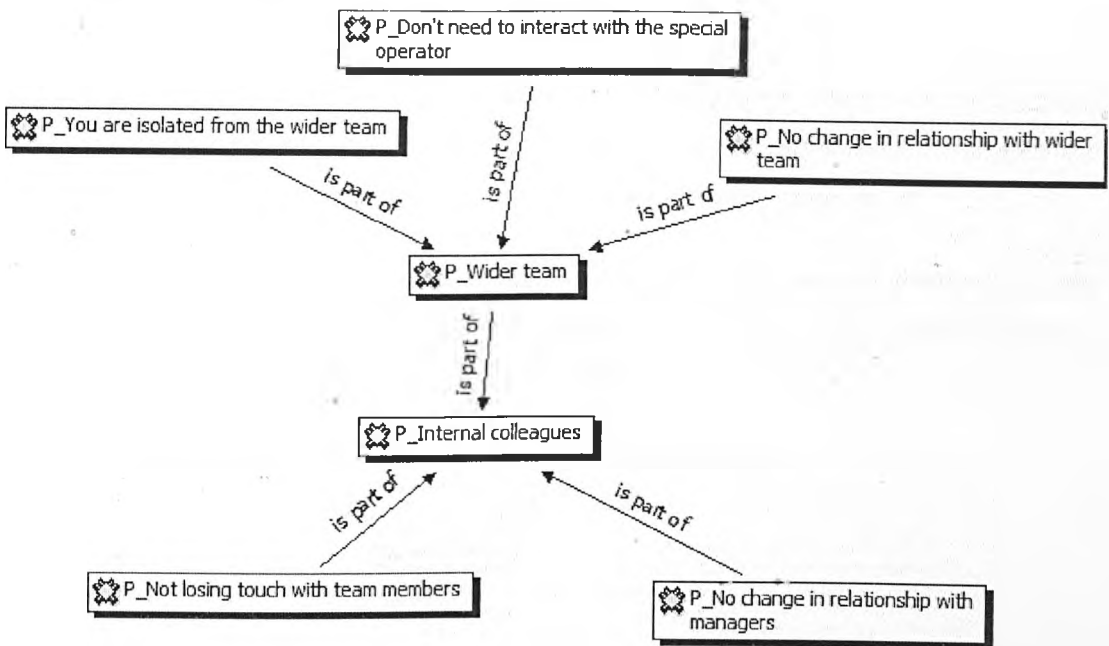


Figure 4.12: Relationships with internal colleagues (TPOC)

Figure 4.12 above illustrates that some officers felt that the technology did not change their relationship with immediate colleagues (i.e., the other officers they worked with as a team) as they were “not losing touch with the rest of the team”, had “just as much communication” with their peers, and that “operational officers when ... called to incidents ... back each other up so always come into contact with each other”. With regard to the relationship with the wider team (i.e., the communications staff referred to by officers as *communications* or *comms*) there were three important aspects mentioned. Firstly, it was generally felt that there was no change in the relationship. This was primarily because the officers still used the services provided by the wider team as they could not rely on the new equipment because “it does fall over so that means that we have to go back to doing it over the radio”, and because communications colleagues “pester us to do jobs so you can’t get away from them” this is because “all the jobs come through the radio”. Therefore, there is “no change - we still talk to them all the time”. However, it was noted that in future when the equipment was used more the officers “will be talking to the control [i.e., colleagues in the control centre] a lot less and will be doing a lot of things independently” and this would change the relationship. Secondly, because the officers could undertake checks themselves there was no need for them to work with special operators (special operators are allocated to operations which require a lot of radio transactions, so that they do not block other radio traffic). Thirdly, and this is a key safety issue, it was mentioned that the officers could feel isolated. For instance, one pointed out that if an officer makes a check on someone:

*“through control and something nasty comes back then somebody knows about it ... but if you do it on here [the kit] then it could be that something nasty comes back and nobody knows because you haven't told anybody you're doing a check”. (PC M OIS 2)*

Thus, there is the potential for no back up sent to assist the officer who is dealing with a difficult and dangerous situation since the information is not shared. There were no comments that suggested there was any change to the relationship officers had with their managers and supervisors due to being “a close team” and the managers “keep[ing] up on us”.

Figure 4.13 below summarises the findings in relation to the external relations i.e., the relationship officers have with the public, both as suspects / perpetrators, and victims of crime.

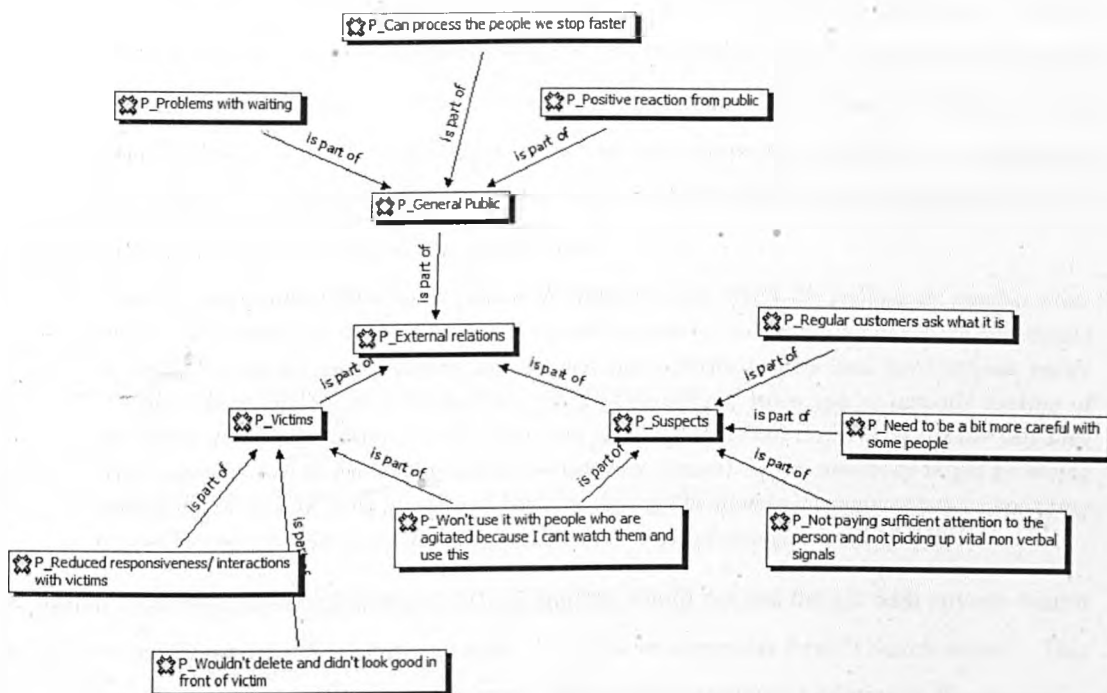


Figure 4.13 Relationships with those external to the Force (TPOC)

The officers perceived that there was a change in their relationship with the general public and that the change had both a positive and negative impact. The negative impact was that some members of the public had problems with the waiting time because the equipment was slow and this was particularly difficult when officers were dealing with people who were stressed, rowdy, irate or impatient. For instance, officers reported:

*“[It] Can take two to three minutes to do a body check [PNC check of the person(s) in the vehicle that has been stopped] ... if you're dealing with someone who is rowdy or stressed they become more so” (PC M OIS 2) “... when the whole system has failed – it brings information back but takes a long time - especially when dealing with irate people” (S M OIS 1) “[The kit is] slow on everyday policing especially when single crewed and [we] usually are ... [and as a result the] public become impatient”. (PC M OIS 2a)*

On the positive side, when the kit worked well it was noted that the public can be processed faster (e.g., “... we can get them moving faster and we're happy and they're happy and that seems like a result”). Another positive aspect was that “people who are not as agitated when in contact with the police” have generally had a positive reaction to the kit and seeing officers

using the technology, and have been "quite interested" in it. Officers, therefore, experienced both positive and negative reactions from the public depending on the type of people they came into contact with.

Officers expressed negative interactions with suspects because of the kit. Firstly, regular suspects were inquisitive and asked "what's that?" which in itself does not seem to be a negative interaction but, the officer who commented on this said "you don't tell them anything – if they don't know what it is that's good". By responding in this way, the officer is ignoring the comments and this does not help to build good relationships or encourage co-operation as the officers will ask suspects questions and expect them to co-operate by answering. Another reason why this interest could be a disadvantage is that the officer could become distracted and put himself in danger or fail to notice something important. This issue of officers being distracted and putting themselves in danger, or not noticing important signals, was specifically mentioned in relation to interacting with suspects when using the kit. Regarding this issue of active listening and attention one officer pointed out:

*"It's one thing to use them when your mob handed on an ANPR Op [automatic number plate recognition operation] for instance but it's quite another to look at a little box when you should be looking at the person you're dealing with and that is partly a safety issue but I suppose partly it's also about paying attention because you pick things up; when you're actually looking at somebody and really talking to them, then you pick stuff up about them. You see the way they react and you start to know when there are warning signals; when somebody might be hiding something, or they're lying to you and if you're paying attention to a computer you're not going to pick that up, or at least not as much, and so that's a disadvantage..." (PCM OIS 1)*

A similar view was expressed when an officer said he would not use the kit with anyone whom he knew would get agitated because, he said, "... [if] I'm using this I can't watch them". This comment applied to victims as well as suspects. None of the comments relating to the change in relationship with victims were positive. According to the officers, they had reduced responsiveness to, and reduced interactions with, victims due to using the new technology. There were two reasons for this. Firstly, instead of listening to the victims the officers are inputting information into the computer (e.g., "When they are talking to you when you are putting a misper [i.e., a missing person] in you can be filling in what the computer is asking you rather than actually listening to them"), and secondly, the officers have reduced eye contact with the victims as a result of inputting information into the computer:

*"Say in a situation with a missing kid .... they [i.e., the parent /carers] may say 'Oh, we haven't had an argument' but the looks between them will give it away that they have, but you are busy as the fields are coming up and rather than looking at them I'm looking down [at the computer]." (PC M OIS 2a)*

One officer expressed his view that by using the computer he could become distant when dealing with victims because rather than listening and talking to the victim(s) he is feeding the computer and filling in forms on the computer:

“...you can be feeding this rather than actually listening to what they are saying so you are filling in forms rather than actually listening and talking to people. The more we use this [i.e., the MICT equipment] the relationship won't actually break down but may become a bit more distant.” (PC M OIS 2)

Listening and talking to people and “getting them listening to you” was described by one officer as “a big part of this job” and it was clear that, in relation to victims of crime, the officers felt that using the equipment affected their interaction with victims negatively. One other point made by an officer was that he could not get the computer to delete and felt that “it didn't look good at all”. He saw this as a disadvantage as he experienced loss of face in front of the victim and felt that it would negatively affect his personal credibility and that of the police more generally.

Clearly, the examples given by the officers illustrate that they felt the kit did indeed change the relationship with the public, suspects and victims but in most cases they saw the change as negative.

#### 4.5 ORGANIZATIONAL CAPABILITY

In 4.3 above I discussed the finding that one of the ways the MICT changed the ways in which officers undertook their jobs was the increased checking activity and that this represents a change in capability. At this stage in the project and in my research this was the only change in organizational capability that was raised. However, I explored police officers' perceptions of what devices like the ones they were using could provide – in other words, blue skies thinking. A summary of the results are displayed in Figure 4.14 below.

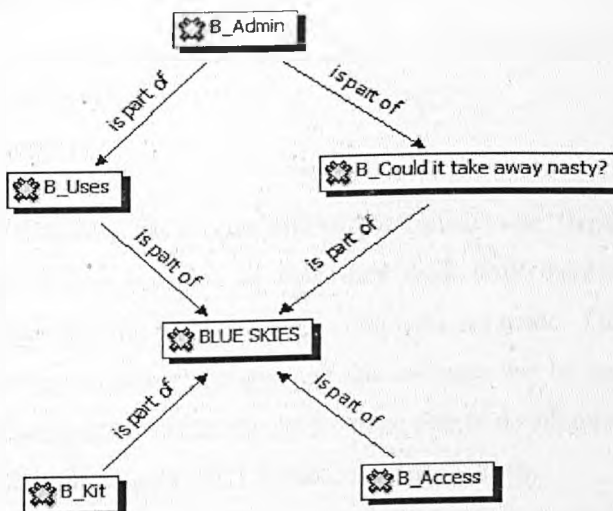


Figure 4.14: Blue skies (TPOC)

I formed four categories from the officers' responses, the largest of which was *Uses* which represents the uses they ideally wanted from a device like those they had been supplied with. The uses they mentioned were varied, but the most frequently mentioned was a camera so they

could take photographs of “*crime scenes*”, “*people who have been assaulted*” and vehicles. In relation to using a camera to take photographs of vehicles an officer explained:

“... a colleague, a few weeks ago, saw a car which shouldn't be on the road but didn't have an authorised officer to get it off the road so we had to let it go. If we could have sent a photo back we could have got it off the road ...” (S M OIS 1)

Another use of the camera mentioned was to be able to take photographs of people and to pass them onto colleagues for comments and advice because, as the officer discussing this point said, he does not “*know all the local villains*” so being able to take photographs and send them to other colleagues and get comments back is a way to share information about suspects. Other uses that officers asked for were:

- the ability to complete and remotely submit crime reports
- information on outstanding warrants and bail conditions as a part of a person check
- finger printing
- a telephone/SMS facility
- the ability to issue a producer (also known as HORT1 – the form requiring a driver or owner/keeper of a vehicle to produce documents relating to that vehicle and their use of it at a police station)
- the facility of positive identification (which is the ability to find out who a person is and what, if anything, is known about them)
- the ability to search integrated databases so that a composite result (i.e., everything we know about this person, place, incident, and/or vehicle) can be obtained rather than piecemeal searching of a range of systems
- “*everything that could be done on the computers at the station*” ( also known as ‘*your desk when you're not at your desk*’)
- voice and video recording.

The voice and video recording was for use with people known to be “*regular complainants*” so that the police officers had evidence of how they dealt with them as their evidence of maintaining appropriate policing practices when complains are made. One officer felt that the device “*should be doing everything*” for him and this indicates that he saw real potential in the device. The final use suggested was for the device to be able to do administrative tasks, and this was linked with the second category that I formed, *Take away nasty*.

The category, *Take away nasty*, is about taking away the nasty parts of the job that irritate the officers or those that they do not want to do, the most commonly mentioned of which were administrative tasks. For example, when asked what a device like this could do for them officers commented:

*"In an ideal world it would deal with the nasty bits of the job for me ... it would deal with ... the stuff that you think 'why are they paying me to do this, why am I doing this it just doesn't seem a good use of my time and my skills', and that's mostly stuff around administration and around the paperwork."* (Ch M OIS)

*"I'd also like to be able to start filling in forms because a lot of the stuff we do gets typed from writing and then it gets typed again, and somebody else wants another bit of it on another form and you end up putting all the same stuff in, time after time, maybe in a different order and maybe in different places."* (PC M OIS 3)

The officer who made the second of the above comments pointed out that one of the problems with the practice he described is that *"by the time you've finished doing that some of it gets jumbled ... [and] you make mistakes"*. It was also expressed that ideally the device *"would deal with the stuff that just soaks up time"* and would *"give me the information I need so that I don't have to go all the way back to the station [to get it]"*. By taking away nasty parts of the job, the officers would be able to use their time more effectively for front-line policing activities.

The third category I formed was *Access*. This represents officers wanting to be able to gain access more easily and have *"the device knowing who I am and allowing me fast, easy access"*, be permanently logged in (e.g., *"If it was permanently logged in that would be good"*), and being able to gain access to *"more information"*, *"[full ICAD]logs - as comms [communications] don't give vital information"*, *"more access to systems"*, *"photo banks"* and *"insurance details"* of cars. The final category I formed was *Kit* and this represents aspects of the kit that the officers would like to be improved. These include improved input and output mechanisms (e.g., by having text-to-voice and voice-to-text), the resilience and speed of the devices, the screen size being increased, and the ergonomics of the PDA used in vehicle by a specific car mounting kit.

In summary, the officers made useful suggestions to the question about what a device like the one they were using could provide, indicating that they saw value in the use of mobile technologies in front-line policing and greater potential for mobile technologies than was currently being exploited. Thus, they saw real potential benefits in terms of organizational capability.

#### 4.6 DISCUSSION

At the outset of my research in the TPOC stage of the project, I had planned to explore the introduction of MICT into the Force and its effects on the work of front-line police officers from their perspectives, with specific reference to four areas of attention – equipment and infrastructure, work practice, relationships and organizational capability. I expected the findings to address both the equipment and the context of use but was surprised to find that, while the equipment itself was crucial to the success of the system, so much of my findings centred on people and context. For instance:



- the infrastructure was about the training and support provided by people, and the way that some members of the support team had clearly made much effort to provide support which had been appreciated.
- the category *Me Factors* was about how the officers could facilitate or hinder their use of the kit.
- the relationships were a key part of the officers' working lives and those internally were of critical importance, especially for officer safety. Relationships with external people could be fraught with difficulty and *face* issues and the officers were looking to the technology to find ways of protecting themselves from wrongful accusations from the public.
- although the job was changed due to the uses the MICT could be put to, and this was predictable, I had not predicted the change to the autonomy of officers or indeed their concerns about the effect of the MICT on their own safety.

In addition to the people aspect, I was surprised that the officers did not disaggregate the kit as this is an area that, having been an outsider, is one I had not expected. One of my key learning points was that the complexity of the role and the effects of the introduction of MICT were far more complex than I had realised. As a result of my work for this Chapter, I was able to further develop my tools for data collection to reflect this complexity.

#### 4.7 SUMMARY

This Chapter reports the findings of the first stage of the implementation of MICT in the Force.

The key points are:

- This was an initial stage for the Force, designed to prove technical capability in context.
- The scale and scope of the stage were both quite small.
- The team with whom the MICT was deployed could be characterised as sympathetic in the main and contained a key champion.
- The data was collected using a set of areas of attention drawn from earlier work.
- The findings were positive on the whole with officers seeing clear potential in the systems developed.
- Officers tended to perceive the system as a whole rather than focusing on separate parts of what they termed 'the kit'
- There was a sense of trajectory in the officers perceptions of the system; they expected it to develop both technically and as a policing tool, affecting others and changing process over time.

## Chapter Five: Systems Proof of Concept – findings

### 5.1 INTRODUCTION

This chapter reports the findings of the second stage of the research which took place at the Systems Proof of Concept (SPOC) stage of the Force's project to introduce MICT into the Force. The project manager explained that the Force saw this as an opportunity, having shown during the first stage of the project, the Technology Proof of Concept (TPOC) that the basic technical problems could be overcome, to start to develop applications and systems which more effectively supported front-line officers in their day-to-day work.

My research at this stage continued to contribute to the following research objectives:

1. explore the nature of the MICT equipment, police officers' perceptions of the equipment and the training and support they received to facilitate their use of the equipment
2. explore police officers' perceptions of how MICT changed the way they undertook their job roles
3. explore police officers' perceptions of how MICT changed their relationships with people
4. explore police officers' perceptions of the added value the kit could give them in relation to undertaking their work roles

The objectives are concerned with my four identified areas of attention - equipment and infrastructure, work practice, relationships, and organizational capability and I have reported the findings under the four areas. For each area, I have firstly reported officers' perceptions in themes that I formed from analysing the data, then I have given examples of how perceptions changed over the SPOC stage as this is what I observed happening, and finally I have highlighted some particularly interesting perceptions of supervisors.

### 5.2 EQUIPMENT AND INFRASTRUCTURE

In this section I have reported findings on the nature of the technology provided to the officers and participants' perceptions of what they termed *the kit* and the infrastructure (i.e., the training and support) provided to support their introduction.

#### 5.2.1 *The nature of the kit*

At the SPOC stage of the project there were twenty-five handheld XDA2 computers (as shown in Figure 5.1 below) issued to users within a geographic area which provided a mix of policing settings and roles. Thus the scale of the SPOC stage in terms of the number of handhelds and users was larger than in the TPOC stage which deployed five handhelds and two MDTs, and

had five users. The twenty-five handheld computers were issued to neighbourhood patrol officers who undertook community beat roles and to response officers involved in reactive response to incidents such as domestic violence, nuisance youth, and burglary. The XDA2s were issued with a thin protective sleeve, however, the Force also obtained protective cases as illustrated in Figure 5.2 below. The XDA2 used Windows Mobile as shown in Figure 5.3.

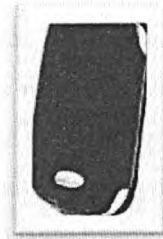


Figure 5.1: XDA2

Figure 5.2: Protective case

Figure 5.3: Windows Mobile

The XDA2 device, running over the GPRS mobile telephony system, had a higher physical specification than those operated during the TPOC in that their processor speed was faster, they had greater virtual memory and the capacity to run on the higher bandwidth GPRS system. The quality of the screen was also improved in terms of overall resolution although it was slightly smaller than the largest of the screens in use during the TPOC. The PDAs were issued with a hard and a soft case, a spare battery, a spare stylus and both in-car and mains chargers. The PDAs were running Windows Mobile which was an evolution of the *Windows CE* package which had run on the handheld devices used in the TPOC stage. This was not greatly different in a look and feel or in technical characteristics than the *Windows CE* as far as the users were concerned. Windows Mobile did present some technical challenges for the project team and these manifested themselves in some drops in quality of service – which in turn negatively affected users' perceptions. The PDAs offered a range of applications and functions, similar in the main to those which had been offered during the TPOC stage. These were a mobile telephony and short message service that allows messages to be both sent and received. In addition, the system allowed access to:

- both person and vehicle checks on the police national computer (PNC)
- the Quick Address system (QAS), drawing on the Voters' Roll
- the Force intelligence system
- the Force's crime management tasks system including target profiles and tasking
- the Force missing from homes application
- mobile telephony and short message service - send and receive

- e-mail (read only initially, with limited reply and attachment handling introduced)
- camera (after the initial stage of the SPOC, and on a trial basis with no evidential use).

### 5.2.2 Officers' perceptions of the kit

Officers referred to the PDA as "kit" and tended to judge the system and unless encouraged to, they generally did not disaggregate the kit. This does not mean they were completely unaware of the systems which were involved in making the device in their hands work – rather they concentrated on the overall efficacy of the system as symbolised by the PDA. The fact that the system did, or did not, perform was what was important and while officers were perfectly well aware that certain problems were not the fault of PDAs themselves, their irritation when they could not access information was centred firmly on the PDAs. So, carrier problems such as *blackspots*, back office problems such as a failure of the PNC (not an uncommon event but one which officers were, by and large, shielded from prior to having the PDAs) or failures in local back office systems such as server crashes, would all result in officers looking at the PDA with a degree of reproach or irritation (e.g., "This is rubbish ... it doesn't work when you need it to").

To encourage users to disaggregate the kit, I sought their perceptions on four main aspects of the kit: (i) hardware and physical, (ii) carrier, (iii) applications, and (iv) systems. The findings in respect of these are as follows, together with additional points raised by users which I have discussed under the heading *Miscellaneous Issues*.

#### Hardware and physical issues

I developed two network diagrams (shown in Figures 5.4 and 5.5 below) to represent the findings in relation to the overall theme of hardware and physical issues; the first deals with negative aspects and the second deals with negative aspects.

*Negative aspects:* Users identified key issues which they regarded as negative across the SPOC stage as summarised in Figure 5.4 below.

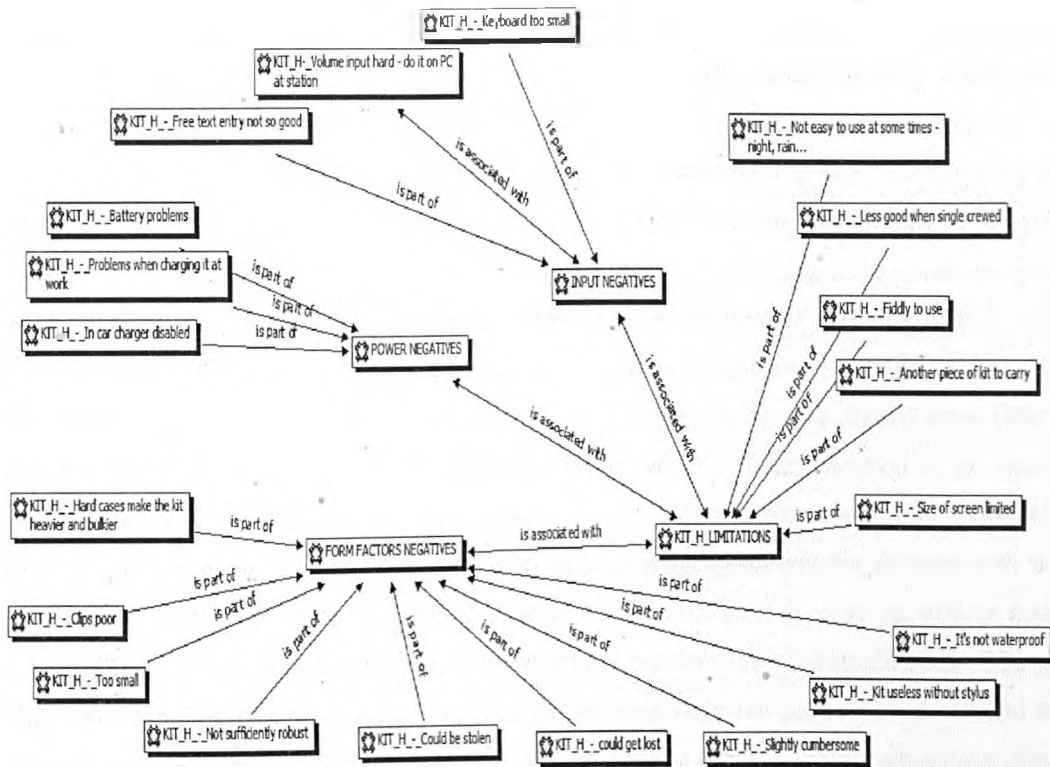


Figure 5.4: Hardware and physical issues– negative aspects (SPOC)

The first set of areas and comments deal with problems relating to input and I have categorised these as *Input negatives*. The devices are portable and so, inevitably, there is a tension between portability and functionality. The devices were equipped with a small virtual keyboard and handwriting recognition. Officers commented on the difficulty of using the virtual keyboard for data entry although it was mainly acknowledged that short data entry was quite feasible. The comment was made that anything other than relatively short data entry would probably be far more effectively done on a full-size keyboard at the police station. A second broad area of criticism centred on the overall form factors of the devices and I have categorised these as *Form Factors Negatives*. Officers felt that, because of the portability of the devices, there was a risk the devices could get lost or be stolen. They also commented that the device did not feel particularly robust, was certainly not waterproof, and could be seen as slightly cumbersome. The issue of the device being cumbersome was related to general dissatisfaction with the cases provided with the devices which did not clip effectively onto the users' utility belts and which were felt to be unwieldy in use. Although officers were issued with two cases, they felt that neither was particularly good for their purposes believing that the soft case offered inadequate protection and the hard case made the device heavier and bulkier. A minor irritant for officers, particularly at the start of the SPOC was the loss of the stylus supplied with the devices. The stylus, although relatively inexpensive, could be lost easily and without it the device can be rendered temporarily almost useless unless the officer improvises. This improvisation normally involved the use of a ballpoint pen which, in turn, meant that the screen on the device could be damaged and become stained. Another area of criticism centred on power for the devices and I

have categorised these as *Power Negatives*. Although a fully charged battery would last a shift, many of the officers discovered that anything less than a fully charged battery would almost certainly not last a full shift. This meant that officers needed both the facility to charge their devices and a level of discipline in doing so. In-car power sockets in police vehicles were often disabled because the load on the electrical systems of the vehicles was already high and the police fleet-maintenance had tried to discourage officers from plugging in personal equipment. As a result the in-car chargers which were supplied were only usable in approximately half of the police vehicles allocated to the group of officers participating in the SPOC. Officers also discovered that, as they used the devices more the battery life became shorter over time. In addition to the above, there were miscellaneous issues which officers mentioned, for instance, they commented that the device was harder to use under some conditions than others, particularly at night and in rain. Rain presented a particular problem for devices with touch sensitive screens because the equipment reacted to the rain as if it were an officer making multiple simultaneous screen taps, and this caused the system to react unpredictably. The users also noted that for officers driving vehicles, the devices were not particularly useful to them when they were on their own; for example, if they wished to check a vehicle which was moving then they had a choice of either stopping and making the check (while the vehicle disappears) or following the vehicle and making a check over the radio. Although most users commented positively about the screen, there were some isolated comments about the screen size being limited. This, again, is an almost inevitable part of the compromise between portability and functionality which most users felt the device managed quite well.

*Positive aspects:*

Users identified a number of key issues which they regarded as positive across the SPOC stage as summarised in Figure 5.5 below.

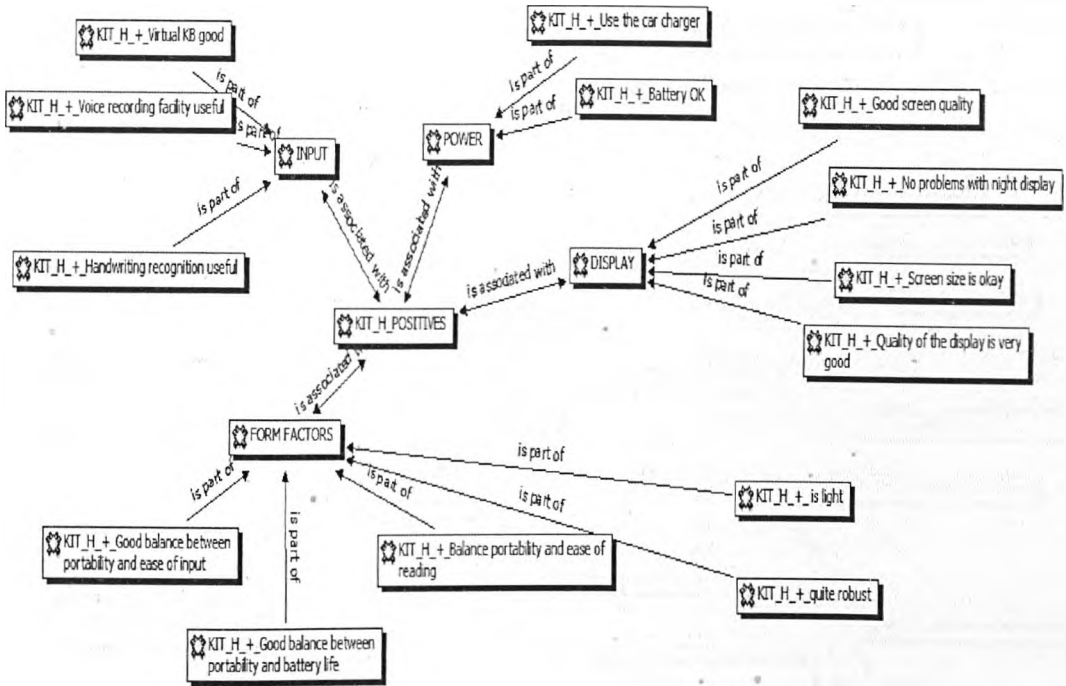


Figure 5.5: Hardware and physical issues – positive aspects (SPOC)

Although the display had attracted some minor criticism, it received much praise with officers commenting that the screen size was adequate, characterising the quality of the display as very good and noting how effective it was when used at night. I have categorised these comments as *Display*. Likewise, although issues with regard to power and charging were raised as criticisms, there were also positive comments made and I have categorised these as *Power*. Officers commented positively that the battery was adequate for a shift and the in-car charger could be used to top up the charge during the day. These positive comments were, however, significantly outnumbered by the negatives. Officers also commented positively on aspects that I have categorised as *Input*, such as the use of the virtual keyboard for short data entry, the handwriting recognition facility which a minority of officers had started to use, and the potential for being able to use voice recording as a means of data input. With regard to the overall form factors of the device most users commented that the device was a good balance between portability, ease of input, battery life and screen quality, and I categorised these as *Form Factors*.

Carrier and systems issues

Users commented on a range of issues which I termed as carrier and systems issues. A summary of how I categorise the data relating to these issues can be seen in Figure 5.6 below.

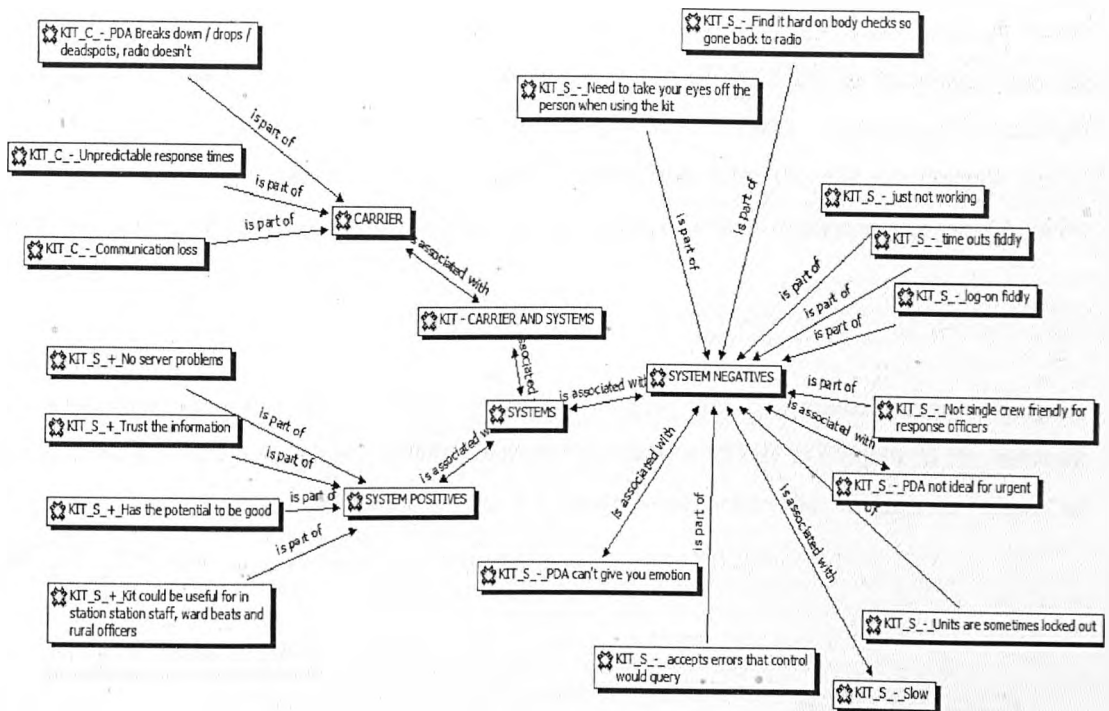


Figure 5.6: Carrier and systems issues (SPOC)

Carrier issues were characterised almost completely negatively and this is shown in Figure 5.6 above by the category *System Negatives*. It is possible that users only noticed the carrier system when it failed and this is why the comments were mostly negative. Users discovered that there were some *dead spots* without coverage and that, at times, response rates were slow. The coverage issue is an almost inevitable consequence of using a commercial carrier system as opposed to the dedicated police radio communications system. Unfortunately, the dedicated police/public safety system has relatively low data rates and is incompatible with the handheld devices. With regard to the overall usability of the system, users made a range of both positive and negative points with rather more negatives than positives. As positive points the users noted overwhelmingly the potential of the devices to contribute to policing and they identified a number of areas such as ward beats and rural officers where they could see the equipment being particularly effective. They noted that they trusted the information returned to them and that the server problems which had initially reduced the level of acceptance and usage had not recurred regularly, or as severely. There were, however, also a range of negative areas raised. One of the key ones was with regard to safety where officers commented that having to use a handheld device while doing a person check with some people is not safe. There are some people who you want to keep your eyes on all the time. There were a number of comments about logons and timeouts making the device “fiddly ‘to use”. The inability of single crewed officers to use the devices while driving was also noted and the comment was made that this means that very often the device is not ideal for urgent use. Two points were made with regard to the current relationship with control and, while these are also noted in the section on relationships, they are also apposite here. The first is that handheld device is unable to relay emotion; when an officer



speaks to somebody in the control room that control room operator will have spoken to the member of the public who has reported, or been the victim of, the crime or incident. They are able to gauge that person's emotional state and relay it to the officer. The second is that data entry onto a handheld device can sometimes, particularly with the use of a small virtual keyboard under adverse conditions, produce errors which a control room operator would query. The device does not.

### Applications issues

With regard to the applications, officers generally indicated that the applications provided gave them a level of advantage and provided a useful resource and this is evident in the network diagram I have presented below in Figure 5.7 which summarises the findings in respect of application issues.

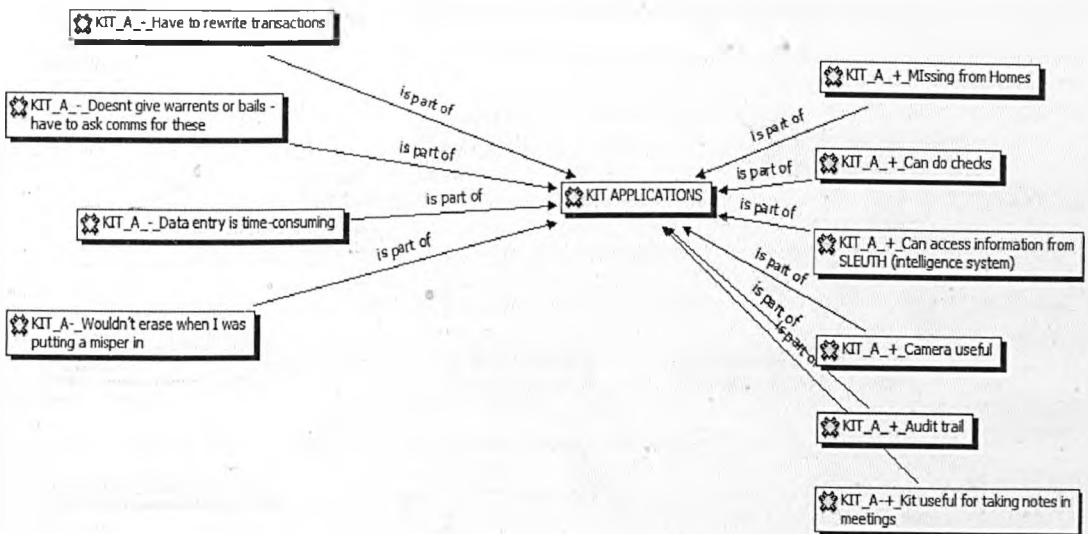


Figure 5.7: Applications issues (SPOC)

The ability to access information systems remotely, and to complete processes such as missing persons reports, were seen as overwhelmingly positive. The ability to use the camera in order to record people places and scenes was seen as a powerful potential tool, and officers also noted that the devices could be used outside of front-line settings; for example to take notes in meetings and to manage their own calendar. They also noted that a key positive for the device is that decisions taken as a result of having carried out checks on such a handheld device provided a neat audit trail. So, even if the decision an officer takes in a particular situation turns out eventually to have been the wrong one a handheld device may well provide an audit trail to show that it was a reasonable decision given the information available to the officer. Whilst this can be done with other systems it is not as immediately accessible. The issues that users raised with regard to applications were generally concerned with the area of data entry. Users found that data entry on a handheld device is time consuming and that data has to be re-entered across

multiple forms. This has not been an issue when they were using a full-size keyboard or, indeed, when they were providing information to a control room operator to input for them. There were also some specific issues of a failure to erase data leading to an officer having wasted a considerable amount of time on data input. One negative point raised related to the general information systems in that the handheld did not return details of outstanding warrants and bail conditions. These are key pieces of information for an officer carrying out a check on an individual who is known to the police. This means that for virtually every positive search result returned on a handheld device the officer then needs to contact the control room in order to check warrants and bail conditions thus, to an extent, eliminating the advantage of being able to carry out their own checks.

### Miscellaneous issues

In addition to the above, there were some general comments from users which did not fit into the aforementioned four areas, and I have presented these in the network diagrams in Figure 5.8 below

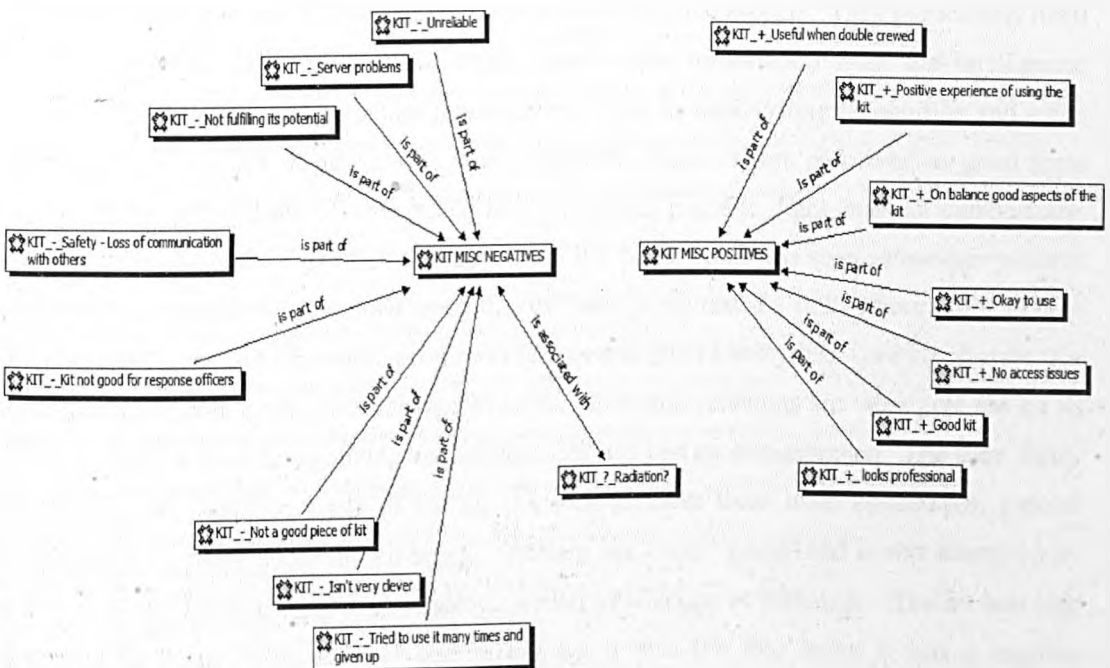


Figure 5.8: Miscellaneous issues (SPOC)

Several issues, both positive and negative, were raised which either have a level of generality which takes them out of the individual categories discussed above, or which do not neatly fit into one of the categories above. Officers commented around the unreliability and servers issues which bedevilled the start of the trial. This they felt led to the devices, initially at least, not fulfilling their potential. Safety was a major concern with the loss of communication with the control room being seen as potentially putting some officers, in some circumstances, at risk. This was part of an overall perception that the kit was not as good for response officers as it was for those officers who were allocated to neighbourhood patrol and community type policing

operations. One user raised a concern about the level of radiation which officers are exposed to as they now carry a radio, a personal mobile phone in many cases, a handheld with data communication potential and, for many officers, a town centre or neighbourhood radio system in addition. Although all of the devices have individually been regarded as safe this officer had a concern, which she raised with the police Federation, about the cumulative effect. Also in the negative comments were some general attitudes about the equipment not being particularly effective. On the positive side, the usefulness and positive potential of the kit were commented on by a significant number of officers including the accolade that it is "good kit". Those officers who commented also noted that this is part of a professional look, and that members of the public liked to see officers with modern technology.

### *Changing views over time*

It was clear that some officers' views on the kit changed over the period the SPOC. At the beginning of the SPOC stage, when encouraged to disaggregate the kit and comment on specific aspects of the kit, users identified several positive factors about the kit and specifically mentioned the functionality of the kit as key among the positive aspects. They particularly liked the idea of being able to undertake checks and access information from the intelligence database. They mentioned particular functions, too, such as handwriting recognition and voice recording. A key set of advantages was centred on what officers perceived as good form factors; these included the devices issued being compact, portable, light, and not cumbersome and the screen being of a good size. The battery life being good was seen as another positive factor and, in particular, it was mentioned that the battery life lasted a full 10 hour shift. These three aspects – uses and functions, good form factors and good battery life – are key factors that make the kit desirable and advantageous to users. Uses and functions are what give the kit its utility as tool for front line policing and without this it is just an encumbrance. The form factor and battery life facilitate usage of the kit. As well as these three main advantages, general comments were made about the kit being "okay to use" and "good" and it was described by one user as an "ideal piece of kit" - indicating total satisfaction at that stage. The kit was also described as being "easy to use" and in general it was felt that using it was a positive experience, and users felt that it made them "look professional". As well as positive aspects being mentioned, users expressed some areas of dissatisfaction. The most commonly mentioned negative aspect of the PDA as issued is that it is slow, and it was clear that this was seen as important because of the problems that the perceived lack of speed caused. In particular, some users mentioned that the public become "impatient" and if there was a rowdy or stressed person then they became more problematic due to the waiting time caused by the slow response. Another key issue is the limitations of the kit in terms of what it does not do. For instance, officers "can't check vehicles on move" when they are "single crewed". "Not getting warrants and bail conditions" was seen as a limitation, and it was noted that a camera

(the camera was disabled on most of the devices at the start of this stage due to a lack of a Force policy on the use of personal digital imaging – this was, itself awaiting guidance from the Association of Chief Police Officers (ACPO) would be “*useful*”. Other key factors mentioned were the unreliability of the kit and officers commented that it “*sometimes fails completely*”. Some users commented that the battery life was poor and were concerned that the kit could get lost or be stolen, indicating that they saw the kit as an additional responsibility. Additionally some users perceived there to be poor form factors, although this was primarily dissatisfaction with the hard case.

At the middle of the SPOC stage, users expressed both positive and negative perceptions of the kit at the middle of the stage. There were some positive thoughts about the kit, such as the facilities the kit offered, the balance between the portability and the ease of use of the kit, the usefulness of the kit, the good screen quality and the physical size. The quality of the camera was also commented on (this was enabled for demonstration rather than evidential purposes) and it was noted that the kit is a potentially valuable device. The findings show that the users did recognise the benefits that the kit offered together with the actual quality and form of the kit. Despite the benefits of the kit being recognised, the limitations were beginning to outweigh them. The most commonly mentioned issue was the problematic nature of carrying an extra device and, in particular, the case. The hard case was seen as cumbersome and the soft pouch was seen as lacking in robustness which led users to worry about the kit being damaged. The second most commonly mentioned problem was that the kit was fiddly to use. So whilst the balance of portability and ease of use was recognised as a strength, it is clear that some of the users did not find the kit easy to use on the front line of operational policing. Examples of other problematic areas mentioned include the limited facilities of the kit, poor battery life (which at the start of the stage had been seen as at least acceptable) and that checks cannot be made (by single crewed officers) when driving. Another point made, which though seemingly trivial had an impact is that the stylus could get lost and if this happened it would render the kit (temporarily) useless.

By the end of the SPOC stage a few strengths were still mentioned by officers both as individuals and as focus group members. But, overall, there were fewer strengths mentioned than were mentioned at the beginning and the middle of the SPOC stage. Some officers expressed views that form factors, in terms of the size of the kit (e.g., “*I think the size is okay*”, “*no problem with the size*”), the screen size (e.g., “*screen size is okay*”) and quality of display which was described as “*very good*”, were strengths. Battery life was recognised by some as non-problematic but this was countered by comments that the officers need to “*charge it at home*” because if charged at work “*you put it in the charger and somebody will turn it off or you'll come back and somebody's taken it off the charger and then it isn't charged*”. Therefore, to be able to have a properly charged device there needed to be some personal responsibility and

equipment at home. It was recognised that the kit has potential to be good, which although it is a strength, also indicates that it is not good enough - yet. Other strengths mentioned were that the quality of photographs was good and that there were no server problems after the initial issues which had damaged the reputation of the kit. One could have expected more strengths to be acknowledged but perhaps, at this stage, positive factors in terms of the uses and functions that had been previously mentioned as positive perceptions of the kit had become expected, which may indicate that the kit had become, or was becoming, embedded into the culture. The limitations and problems were, at this stage, reinforcements of issues which had been raised earlier in the stage. Form-factor limitations were the most frequently mentioned problems with the kit at this stage. Specific criticisms of the protective case supplied were that it was not robust and the clips did not fit onto the officers' utility belts; it was suggested that, if the kit was more robust, the case could be dispensed with. It was commented that the kit was "not waterproof", "too small", and "slightly cumbersome" and that the keyboard was "too small". The small keyboard was particularly problematic and was a barrier to using the device as one officer explained:

*"... and the keyboard particularly is too small if you are out there and try to do something on that keyboard and it's raining and three in the morning then it just goes back in the pocket and you go on the radio". (PC M YIS R 7)*

The next most frequently mentioned aspects were problems with systems and operations. The most commonly mentioned aspect of this was that there was a communications loss, firstly with communications personnel and this left the officers with safety worries about who would know if they were dealing with problematic and dangerous people. The second was the loss of eye contact with suspects as officers take their eyes off the suspects to enter data into the kit. There was a fear that information could be missed. For example, it was mentioned that a suspect could hide, or even dispose of, items they do not want the officer to see or potentially even assault the officer, as mentioned above. In respect of this an officer explained:

*"... when you are conducting a check and looking at this screen you are taking your eyes away from the person you're doing the check with, and coppers do not like taking their eyes off the person they are checking; for one people stuff things down their pants or drop them down a grate or, two, people run away or, three, they hit you over the head - so bobbies basically do not like taking their eyes off people they are checking ..."(PCM YIS N 5)*

When speaking into the radio an officer "can keep eye contact" and not being able to do this when using the kit was described as "an issue" as it stopped the officer being effective in the work role. Other operational and systems issues were the system not working every time it was used, problems with charging the device at work, and not being able to use the device when single crewed as an officer could not drive and use the kit at the same time. The issue of the (fear of) kit, or elements of it, being stolen continued to be problematic and there was one officer who reported that his stylus was stolen repeatedly. Battery problems were the next most frequently mentioned problem as they only "Sometimes" lasted a shift but "on occasions" did not. Battery life was described as "a problem" and not "long enough by far". Finally there

were comments about the kit "*not fulfilling its potential*", "*not being that clever*", and officers having to "*rewrite transactions*". The need to rewrite transactions is highly significant as officers said they "*seem to have to redo / rewrite transactions a lot and very often you don't have time to keep redoing it*" which means that, apart from the irritation that this can cause, officers are wasting valuable policing time. Overall, there was much dissatisfaction expressed about the kit itself, and the way it fitted in to operations and systems, indicating that there was still much to be done to improve both the technology and the systems.

### *Supervisors' views*

Supervisors were positive about the concept of mobile data as well as the actual use of the XDAs throughout the SPOC and regarded the units as being a good compromise between portability and functionality. The perception was, however, that some users had unrealistic expectations of the ability of the units to continue to function without the basic rules being followed (e.g., "*there are some problems with people taking care of them; this one on my desk here, that is rundown, and that's because somebody didn't take care to charge it up*"). Supervisors were keen to see use made of the camera but recognized that there are larger management issues behind the use of the cameras in operational situations, for example:

*"We're looking at the camera angle and that will be good, but it's issues of the management of the photographs, and if it's evidence it's about disclosure issues, and the background issues in the management of all of that will determine that use for it". (S F OIS 2)*

They were also keen to see the introduction of the MDTs alongside the handheld units in the larger trial and one commented that:

*"We get a lot of complaints [where people have said that they] ... rang in, and a police car was going past, and they didn't stop ... [and they ask] Why? ... and that's because the car didn't know; and if we can do it on the mobile data, and they can get logs into the car then maybe we can start to tackle that". (Mgr F OIS 3)*

This illustrates that the supervisors were keen to support the introduction of MICT and could see the advantages of the kit.

### **5.2.3 Officers' perceptions of the infrastructure**

Training attracted a considerable level of comment from the users and their attitudes to it changed quite markedly across the SPOC stage. The following is an account of the users' perceptions of the training and support they received, and issues about the lack of communication.

## Training

Officers identified four key areas where they felt that the training provided was less than effective – materials, delivery, timing and content – as summarised in Figure 5.9 below.

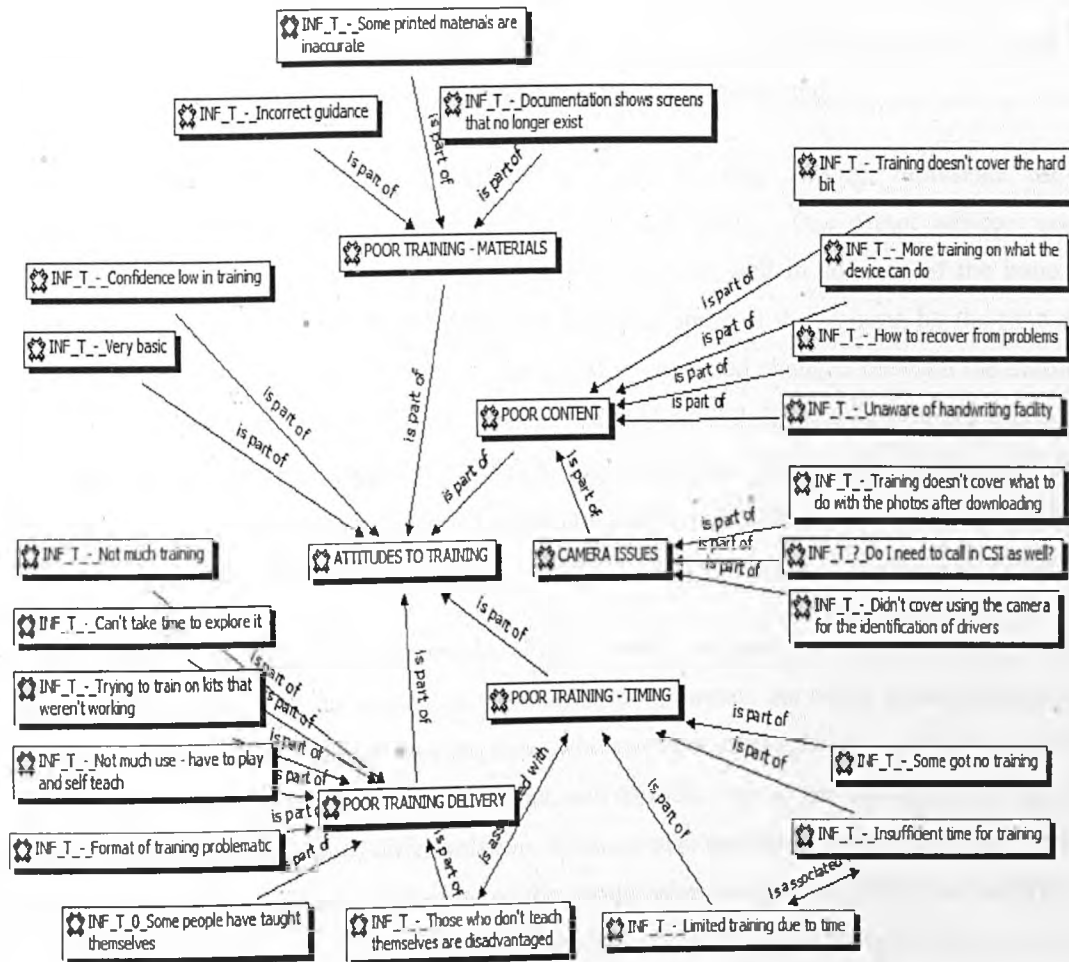


Figure 5.9: Issues perceived as reducing training effectiveness (SPOC)

The first was area, which I have categorised as *Poor Training Materials*, represents users' dissatisfaction with training materials and officers commented that the materials were often factually incorrect. This was an issue with some of the training sessions held early in the SPOC stage because changes had been made to some of the systems on the device after the training materials had been devised. The training programme had to go through an approval process in the Force and this approval process which took time and, for a short period, officers were being trained on systems which looked materially different to those in the training materials. This was later corrected.

The second area, which I have categorised as *Poor Training Delivery*, represents users' dissatisfaction the way the training had been delivered. Police officers, by the nature of their jobs, have to react to the demands placed on them and as a result it is not uncommon for a

police officer to miss training sessions there were booked into due to being called away during the course of the training, and this happened during the training in the SPOC stage. Officers also pointed out that the training failed to differentiate between those who were quite familiar and confident with information technology and those who were not. There was also one instance where the back-office systems failed during a training session and, as a result, none of the demonstrations or training exercises could be successfully completed.

The third area, which I have categorised as *Poor Training Timing*, represents users' dissatisfaction with the time at which the training took place. One factor which caused dissatisfaction was that some of the training was carried out well in advance of the issue of XDA equipment and, as a result, the users had forgotten some of the training by the time the equipment was issued and, in a few cases, the actual systems had changed between the training for, and the delivery of, live equipment. Officers also identified that training timing was *quite tight* and did not give much scope for officers to experiment and "play" with systems. Officers also identified that training was a one-off event and some commented that they would like to have had additional refresher training made available.

The fourth area, which I have categorised as *Poor Content*, includes comment which represents users' dissatisfaction with the content of the training programme. As noted above, officers felt the training failed to differentiate between those who were experienced and comfortable users of information technology and those who were not, and this led some to consider the content to be inappropriate due to the lack of differentiation. Officers also commented that the training failed to provide them with guidance on the use of the handwriting recognition facility on the XDAs, did not address the issue of how to deal with problems which they were likely to encounter, and did not give them a clear overall sense of the capabilities of the devices. Another issue on which officers commented was the failure of the training to address camera use. This was, perhaps, inevitable given that the Force had not enabled cameras at the start of the trial and only made this facility available at a later point. There would, therefore, have been little point in incorporating training on camera use into the initial training which officers undertook. Nonetheless, it was clear that some officers felt they would have liked to have been trained in this, particularly when camera use was made available for non evidential use.

Whilst users comments on the training provided were overwhelmingly negative, and were particularly so by the end of the SPOC stage, there were initial comments that training was effective, appropriate and useful and I have summarised these in Figure 5.10 below under the category *Good Training*.



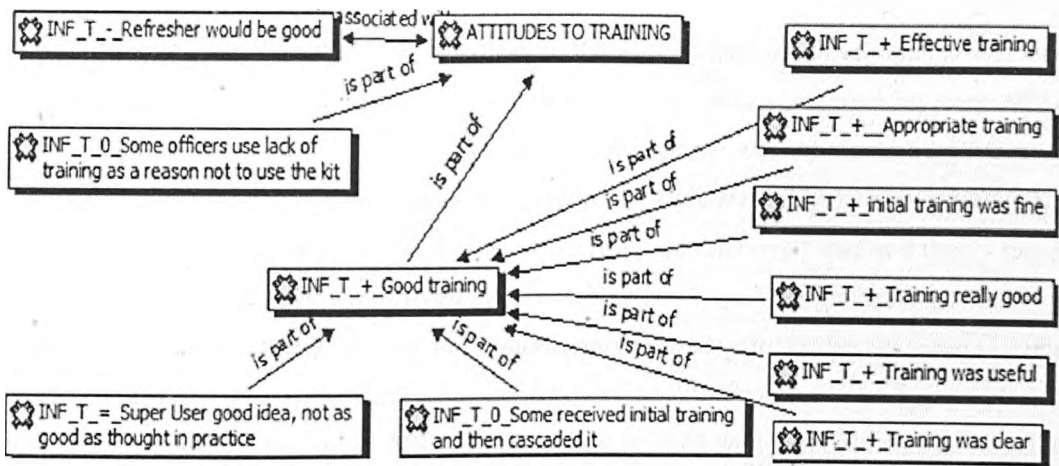


Figure 5.10 Positive comments about training (SPOC)

Some officers appreciated the ability to cascade training and specifically the provision of super users who were able to provide training and support colleagues was seen to be a good idea. Although having super users was generally considered as positive it was noted that, in practice, super users tend to have their own jobs to do and may, in any event, be on a different shift system to the person who would like to ask them some questions. This meant that they were not always available when needed by users.

### Support

Overwhelmingly the officers were positive about the support which they received in terms of technical support from the Force Information and Communication Technology department, and I have summarised their views in Figure 5.11 below.

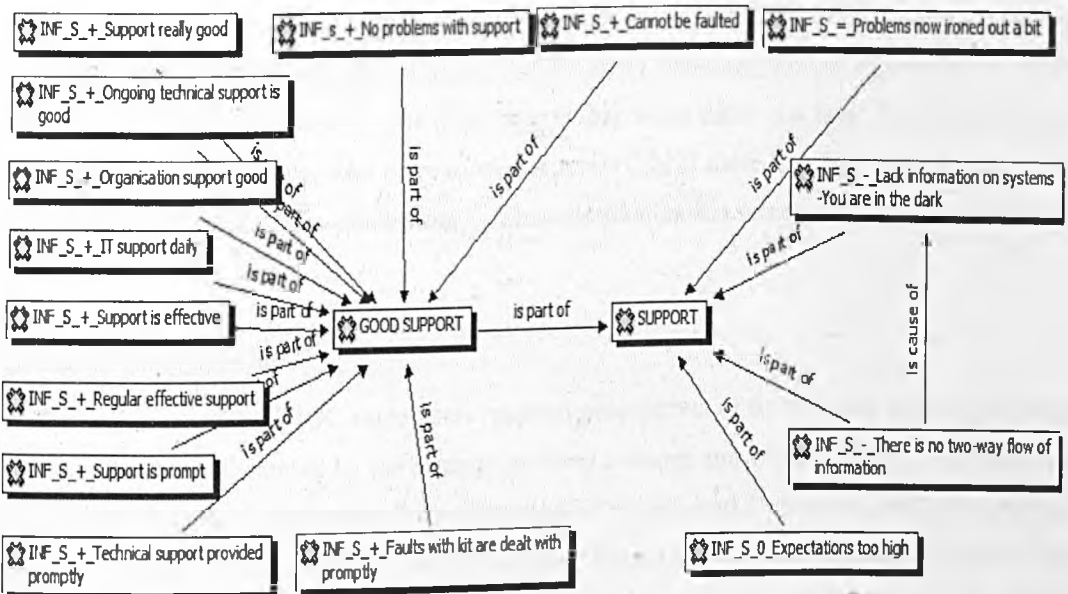


Figure 5.11: User attitudes and comments about support (SPOC)

This support was intended to deal with technical issues rather than issues of systems use, which were to be covered by initial training and by access to super users. Nonetheless, some officers did indicate that they had received some useful information and *tips and tricks* from the technical support staff. Positive issues with regard to technical support centred around the support being prompt, problems with devices being resolved effectively and in a timely manner and the fact that the support was provided on a daily basis with a technician from the central support services department visiting the police station Monday to Friday in order to collect devices which had problems, deal with problems he could address on the spot, and return devices which had required work. Whilst this system worked well it should also be noted that one of the supervisors in particular commented that it raised expectations too high in that this level of technical support, whilst very welcome in a proof of concept stage, was not sustainable if mobile data was rolled out to the whole of the county. Officers also commented that they would have expected the support function to inform officers when there were problems with central systems such as the police national computer or with local back-office systems such as maintenance on servers. Because officers had not had direct access to these systems in the past there was no system for notifying them of problems and downtime. By giving officers access directly to these systems it raised the issue that when they did not know that a central system was down they tended to blame the mobile device. As a result they would keep on trying a system which was never going to respond, become frustrated with the mobile device and then attribute the failure of the central system to the failure of the mobile device. The mobile device then fell into disrepute as a technology.

### Communication

Another key area of concern about the infrastructure was the communication when problems arose and officers expressed the view that *"there is no two-way flow of information"* which meant they were *"in the dark"*. The issue here is that when there is a fault the officers do not know if *"they're doing upgrades or rebooting a server"* or if there is a fault with the kit. This issue was described as *"very frustrating"*. This communication issue was raised as an issue at the end of the SPOC stage.

### *Changing views over time*

At the beginning of the SPOC stage users' general perceptions of the training and support were positive; these are illustrated by the categories *Good training* and *Good support*. Officers said that the training was *"appropriate"*, *"really good"*, *"clear"*, and *"effective"* and these indicate that they were generally satisfied with the training. They described the support as *"good"* and some commented that the support was *"ongoing"* and provided on a *"daily"* basis. Whilst there was generally a satisfaction with the training and support, it was also mentioned that the training was limited due to time indicating that, for some, more extensive training was needed.

At the middle of the SPOC stage, users' views of the training were not positive. They said they were trained using incorrect training materials for instance it was commented that "*some of the printed materials are inaccurate*" and the "*documentation shows screens that no longer exist in that format*". Some described the training as "*very basic*" and officers reported that they struggled to view the details of actions because the documentation showed screens that no longer existed in that format. Overall, the training was heavily criticised and it was also noted that some officers used the lack of training as a reason for not using the kit which indicates that training is a highly important factor in changing behaviour and embedding the new technology into every day practice. The technical support had not been called on to any great extent at this point, however officers who had the occasion to use the facility commented positively on the speed of response.

At the end of the SPOC stage users' described the training and support they had received negatively. The key issue concerning the initial training is that it was insufficient and that more extensive training was needed, and a particular issue raised by several officers was that there was a lack of training in the use of the camera. It was felt by some that the training did not "*cover the hard bit*" by which they meant the "*protocol - it's about what you do with it*" or "*how to recover from problems*". It was even suggested that "*a bit more instruction perhaps just another 20 minutes to say you can do this and this with it would help*". Some reported that they "*didn't get much training*" and acknowledged that "*some people do fall through the net and don't get the training*" which meant that some officers were not trained at all. Some people were "*self-taught*" and made time to "*messed around with it [the kit]*" so that they "*learned things that are there*". It was acknowledged that officers who "*don't have time or aren't that way inclined ... just don't find out*" how to use the kit and are "*disadvantaged*". Other key issues were that the training that was provided was inaccurate, officers were trained on kits that were not working, and the format of the training was inappropriate. Training was provided to some officers in the form of face-to-face sessions, and those who attended those sessions were to *cascade* the training and the quality and quantity of this was variable. Training was also provided by email and this was particularly problematic to some officers. For instance one officer described the format of training relating to training on the camera as just coming "*out as a piece of paper on e-mail you do this and you do that and that's how you enable it, and that's supposed to set you up ...*". The above illustrates that many officers felt that the training was superficial. Some suggested that follow-up training would be useful. For instance one suggested "*... go[ing] a little bit further into some of the things that the device can do*" and that it "*would have been useful perhaps to have some further training a bit later partly as a refresher*". Overall, whilst the training was felt by a few to be satisfactory, most officers complained about the inadequacy of it and expressed dissatisfaction. Whereas the training was considered to be problematic, there was general satisfaction expressed about the support

provided. Support was described as "good", "prompt" and "effective". The following is a typical description regarding support: "make a phone call and register the fault, you put the machine back on again, and it comes back pretty promptly. I'd say they're pretty good".

In summary, the views expressed about the training changed from general satisfaction when explored at the beginning of the stage to general dissatisfaction when explored at the middle and end of the stage. Support was considered to be strength throughout, and communication was raised as problematic at the end of the phase.

### *Supervisor' views*

The support provided to users was seen by the supervisors as having been of very high quality and key to a positive perception of the system by the majority of the users. "It has been absolutely excellent with [Technical Liaison] coming everyday - he's on leave but he's passed it on and everybody knows who they should be contacting" although they did also raise a note of caution with regard to the ability of the Force IT department to maintain the level of support in a wider roll out of the technology "It does concern me about the next stage of the pilot that this has raised expectations. People have an idea of the sort of support they're going to get and there is no way they can do that with a larger pilot". While the Force recognises that the level of support provided to the pilot cannot be sustained in a wider implementation there is also an expectation that the experience of the pilot will mean that there are fewer issues for users to call on support for – in addition users would be expected to require less support as their familiarity with the technology grows. One manager commented:

*"Some of the problems hopefully have been eliminated, some of the things that [Technical Liaison] had to deal with early on are now designed out, and that may mean that we can get away with less support" (Mgr F OIS 3)*

Supervisors are much less positive about the training which officers received. Although, initially, training was quite well received by the users it rapidly fell into disrepute as a result of failure in systems, incorrect training materials and what was generally perceived as rushed and poor delivery. These perceptions took time to develop with officers making use of equipment and running into problems which they then felt should have been dealt with in training. Officers also identified that the initial training did not cover the full functionality of the devices and felt that, although they had been provided with access to super users they could have done with some level of additional training either as refresher or extension training. Problems encountered by users translated into additional workload and additional problem for supervisors.

### 5.3 WORK PRACTICE

In this section I have reported the officers' perceptions about how the equipment changed the way they undertook their job roles. This area are attracted relatively little comment in comparison to comments made about the equipment per se.

#### Officers' perceptions

I have presented a summary of the findings in respect of users' perceptions of the way using the equipment changed the way they undertook their work in Figure 5.12 below. Figure 5.12 shows that I categorised the findings into three categories. The first relates to the potential issues and problems which could impact on work practices and I have categorised these as *Issues*, the second, to the potential efficiencies in working and I have categorised these as *Efficiencies*, and the final area brought together three specific comments which were more in the character of notes than impacts but which I nonetheless felt appropriate for inclusion and I have categorised these as *Notes and comments*.

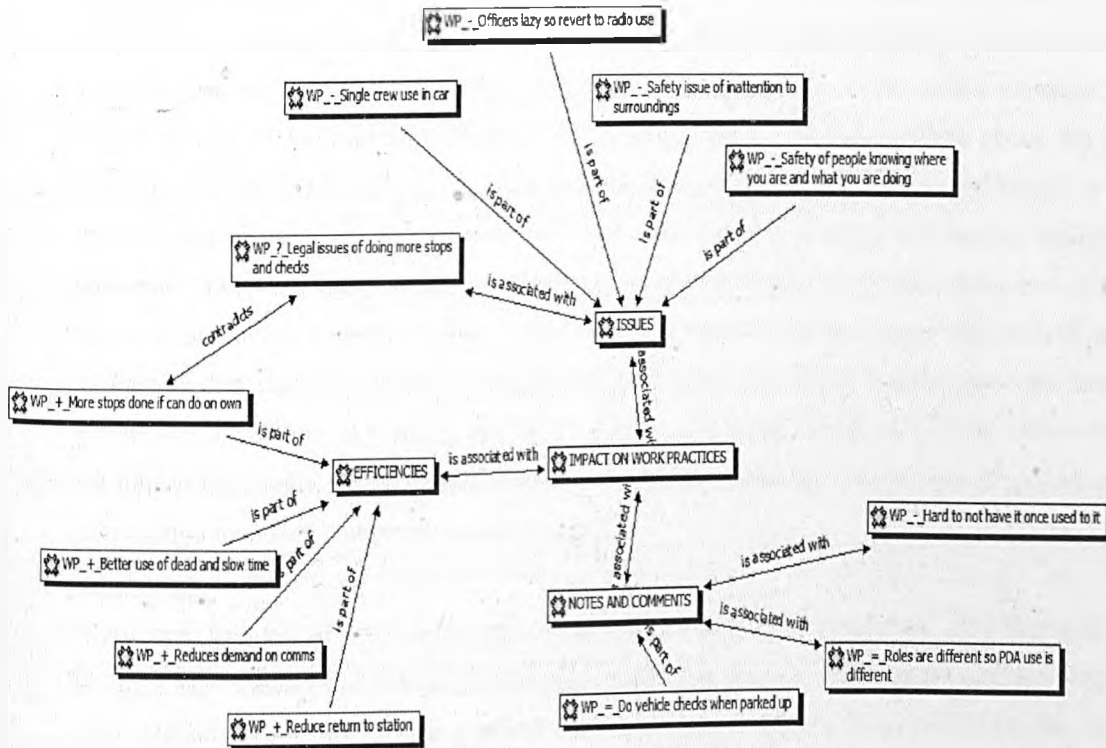


Figure 5.12: Impacts of MICT on work practice (SPOC)

#### Issues

There were five issues raised. The first two issues concern the safety of officers whilst using the devices. The first of these were that officers undertaking checks silently over data channel and what is, effectively, a public information space, (rather than using the force communications functions) are not making anyone else aware of what they are doing, who they are interacting

with and where the interactions are taking place. Although officers can press a panic button on their radios to attract attention and backup should they require it, the backup will need to be told where the officers are located rather than potentially already being aware. The second safety issue concerns the direct use of the equipment in an interaction with a member of the public and is centred on the potential for the device to take attention away from the person the officer is dealing with. At the lowest level of impact this may make the officer seem less interested and adversely affect the public perception of the police and of the officer, at the worst, this inattention could provide an opportunity for somebody to assault the officer. There are a range of other potential intermediate scenarios. These two issues about safety are of critical significance because they mean that the officers perceived using the equipment changed their work practice in a way that made their work less safe and made them more vulnerable. The third issue concerns use of the devices while single crewed in a vehicle - officers raised the issue of how the Force and how the courts would view an increased number of person and vehicle checks if these checks did not produce a commensurate increase in sanctioned detections, intelligence reports submission, or other measurable performance indicator. The fourth issue is that the increase in checking activity without a commensurate increase in result could be seen as well-intentioned but ineffective, and at worst it could attract attention with regard to data protection, civil liberties and human rights, and this concern about the legal situation was the fourth issue to be. This indicates that some officers felt uncomfortable in with their change in work practice in terms of increased checking activity that having equipment provided. The final issue raised was made by a supervisor who noted that there is a level of inertia in promoting systems change. This supervisor commented that many officers will revert to the way they currently do things not because it is better but simply because they are familiar with it and so changes in working practices which could be beneficial, or at least which would not impact negatively on the officer, would not be adopted without some form of management intervention to ensure that practice was changed.

### Efficiencies

There were four key areas of comments raised which related to efficiencies. The first was that having a PDA system had reduced, and would continue to reduce, the need for officers to return to the station during shifts. This improves one of the key statistics, that of visibility, by which police forces and officers are judged. Thus this change to work practice is a highly significant one as it was a key driver for the introduction of MICT into the Force. This means that one of the changes MICT has had to the work is to change some of the location where work takes place. The second area of efficiency identified, more as a potential at this stage of them as an actuality, was a reduction in the demand on the Force communications function as due to having the equipment, officers could carry out over data channels transactions which they would formerly have carried out by voice radio. This change to work practice represents a new role for the officers, that of conducting their own checks rather than having to ask for the checks to be

done for them. It also indicates that officers were able to conduct their jobs with greater autonomy. The third area of potential efficiency was the use of the PDA system as a potential smoothing device allowing officers to undertake transactions and carry out tasks in what they refer to as "slow time" or "dead time". There can be many reasons for such pauses in officers' normal activity (e.g., acting as a scene guard for a scene of crime, awaiting vehicle recovery to seize a vehicle which is not taxed or has no insurance, or awaiting an appropriate adult to deal with the juvenile shoplifter) and, prior to having the PDAs, officers had little (if any) opportunity to progress other tasks. The PDA systems potentially allowed them to make phone calls, read and respond to e-mails and carry out checks into back-office database systems which would not merit being carried out over the voice radio channel and which would normally have taken up time at the end of a shift using a computer terminal in a police station. Thus having and using the PDAs allowed officers to be able to use their time more efficiently and potentially to do more work.

#### Notes and comments

There were three comments which I categorised in the *Notes and comments* category. The first was that officers have started to do more in the way of vehicle checks while they were in their cars and parked. This was not because more vehicles worthy of checking had suddenly arrived but was a result of the ability for officers to undertake checks directly without recourse to an information intermediary. Particularly at busy times a day such checks would probably not have been done if the officer was unable to undertake them directly because of the demands on the FCC. This shows both a change in work practice as well as the potential for a larger shift in organisational capability. The second comment area relates to the recognition by officers that the use of the system is highly personal. It is role dependent but it is also dependent on the particular workload on a day and on the working style and inclination of the officer concerned. This level of personal and work related variation is unlikely to be significantly reduced or eliminated in the short term. The significance of this to the changes to officers' work practice as a result of using the PDAs is to illustrate and confirm the importance of understanding context as an integral part of the use and usefulness of MICT. The final comment was made primarily by officers whose PDAs had had to be returned to the central technical support function for a period of time. These officers noted that, once having had of the system, it was "hard to lose it, it is only when you haven't got it that you realise that you come to rely on it". This indicated that the officers' roles had been changed by having access to MICT and meant that the system was having a positive impact overall.

#### *Changing views over time*

At the beginning of the SPOC stage of the project, users indicated that the facility to carry out checks without using the control room meant that they were likely to carry out more checks in certain situations. They also recognised that having the devices did not mean that other

channels of communication were closed to them, as a result of this they expected that, overall, the number of checks would increase and that this would be partly due to having the devices and partly a result of developing greater facility in using the devices. In addition, users reported that they were carrying out more vehicle checks and that they were doing so more on speculation as a result of the ability to react quickly to an intuitive feel that a particular vehicle was worthy of attention. They also indicated that, on occasions, when they had contact with members of the public in a group they found the facility to follow up extra names a valuable one and something, particularly at busy times, they would not feel comfortable requesting via control. At the beginning of the SPOC stage the devices were still unfamiliar and the users had not yet identified a variety of significant changes in the way they do their jobs, but were experiencing undertaking checks themselves and their focus was on being able to do this as this was a new addition to their role.

At the middle of the SPOC stage officers identified that there were some changes to working practices but that there were also drivers to use the existing channels at many times for many of the situations officers found themselves dealing with. A typical comment was that *"I don't want to be too critical but think it's still easier to go through comms a lot of the time - it isn't that it [the PDA] doesn't do anything, it's just that we find it easier to use the radio at the moment"* and this was based primarily on it being seen as easier to use channels which were already in use. Specific situations where the devices may not be used include single crewing in cars *"If you single crew it may not get much use at all on a shift, if there are two of you or if you are on foot then you use it a lot more"* as well as the situation where making a call to control serves the purpose of ensuring that control are aware of the officer's location and situation as well as providing information. This was particularly the case for officers alone, at night or in situations seen as potentially *"dodgy"*, *"you want comms to know where you are so you call into them anyway - better to let them know than rely on them finding out"*. Despite these caveats the facility was seen as being useful in situations, for instance, where a check might not have been performed under other circumstances (e.g., *"I find it handy for intelligence checks, for instance if you see a car or something like that, if you had to go through comms you might think I won't bother checking it' but is really handy to have this and do it on here"* (PC M OIS N 12)) or where the constraints of being single crewed in a car are not present (e.g., *"I'm on foot I don't work response so that means that I would have to change to the second channel [on the radio] so it's easier to do it on here than have to change channel all the time"* (PC M OIS N 15)).

At the end of the SPOC stage officers' perceptions had not changed significantly from those held at the middle of the stage. The perceptions were, however, perhaps firmer at the end of the stage with regard to the key points which officers identified. The first of these was that currently the changes to work practices were relatively small scale and low-key. The second



was that larger scale changes would require both time and volume of deployment. With more devices deployed, and the ability to change back office systems in order to support both of the use of the technologies and the affordances associated with them larger scale change in work practices may be possible. The third key area of comment centred around the level of variability of use and the sources of that variability; the role of the officer, the workload, and the officer's personal inclination and working style. Perhaps the summative comment, however, came from those users who, having been deprived of a system they have become used to for a period of time, identified that they found there was a material impact when they did not have access to the devices.

### ***Supervisors' views***

Supervisors did not see the use of the mobile technologies as having significantly changed work practices, although they did see impacts on individuals being quite different both between roles and individuals in roles;

*"One who was on the response team and has now become a community beat manager ... has probably changed quite a lot and she's doing a lot of intelligence checks and otherwise she wouldn't have been able to do that. So for some individuals it has [changed their work practice] and for some it hasn't. It hasn't changed the whole of people's lives; it has changed some parts of different bits of their lives". (Emphasis added). (S F OIS 2)*

Supervisors also noted that some early technical failures had meant that some users formed a poor initial picture of the overall usability of the technology noting:

*"It's frustrating when sometimes it doesn't work; with missing from homes we had a couple where they got right to the last screen and then it wouldn't finalise the transaction and they had to go back and use paper" (S F OIS 2)*

These comments indicate that the supervisors believed that the use of the PDAs had changed the work practice, but the extent of the change was variable. In addition, the frustration experienced by officers when the PDAs did not function as needed is highlighted.

## **5.4 RELATIONSHIPS**

This section reports findings regarding the effects of MICT on the relationships between users and others with whom they come into contact in the course of undertaking their roles

### **Relevant others**

The use of MICT affected officers' relationships with five groups of people as indicated in Figure 5.13 below: the team, the wider team, managers and supervisors, the public as perpetrators of crime, and the public as victims of crime.

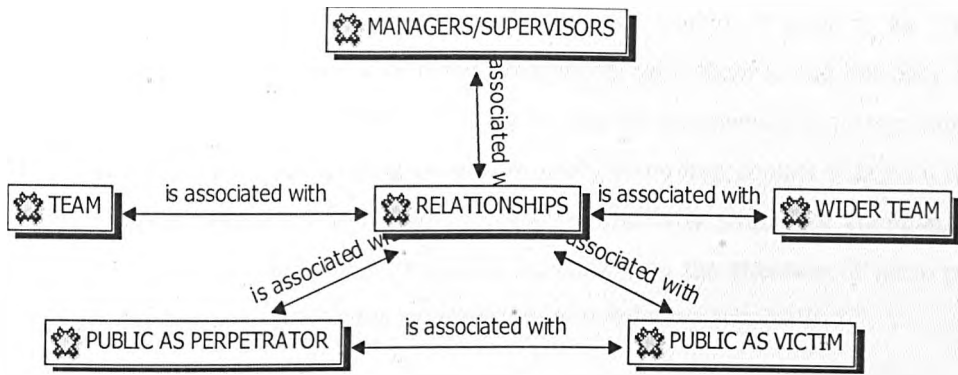


Figure 5.13: Impacts of MICT on officers' relationships with others – overview (SPOC)

The team consists of immediate peers, the group officers refer to as “their” team. This would normally include officers who either work directly with them (such as a double crewed in a response vehicle) or officers who work with them by virtue of being allocated to the same shifts, similar roles and the same sub-divisional unit operating from the same police station.

The wider team includes those with whom the officers interact as a normal part of their working relationships. Practically, for the response and neighbourhood patrol roles which form the subject of the SPOC this meant the Force Control Centre (FCC), also known as “control” and communications” function (referred to as “Comms”). That is to say, the radio operators who received requests for information from the officers and relayed both the answers to those requests and an incident dispatch data to them.

Although the issue of the supervisory layer in police Forces is not clear-cut it is normally taken to mean officers at the level of Sergeant and, dependent on role, Inspector. Officers above the rank of Inspector, and some that rank depending on role, would be characterised more as managers than supervisors. For PCSOs the supervisory layer is normally provided by experienced Constables, and Sergeants would normally be regarded as management. I found this to be the situation at the Force.

The public as victims of crime tend to come into contact with the police relatively rarely and, when they do, they often find it stressful both as a result of the event that has caused them to come into contact with the police and, in many cases as a result of the encounter per se. The officers in this SPOC were in response and neighbourhood patrol roles and so would tend to come into contact with members of the public, as victims of crime, who have been subjected to relatively low level criminality in the larger scale of things. Nonetheless these crimes are often ones which cause a great deal of stress for the individuals concerned and would typically include such things as domestic violence, common assault, burglary, damage to property and antisocial behaviour. The police officers tend to treat such people quite differently from the members of the public whom they come into contact with on a more frequent basis as the perpetrators of crime either in the past or in the present.

The public as perpetrators of crime are who the officers tended to refer to as “regular customers” and officers have quite a different relationship with them to the one they would have with the public as victims of crime. This is not always an adversarial relationship with most officers making a point of greeting people who they come into contact with on a regular basis as the actual or potential perpetrators of crime. Particularly within the community and neighbourhood patrol roles the officers note that bringing it to the attention of these regular customers that they have been noticed is an integral part of reducing criminality.

Immediate team and wider team

Findings about the impact of the mobile technologies on the officers’ relationships with their immediate team and wider team are summarised in Figure 5.14 below.

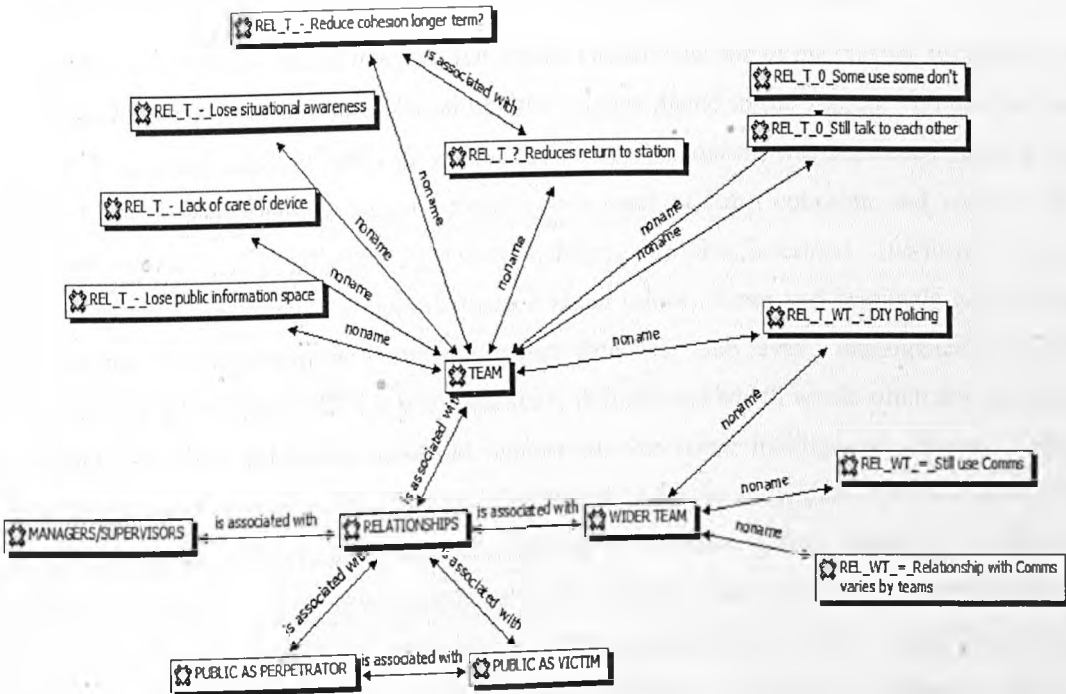


Figure 5.14: Impact of MICT on officers’ relationships with the immediate and wider team (SPOC)

With regard to changes in relationship officers had within the team, there was a feeling that although the use of the PDAs may reduce the level of interaction, it by no means eliminated it and that the remaining level of interaction was sufficient to maintain a good working relationship. Officers raised some concerns over the longer term impact of the use of MICT, particularly if they are rolled out to the Force as a whole. In particular, they noted that there is the potential for the lack of a “public information space”. At the moment officers making a request for information or being dispatched to a job will be audible over the Force’s public radio channel i.e., public to all of the officers on that talk group rather than public to the public at large. This channel works as a public information space for police officers, and they become very good at extracting relevant information from this stream of radio traffic. The issue officers raised in respect of this are twofold. Firstly, that an officer requesting, for example, a person

check is, by the very fact of requesting the check, notifying both the FCC and fellow officers that he/she is interacting with a particular individual in a particular place. If anything should happen to the officer a number of people are aware of who they were dealing with and where. Secondly, officers were concerned about losing what they termed as the "*chip in effect*" whereby somebody hearing radio traffic may have useful information to contribute such as a warning that if an officer performs a search on a particular person they should take care because they are a known drug user and may have needles on their person. Linked with this issue officers also raised the point that the stream of radio traffic provides a level of situational awareness which could be lost if a significant proportion of officers' interactions and transactions move to data channels which are effectively silent. This reduction of interaction has significant implications for officers' safety and keeping their knowledge up-to-date.

Officers also noted that one of the potential effects (which was one of the reasons for the project being undertaken) is to reduce the level of time officers spend in the station. Whilst this was seen to be a clear benefit to both officers and the Force, the concern was expressed that if it was taken to its logical extreme officers could lose a level of team cohesion and some of the informal networking opportunities by which intelligence at what is termed "*sub level 1*" could be lost. Level 1 intelligence is the intelligence about minor crimes and criminals gathered by officers and submitted into the Force intelligence database. Sub level 1 intelligence is context and situation information which is not particularly definite and which would often not, by virtue of failing the data validation threshold, appear on the Force intelligence database. Such intelligence could include a minor change of attitude by a known individual, a rumour which the officer is unable to verify, or a suspected sighting of a vehicle which cannot be confirmed. Officers regarded this as being a valuable cultural background to an area and commented that it can be used to sensitise officers to issues and dangers before they reach a stage where they could legitimately be incorporated into formal intelligence systems. Although officers expressed concerns about the effects of reduced networking, they commented that they had not seen such effects at this SPOC stage as they still talked to each other, still met for briefings, and still met at the end of the shift.

None of the officers at the SPOC stage foresaw any problems in the relationship with that wider team. Overwhelmingly, their view was that although some transactions could now be carried out by the officers themselves, without the need to go through the control centre, there were still an adequate number of transactions for some level of rapport to be maintained. They did identify, however, a potential for what they referred to as "*do-it-yourself policing*" and this was also expressed as a fear with regard to relationship with the wider team; that in the longer term the provision of additional facilities and information to front line uniformed officers was part of an agenda to reduce the level of support and back office services available to those officers.

## Relationships with managers and supervisors

With regard to the impact of the use of the PDAs on the relationship between officers and their managers and supervisors, there was a relatively low level of overall comment. A summary of the findings are shown in Figure 5.15 below.

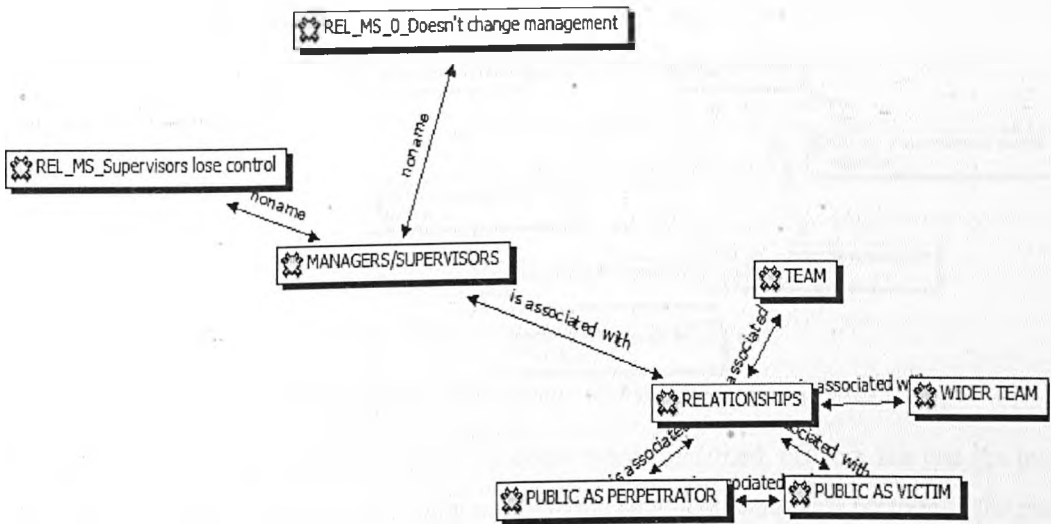


Figure 5.15: Impacts of MICT on officers' relationships with managers and supervisors (SPOC)

Overwhelmingly, officers felt that the use of the PDAs, particularly at the current level, was unlikely to change the nature of their relationship with supervisors and managers. Police officers' relationships with their immediate supervisors (i.e., usually Sergeant) tends to be quite an amicable one and the officers felt that there would be sufficient opportunities for interaction for no problems to be caused to this relationship. There was a minority view expressed that in the longer term if officers were less connected by virtue of perhaps undertaking briefings remotely, not coming into the police station as often, and not working to the same shift patterns then there could be a lack of supervisory control which could adversely affect the relationship. This was, however, seen as an issue for the future and not one for the present.

## Public

There were mixed views about the relationship between officers and the public as perpetrators of crime and as victims of crime as summarised in Figure 5.16 below.

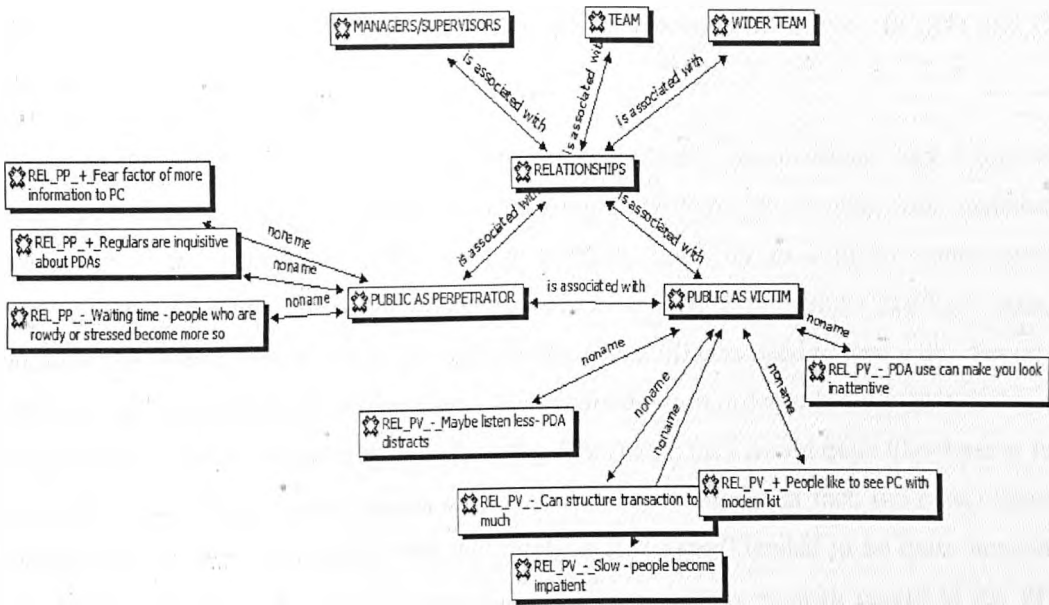


Figure 5.16: Impacts of MICT on officers' relationships with members of the public (SPOC)

Generally, as far as the public as victims of crime were concerned, officers felt that the public liked to see the police with modern equipment and the handheld computers portraying the police as modern and up-to-date. There were, however, a number of issues which officers felt had the potential to damage the relationship with the public as victims of crime, or had actually done so. The first was the speed of the system and the speed at which officers used the system. While officers were using the PDAs there were gaps in conversation and waiting times which were perceived as overly long. While officers noted that in many cases the overall transactions were faster because they did not involve officers having to drive back to the police station or sit outside the police station in the police car and talk on the radio to the control centre, the perception by members of the public could be that things were dragged out unnecessarily. Officers also noted that they had to look at the PDA and concentrate on its use (particularly in the early stages of use when they were novice users) and as a result could look as though they were inattentive, paying attention to the machine rather than to the person. Officers also commented that, particularly in the early stages of use, they probably did concentrate more on the device than they would have done on an equivalent paper form or notepad and, as a result, could potentially miss verbal or body language cues which could have alerted them to some aspect of the incident they were dealing with. Linked with the issue of inattention and the effect that the use of the PDA had on the transaction with a member of the public, was the structuring potential of forms presented on a handheld computer. Paper forms have the affordances of allowing the user to fill in fields out of sequence, to make marginal notes, and to append additional material. Computer-based forms either reduce or eliminate some of these affordances thus structuring the transaction so that the officer has to insist that a member of the public goes through the incident or complaint in a specified manner rather than being able to do so in a

slightly more flexible and fluid way with the officer recording in a more flexible and fluid manner.

As far as the public as perpetrators of crime are concerned, some officers had a somewhat ambivalent attitude. Officers reported that they regularly come into contact with members of the public as perpetrators of crime and, as a result, often try to cultivate some level of relationship with them. However, officers remain aware that these people are, have been, or could be the perpetrators of crimes and behaviours which officers need to deal with. So, on the one hand officers want to be responsive to these individuals in order to build a relationship and possibly gain information from them and, on the other hand, they would quite like them to form a picture of the officer having access to more information than is, in fact, the case. Specific issues which officers raised were that the "regular customers" tended to be quite inquisitive about any new piece of police equipment and were particularly so with regard to the PDAs asking what they were, how they worked and what the officer could use them for. Most officers noted that they were very evasive about the capabilities of the devices preferring their regular customers to assume that the officer had access to far more information than was in fact the case. One officer recounted having observed "a friend" pointing the camera (which was at that stage of the trial disabled) at an individual and telling him

*"I don't know who you are but this does or, at least, in 30 seconds it will. So you may as well give me your right details now and save me nicking you". (PC M OIS N 13)*

The individual concerned provided accurate details which were then checked on the PNC via the PDA. One key negative point officers noted was that, particularly when dealing with people who were rowdy or stressed, using a handheld with the associated waiting time, could mean that the person concerned became more frustrated and difficult to deal with. This was particularly the case when dealing with a group of people; over the radio a series of names and dates of birth could be given and the officer would then know how to interact with them and talk to them while waiting for the results. While using a PDA the officer would have to input details sequentially and wait for results to come back.

### *Changing views over time*

At the beginning of the SPOC stage, officers felt that the devices were not likely to have a major impact overall but did note that this is part of a larger trend and commented that "it might be different if we all have them". They did not feel that there had been any significant impact on their relationship with peers as a result of having been issued with the devices. Nor did they feel there would be any significant impact on their relationship with supervisors as a result of using the devices. They did, however, identify that in future the use of the devices could mean that supervisors either had, or perceived themselves as having, less control over the people within their team. With specific reference to the effect of the use of the PDAs on relationships with the public, there was a clear divide between the expectation of reaction from the public as

victims of crime and the "regular customers" known to police on an almost daily basis. Officers indicated that the possession of the devices had "put them up" in the estimation of their local "regular customers". The image of the Force had become far more one of being technologically capable with officers who were connected in a central Information System. The officers identified that there was a level of fascination exhibited by regular customers and noted that this was, in part, due to the fact that the device itself is not unfamiliar as the people with whom they interact can see the devices in mobile phone shops and in advertisements. This is therefore seen as cutting-edge technology. Officers also noted that for some of the "regulars" of the area which they police, there would be a considerable incentive to steal one of the devices both as a matter of machismo and because they would see this as a gateway into police systems. Officers indicated that all of the public as victims of crime with whom they came into contact saw the use of the PDAs as being a positive development. Officers did not feel that the relationship with the public was damaged by their use of the PDAs although it was noted that, particularly in situations such as missing from homes (which at the time of the interviews had not occurred), the public could feel that the device was getting in the way of their being able to describe and explain the issues surrounding the disappearance of the individual concerned. Officers were happy to use the devices to do body checks whilst interacting with individuals on the street, feeling that there were no adverse effects to the relationships.

At the middle of the PSOC stage, I noted some minor changes to the impressions and expectations expressed by officers at the beginning of the stage. Officers reported no impact on their relationship with their immediate team and peers – they still met and chatted, compared notes and swapped stories. The use of mobile technologies did not change the start and end of day interaction, although they officers reported that it could reduce returns to the station during the day. Officers did not see any impact on their relationship with the wider team with whom they interacted. A typical comment was "No, that hasn't changed anything, we're still talking to them all the time, you're still doing checks through them, the majority of the things we do still go through comms", and the need to put urgent jobs through the pre existing channels was also noted. This driver to use existing channels, together with the need to supplement basic information returned to the PDA meant that the impact on the relationships with the wider team was seen as minimal. It was noted that the lack of access to Crime Recording System (CRS) logs, amongst other areas, meant that many issues still had to be routed via control (e.g., "If we could have logs it would mean we didn't have to call in [to the station] so much to check on 'what was the number, what was the name?' ; you can also do cross referencing - if that was on here that would change the way we work" - it was also noted that the ability to result actions to logs directly (that is, to record the action taken in response to a dispatch or control request onto the central record for the incident) rather than having this done by the FCC as is currently the case would reduce the issues of mis-transcription which sometimes occur "It



would be good for result logs as many times when you say things to comms it doesn't go through on the log". Another advantage noted of the access to logs on mobile units was a reduction in "check calls";

*"sometimes you get a job in and get sidetracked and then you remember the street but don't remember the number and you have to go back and ask and that would be handy to have on here and just be able to look it up". (PC M OIS R 9)*

However, there was a recognition that the relationship with "comms" could change in a wider scale deployment of PDAs, for example:

*"if you are doing a lot through this [PDA] then you are not getting the communication with the operators, sometimes I'd rather talk to somebody who actually talked to the person [victim or reporting member of the public]; they can tell you whether the person is really distressed or just a bit upset and that's not something that you can get from text on a screen" PC M OIS N 12)*

A fear expressed at this stage was that "they" (i.e., the Force's management) might be looking at using the issue of mobile devices as a precursor to reducing support staff. Although this was expressly denied by the Force it remained a fear for the front line officers who could foresee a situation where "you get onto control and there's no one there but the robot".

Officers identified that they tended to use the PDA far more with the "regulars" than they did with the public as victims of crime (e.g., "don't tend to use this with people who rarely come into contact with the police, unless it's a missing from home, and many of them are regulars". The "regulars" were seen as being generally "quite impressed by it [i.e., the PDA]" as well as interested to know the exact capabilities of the units (e.g., "They're inquisitive they want to know what it is ... [and] why we are doing it"). There were a few anecdotal references to officers allowing people to assume the devices had more capabilities than they actually provided and the expressed wish that "you could put a name in and the photograph comes up" noting that "that's where the potential will come". In fact, there had been a couple of occasions where subjects had assumed they would be identified by the device and volunteered correct details before the officer ran the check. This situation is unlikely to last as word about the actual capacity of the PDAs spreads.

Officers felt that the general reaction from the victims of crime was also broadly positive (e.g., "most people seem to think it's good; they seem to like the idea of us having this sort of kit") although officers did identify the potential hazard of allowing the device to structure the transaction with members of the public, resulting in inattention to cues which would normally be picked up by observation and interaction (e.g., "I suppose if you got your head down concentrating on using this [i.e., the PDA] you're not really listening to them, you're not giving them as much time"). Officers also noted that it is not always possible to structure the transaction with a member of the public in a manner which fits the requirements of the forms on the PDA and that this can lead to officers reverting to earlier practices:

*"sometimes a bit too structured - it forces you to do things in a certain way and the transaction doesn't go that way, then you have to go and get other information and you can't input things on here until you have it so it just gets easier to do it on paper".(PC M OIS R8)*

At the end of the SPOC stage officers' perceptions had not changed much from the mid-stage. They had become used to the slight level of reduction of interaction between team members and did not feel that it had any material impact on the way they worked together. No major impact was noted on the relationship with officers and the wider team and officers still commented that the level of interaction, particularly with the FCC, meant that they still had a level of relationship and were still in regular contact with the service. However, officers noted the longer term potential for some things which were currently carried out by information intermediaries on behalf of officers to be transferred either to an automatic system or to the officer themselves. Officers noted a current reduction in the total level of interaction with the communications centre and felt that, in a larger deployment, this effect could be more significant. None, however, expressed a real fear that they would see the implementation of MICT materially damaging the relationship with the wider team in the short to medium term.

Officers did not expect, and did not find, any level of impact on the relationship with managers and supervisors. Supervisors were potentially more able to support officers by the use of the PDA systems to allow them to supervise actively and "get out" of the office. One supervisor commented:

*"the problem I have is that it is difficult to get out there and actually supervise people on the ground, to hear that so-and-so has been dispatched to such a job and to think 'he could maybe do with some back up and I'll go' because really the only way that I can keep track of what's going on is through computer screens and the only place really that we have computer screens is in here [office at police station]. So to a large extent I am tied. I get a window on what the team is doing but it is a window 19 inches square". (S F OIS 2)*

With regards to the relationship with members of the public, officers attitudes developed between the mid and the end stage. This was not a development in the sense of a change of mind but was in the sense of increasing certainty with regard to impact. Officers tended to use the devices more with the regular customers than they did with people who come into contact with the police as victims of crime. This is not because of the disinclination to use the devices with the public as victims of crime, but more a result of there being more facilities of the devices and affordances of the system with regard to the public as perpetrators or potential perpetrators of crime. Officers generally felt that both the public as victims and the public as perpetrators were impressed by the devices and the fact that officers now have direct access to systems which would, previously, have needed to be queried via an information intermediary. The reaction to this was, however, as might be expected different between the two groups with the public as victims of crime paying less attention to the police and their technology, in part as a result of unfamiliarity with systems and processes and in part as a result of the stressful situations in which they normally came into contact with the police. The public as perpetrators (the regular customers) showed more interest in the actual affordances of the devices which

probably resulted from them coming into contact with the police on a more regular basis and were thus aware that this was something new. Officers' perceptions were that across both groups the image of the police was enhanced, although in different ways.

### *Supervisors' views*

Supervisors did not see any immediate impact on the relationships within the team but commented that, in a wider scale deployment, this could start to become an issue (e.g., "I haven't any evidence of it-I can only guess that it would do because they [officers] aren't coming in as much; it's probably too early to say"). They did, however, comment very strongly that they would see a move to officers not coming into team situations regularly as an unhealthy development (e.g., "I don't think it would be healthy for them not to come in at all. I know some people want us to brief remotely on them but when you are talking it is bigger than just the surface things going on. That is something that is crucial - that interaction between the officers"). The key gains from such informal interaction were seen as low level intelligence rather than formal intelligence:

*"people get knowledge about individual jobs - from this informal interaction they get knowledge about jobs people have been to and how people reacted so people know how to deal with this if they go to a similar job at the same house for instance. If you know how somebody else was treated you discover a bit more about what's going on. I know we should say we've got intelligence on the system but very often officers think it's not worth putting on it something fairly minor and if something comes up that they already know they may not put it on the system. It's just putting the meat on the bones really."* (Mgr F OIS 3)

In contrast to this, the potential of the mobile units as aide memoire was noted (e.g., "it would be good as a backup, that would be good, to be able to go back on things to check what colour the vehicle was, what the names were") and the ability to check on facts and intelligence was seen as being a part of an enabling process which could provide officers with more information to work from in situations. This was commented on by a supervisor who said:

*"Sometimes the information you have doesn't register; you have one piece of the jigsaw and other people have other pieces; it's about awareness it's about knowing what's going on in an area and picking up; maybe it makes you bit more aware, maybe you look a bit harder, maybe you're a bit more cautious".* (S F OIS 2)

Supervisors did not see a major impact on the relationship between individual officers and the wider support team working with those officers and also emphasised that there is a definite relationship built up between officers and the control room staff with whom they interact, for example:

*"they're still in regular contact and maybe it would make a difference if we went wholesale over to mobile data. For now the relationship with control is still there; we actually did try putting communications operators on different shift pattern a while back and we had to put that back; it didn't work so we've come back to having a team working together".* (S F OIS 2)

Nor was any major impact on the relationship with managers envisaged at this stage (e.g., "you're in contact nearly all the time and I certainly haven't seen the officers less"). It was also noted that other officers saw the potential impact as being overwhelmingly positive (e.g., "I've

*shown colleagues as a basic what you can get, the basic information, and they're absolutely thrilled").*

Supervisors also reinforced the officers comments that the bulk of current use is with the regular customers rather than those who rarely come into contact with the police (e.g., *"Most of the incidents at the moment have been with offenders rather than victims because there isn't a lot on there for victims at the moment"*) and they also noted that the technology has an effect on those with whom they come into regular contact:

*"There was one where an offender saw that handheld and said "is that the camera on it?" and the officer just showed him what it was and how the camera was on it and he said "I'd better give you my right details then", this is the fear factor, that we could just press a button and know who he was". (Mgr F OIS 3)*

The public more generally were perceived as being equally positive, for example:

*"I mentioned the example about the guy up on ... [local beauty spot] and it just shows as a remote area the signal its working fine. And most people were impressed with it; seven out of eight people were absolutely blown over by it, and of those just the one, he wasn't having a go at the equipment, just really having a go at the officer having a break". (S F OIS 2)*

## **5.5 ORGANIZATIONAL CAPABILITIES**

In this section, I have reported officers' perceptions of the level at which the use of the XDAs provides capabilities which are new to the users or to the Force as well as what they felt could be added to the system to provide them with further functionality – termed Blue Skies developments. I explored the Blue Skies development with officers mainly at the end of the SPOC stage and I gave them the boundary that this should not be science fiction level developments but rather things which they felt could be achievable in a few years. Specifically, I asked officers what they saw as being potential future developments in technologies like this.

### *New capabilities*

#### Officers' perceptions

At the start of the systems proof of concept officers felt that the devices offered no real new capability but did identify that potentially the use of cameras and voice recording (not a part of the SPOC and not available for use) would allow them to do things which they could not do at the moment. They also identified that the fact they were not having to route queries through a control room meant that they could make more effective use of *"dead time"* and would feel at liberty to carry out more checks than they would feel comfortable with routing via *"comms"*. Officers also identified that there were more likely to be changes in the way that they worked or in the overall capability of the organisation if the use of the XDAs was either part of organisation-wide changes in a larger pilot or as the capabilities and abilities of the devices became known and users developed greater facility with them. However, even with wider experience of the use of the devices, the summary comment remained *"No not really"*, it would

not change organizational capability. Camera use was suggested as being a potential area for development and where a new capability of significant use could be introduced, for example:

*"If we could have the camera enabled then we could take photographs of perhaps a crime scene, perhaps an accident scene, to be able to show what has happened to a vehicle" (PC F YIS N 4)*

and a specific use for this facility was seen as being use within the domestic situation, for example a comment was made that the camera would be:

*"very useful on domestics if you have to wait for crime scenes to get there very often people are cleaned up; you don't have the impact, you don't see the blood, you don't see what the person looked like when you walked through the door". (PC F YIS N 4)*

The voice recorder was also seen as being potentially useful for keeping a record in the cases of people who have a history of making complaints as *"you could use the voice recorder to keep a record if you think people are likely to complain"*.

#### Supervisors' views

Supervisors did not feel that the use of the XDAs in the SPOC had resulted in any major new capabilities, and the comment was made that such new capabilities might emerge as a result of further use of them.

The two key areas of potential identified were the use of the camera and the voice recorder. The camera was seen as primarily capturing evidence for use in cases where the requirement for a formal chain of evidence may be low, for example:

*"The camera would be a new ability and it could be used in anything; certainly things like domestic incidents and assaults where you have a victim and an offender - you take a photograph whether its minor injuries and it's very visual - it goes on the custody record and the custody officer can see and they're not going off 'I think it's such and such a crime' they can see what they are dealing with and they've actually got a visual. It can also be used in the first hearing at court if it gets that far because we wouldn't have scenes of crime for the first hearing so to have a visual there straightaway is excellent, maybe also for other things like the states that vehicles are kept in - things like bald tyres - it is just excellent evidence." (Mgr F OIS 3)*

The voice recorder was seen primarily as a device for use to protect officers from complaints and abuse where often the officers conduct comes down to one person's word against another (e.g., *"... the other day an officer was being...verbally abused and to just click a button to capture that would be excellent ... It stops it being one person's word against another"*). One additional area where it was felt that some change in capability might be delivered was in the volume of intuitive level checks into databases. The capability to carry out such checks is not new but the ability to do them in volume, and at a time when the radio is busy, even if the individual officer is not, may be regarded as something which is new in certain roles and in certain circumstances. So, for example, as one officer commented;

*"if we're sitting outside a club, and we know they've got a bit of a drugs problem and it's half past two at night, that is Saturday morning really, then getting on to the control centre and saying can you run me 50 plates well it's just not going to happen, you wouldn't even go there. But with this I can just run plates, cars parked up, cars cruising around. And, maybe, you get lucky and one of the plates comes back to someone who we know that deals and we can also check where they tend to hide drugs in vehicles and then if somebody comes back to that vehicle*

then it's probably worth a go, and we wouldn't have known about it if we hadn't done a series of plates." (PC M OIS R 11)

### Potential evolution of the kit

There were many suggestions from officers about what could be added to the system to provide them with further functionality (i.e., blue skies developments) and a summary of the findings can be seen in Figure 5.17 below.

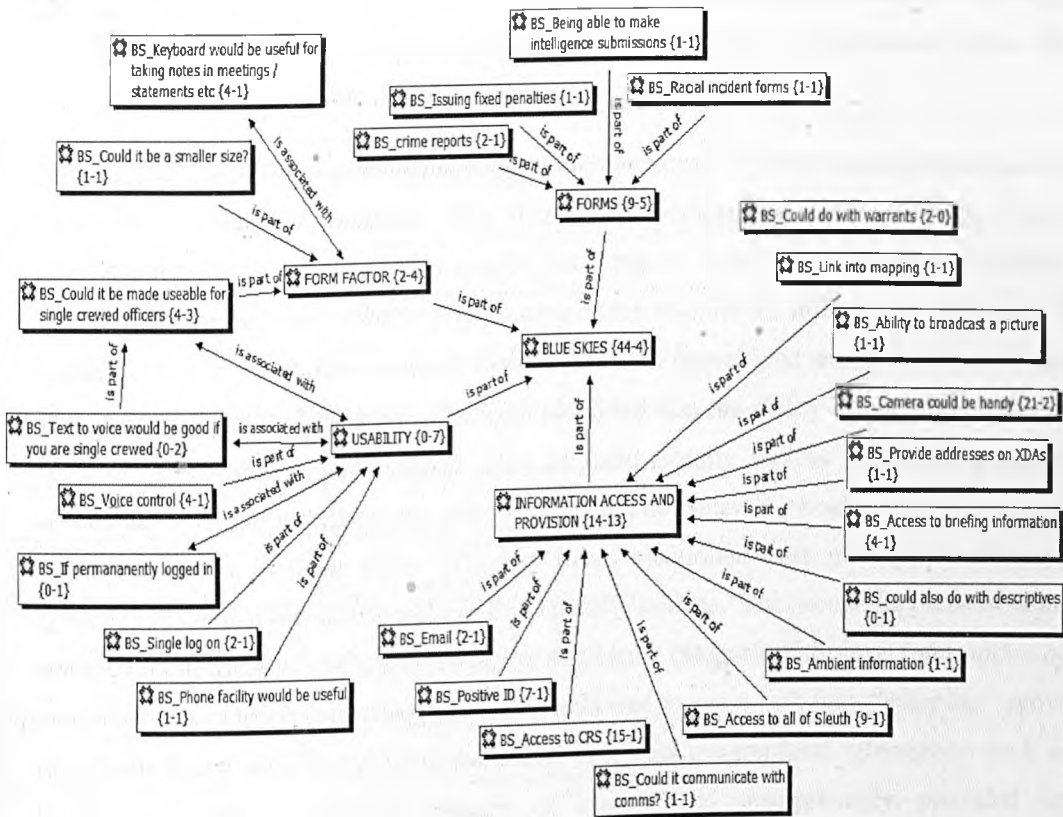


Figure 5.17: Blue skies (SPOC)

Officers' responses fell into two broad areas, one dealing with the actual equipment and the other dealing with the facilities which it gave access to. To take the area of physical equipment first there were two sub areas identified; the first, and the one which attracted the most comment, was around the usability of the device, and I have categorised these as *Usability*. This category has some overlap with the second area which concerned the physical form factor of the device and which I categorised as *Form factor*. The category, *Usability*, had three main themes within it. The first was around the security protocols and log in processes which officers found to be cumbersome and which they suggested they would like to see reduce to either some form of single logon via proximity badge or fingerprint or to a permanent login which would be disabled if the device was more than a given distance from the officer. The second was around the use of voice both as an input and output method. Officers discussed the difficulty in using the XDA faced by officers who are single crewed and suggested that the ability to access simple

commands and start processes using voice control would reduce many of the problems which have been encountered. They also suggested that the ability to have the device turned text to voice and effectively read out the results of queries would be of value to such single crewed officers. The *Form Factor category* was commented on to a lesser extent than the *Usability category*, and were concerned with the size of the device with some officers asking if it could be made smaller while retaining the same functionality and display quality. Officers also identified that the ability to add on a keyboard would effectively make the device more useful for taking notes in meetings, taking statements and, potentially, acting as a replacement to the desktop terminals which are available in police stations.

Moving away from the physical equipment to the functionality of the equipment provided, there were two key areas of comment. The first of these concerns the ability of the devices to complete and print forms, and I have termed this category, *Forms*. Officers currently often have to hand write forms under adverse conditions and then re-enter the information which has either been recorded on a carbonless copy or in their notebook into a fixed terminal at a police station. This process can introduce errors. Officers identified that the ability to complete many of the common forms and to print outputs such as fixed penalty notices would be a significant advantage for a system such as this, although they did note that this would, necessarily, add bulk or another device in some cases. The key forms mentioned were intelligence submissions, crime reports, racial incident forms and fixed penalty notices. The second key area of comment centred on information access and provision, and I have categorised these as *Information access and provision*. Officers reported that they would like to see a link into "mapping" providing them with directions and providing the ability to access geographical information such as the location of previous incidents. Images on camera use, unsurprisingly, provided several comments with officers being very keen, as already noted, to be able to take and use images in evidence as well as to access up to date images from a range of systems. They also noted that they would like to have wider access to intelligence information, to briefing information, and to the crime recording system. The ability for the device to assist in proving identity was also seen as key with officers suggesting that it could be used as a fingerprint reader or facial recognition used after an officer took an image of a person. They also noted that whilst positive identification would be the ideal negative identification, that is to say the ability to tell that somebody is lying about their identity rather than being able to positively identify who they are, is almost as valuable. The final area around *Information access and provision* on which officers commented significantly was around the need for improved handling of e-mail attachments which could not always be opened on the system as supplied. Officers did identify that, in the future, it is likely that some functionality will develop which they are unable to predict.

## 5.6 SUMMARY

This chapter reports the findings, primarily from observation and interview from the SPOC stage of implementation. The key points are:

- This was a second stage POC for the Force, aimed at proving the ability of systems, shown to be technically capable, to produce business value
- The scale and scope of the stage were both increased from the TPOC with changes to hardware, policing roles and functionality as well as to the number of users involved.
- The data was collected using a set of areas of attention derived from the results of the TPOC analysis and harmonised with the Activity Process Model to provide a question set designed to elicit activity and process as well as a concentration on technology.
- As with the TPOC, officers tended to perceive the systems as a whole and not to disaggregate them.
- Officers reported specific issues with regard to hardware, software and the ability to use the devices, going through a process which initially concentrated on the technology, then on the utility and, finally, on value. This was a cycle which had been seen in the TPOC stage.
- This cycle was one which individual users went through, as well as being one the SPOC went through as an implementation.
- Officers did not report major changes to work practices but did initially express fears with regard to safety; these reduced over the SPOC.
- Officers perceived there to be a trajectory for the MICT development, both in terms of the equipment per se and in terms of the changes it would bring to business processes.



## Chapter Six: Trial - findings

### 6.1 INTRODUCTION

This chapter reports the findings of the third stage of the research, the trial. This stage was intended by the force to build on the two earlier stages:

- The Technology Proof of Concept (TPOC), which had demonstrated the technical feasibility of mobile access to information systems using handheld and in vehicle computing.
- The Systems Proof of Concept (SPOC), which had demonstrated the ability to use existing information systems to provide officers with information useful to them in carrying out their policing role through handheld computers.

The trial was intended to allow the Force to build on the learning from the TPOC and SPOC stages and to trial the larger system changes – both in technical systems and in operational management such as supervisory practice – which had not been fully developed in the TPOC and SPOC stages due to the smaller scale of the deployment. The area selected by the Force for the trial was in the same division as the station in which the SPOC had been implemented. The area selected was the command unit which covered the town centre of a major town, as well as most of the suburbs of that town. The main groups of officers, based at two large town centre stations, were a mix of community officers (town centre and housing/estate), and response officers also carrying out some traffic functions (not including motorway patrol which is covered by a specialist group). The intention expressed by the Force was that the trial would not have a formal close date; rather, it was planned to run it for up to six months to make sure systems were working as planned. During this time, in a parallel development, the force aimed to develop the infrastructure which would then allow the trial to segue into a full Force roll out – carried out geographically and by role.

My research at this stage continued to contribute to the following research objectives:

1. explore the nature of the MICT equipment, police officers' perceptions of the equipment and the training and support they received to facilitate their use of the equipment
2. explore police officers' perceptions of how MICT changed the way they undertook their job roles
3. explore police officers' perceptions of how MICT changed their relationships with people
4. explore police officers' perceptions of the added value the kit could give them in relation to undertaking their work roles.

The objectives are concerned with my four identified areas of attention - equipment and infrastructure, work practice, relationships, and organizational capability and I have reported the findings under the four areas. The findings are summarised at the end of the Chapter in the form of a table which identifies by officer role the reactions to the introduction of MICT – using

the key identified areas of attention as a basis for the analysis. This table then informs the discussion in Chapter 8.

## 6.2 EQUIPMENT AND INFRASTRUCTURE

In this section I have reported findings on the nature of the technology provided to the officers and officers' perceptions of what they termed *the kit* and the infrastructure (i.e., the training and support) provided to support their introduction.

### 6.2.1 *The nature of the kit*

At the Trial stage of the project, there were 125 PDAs. The PDAs were XDA2 devices (manufactured by HTC and supplied by the O2 mobile network operator) which operated over the GPRS mobile telephony and data system. They were issued with a hard and soft case, a spare battery, a spare stylus and both in-car and mains chargers, and they ran Windows Mobile. As mentioned above, the XDAs were almost identical to those in the SPOC in functionality although, as a result of a version change by the manufacturer, there were minor differences in some connections, switch positioning and stylus storage.

The equipment is shown in Figures 6.1 to 6.3 below.



Figure 6.1: XDA2



Figure 6.2: Protective case



Figure 6.3: Windows Mobile

The facilities offered to users included all the systems which had formed the backbone of the SPOC. These included access to:

- both person and vehicle checks on the PNC. As a result of an upgrade to overall force systems, PNC vehicle checks now included access to MOT and Tax databases. This information had, previously, only been available via the FCC.
- Quick Address System, drawing on the voters roll.
- key parts of the force intelligence system.
- the forms required for crime management tasks including target profiles and tasking.
- the force missing persons (Misper) application. It should be noted that at this stage this was a read and write access into records of missing persons, rather than the (formerly available) ability to complete and submit missing persons reports. This was due to the

introduction of a national form for reporting missing persons which was of a size and complexity which made it virtually impossible for it to be completed on a handheld device.

- mobile telephony and SMS, both send and receive.
- e-mail - Initially this access, as deployed in the SPOC, was read and write with limited synchronisation and attachment handling only. This was upgraded over the first three to four weeks of the trial to improve both synchronisation and attachment handling.
- a camera, although it was made clear to officers that this was not for evidential purposes and it was subject to a fair use policy. It should be noted that at about this time there had been considerable adverse publicity with regard to camera usage by public safety staff and, in particular paramedic staff. As a result of this both the force and individual officers were very cautious.

As with both the TPOC and SPOC stages, there was a complex system behind the device in the officers' hands. The trial was, however, significantly different from the TPOC and SPOC stages of the project in terms of the back-office systems and architecture. These had been fundamentally redesigned in order to support the ability to scale the trial up to a full force roll-out with minimal disruption and change to information technology systems. The intention in this re-engineering of back-office systems and processes was that it should be completely invisible to users. It did, however, present some very specific technical challenges to the project team.

### **6.2.2 Officers' perceptions of the kit**

Officers referred to the PDA as "kit" even before the equipment had been issued and, once issued, they tended to judge the system as a composite and, unless encouraged to, they generally did not disaggregate the kit. As a result of some of the problems which had been encountered during the SPOC stage of the project, officers generally, were somewhat cautious about the kit and what it could do for them.

To encourage users to disaggregate the kit, I sought their perceptions on four main aspects of the kit: (i) hardware and physical, (ii) carrier, (iii) applications, and (iv) systems. I have summarised officers' views of the kit below in Figure 6.4. Figure 6.4 illustrates two major subdivisions – one dealing with issues which I have categorised as *Negative Issues about the kit*, and the other dealing with issues which I have categorised as *Positive issues about the kit*. In addition to these, Figure 6.4 shows a set of issues regarding the size of the equipment, which I have categorised as *Size*, together with a set of issues about safety, which I have categorised as *Safety*. Further to this, there are two specific areas of contradiction or tension which I have

highlighted in Figure 6.4, and these relate to the potential with regard to the reduction of bureaucracy and to the prevalence of use.

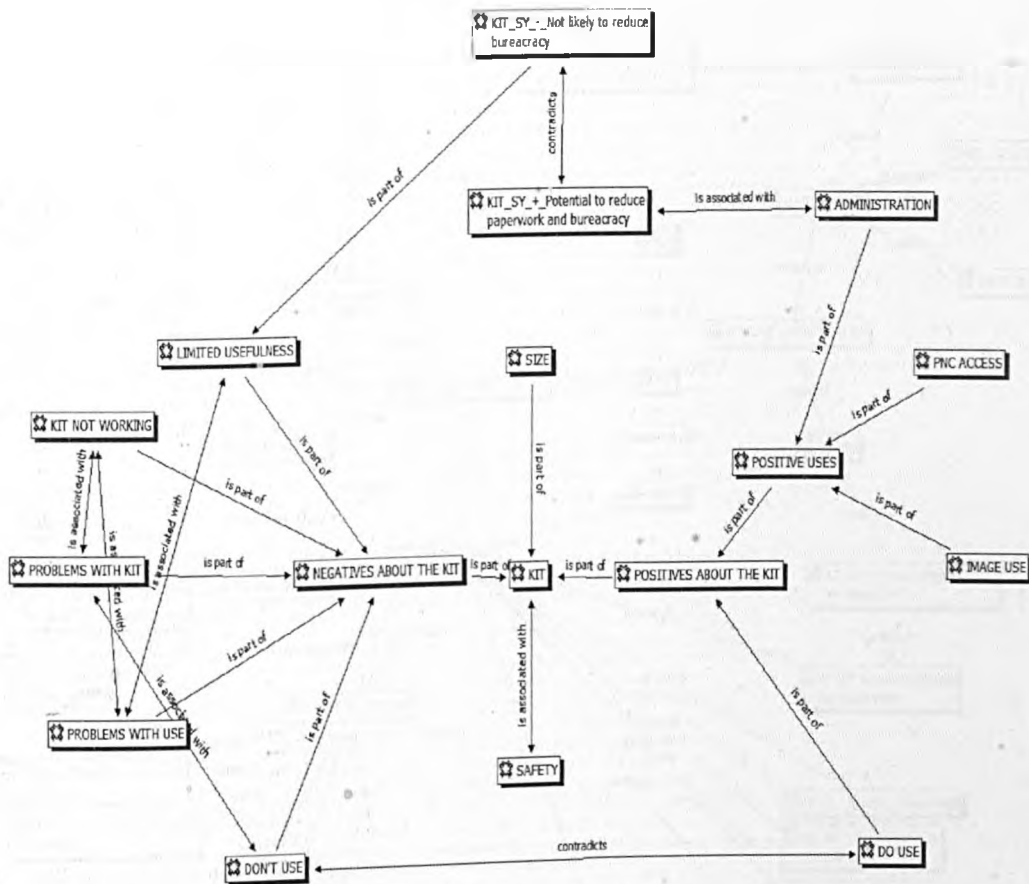


Figure 6.4: Perceptions of the kit – overview (Trial)

### Negative issues

Officers reported specific problems with equipment not working and these are highlighted in the four categories I formed to represent the key negative issues: *Kit not working*; *Problems with kit*; *Limited usefulness*; and *Problems with use*. These four categories relate to a fifth category which I named *Don't use*. The category *Don't use* is more than simply a summation of the four aforementioned areas which are associated with it. It has quotations and issues attached directly to it which do not fit the other four categories. Each of these categories, together with the associated issues, is detailed below in Figure 6.5.

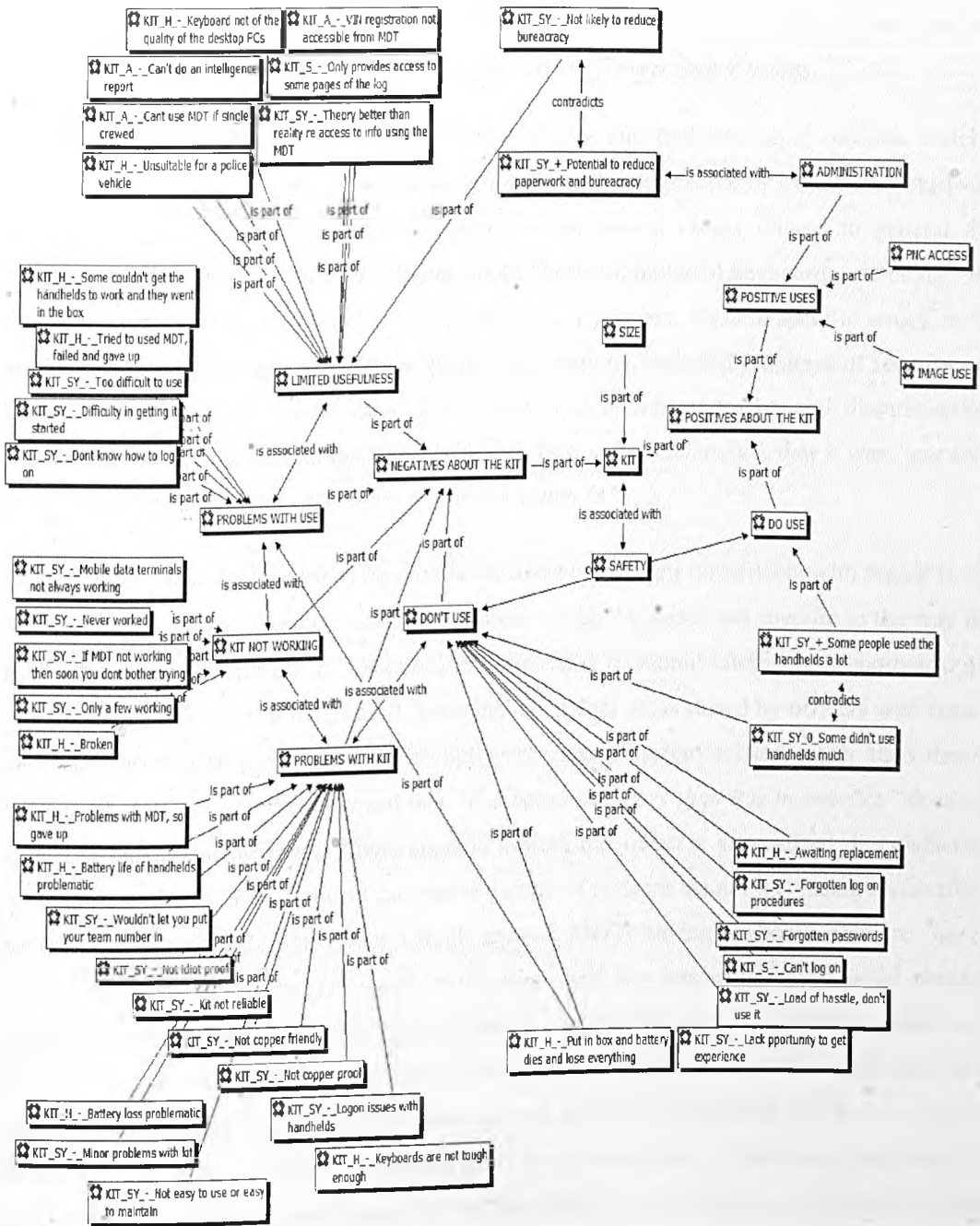


Figure 6.5: Negative perceptions of the kit (Trial)

The category, *Kit not working*, represents officers' comments about occasions when equipment failed, or was perceived to fail, in its entirety. Officers encountered a significant number of problems with kit which simply did not deliver any of the functionality which they required, or which failed during use. The project team had significant problems with some of the back-office architecture as well as contractual issues with their suppliers. The effect of this was that many of the systems were unreliable and some failed on a regular basis. ICT staff tended not to provide users with an understanding of where and when faults had occurred - officers simply knew that they had a piece of equipment which had failed. As a result, officers started to view the technology as a whole as being unreliable and, therefore, not worth bothering with. As one

officer commented "if it isn't working for some time well, you try it a few times, and then you just get used to doing without. And after a while you don't even bother trying."

The category, *Problems with the kit*, represents failures and problems short of those which I categorised as *Kit not working*. Officers raised a range of issues some of which were hardware related, some related to the design of specific systems and others related to general and relatively unfocused dissatisfaction. Issues about hardware included keyboards not being "not tough enough", problems with battery life, and reliability issues. System specific issues, at the level of general architecture rather than specific applications, included problems of security and log in. There were also some general comments which indicated a general dissatisfaction. These included comments that the equipment was "not copper friendly", that it was "not idiot proof" and that it was "not easy to use or easy to maintain".

The category, *Limited Usefulness*, represents the areas of concern for officers with regard to the systems, rather than the device. Some of the areas which are raised are specific to the way the back-office systems were set up, for example the inability to submit intelligence reports had not been *designed in* as part of the desired functionality. Other areas raised by officers with regard to limited usefulness were less specific but were clearly system related rather than device related. So, for example, the comment that "it is better in theory than it is in practice" does not reflect dissatisfaction with any single specific system but rather a generalised dissatisfaction with the device as "Kit". Officers saw the key areas of concern as, not increasing their safety, not being able to use MDTs or PDAs if single crewed, MDTs having keyboards that are "not of a quality to be able to type [in data] in the same way [as one would have in a] desktop terminal" and having screens that are only useful for allowing you to "delete emails" (as opposed to responding, writing, and sending emails). They also criticised the kit because they could not use it to submit intelligence report forms or access VIN numbers, and because it only provided access to the "first page of the log, plus the last two pages" (which was described as a "real irritant"). A less focused limitation, but nonetheless very real to the users, was that the kit did not allow them the access they really wanted to have. In respect of this an officer commented:

*"The actual functionality, the things that we can get access to on them is pretty good in theory but in practice you don't get it; it would be nice to have full access to [force intelligence system but in practice you don't get it; it would be nice to have full access to [force intelligence system and name], to be able to input intelligence reports and to use the [custody images] system, and access to warrants - an up-to-date list of warrants with names and images would be absolutely cracking". (PCF OIS N 6)*

The category, *Problems with use*, represents officers' concerns about their ability to actually use the equipment and is primarily focused on problems encountered with using the equipment in the operational situations. Officers gave various reasons for not being able to use the kit. The most common reason given was not knowing how to log on, but other reasons were that the kit was "too difficult to use", letting the battery die, not being able to work the kit, trying to use the

kit, failing and giving up (e.g., *"I tried to use the mobile data terminals in cars and failed so I gave up"*). The reasons for not being able to use the kit were ones that could have been addressed and, once again, the link between not being successful in using the kit and giving up is apparent. The category, *Don't use it*, represents officers' comments that they do not use the kit or they do not use it very much. Various reasons were given for not using the kit such as forgetting logon procedures, forgetting passwords, not getting the experience of using it, awaiting a replacement kit, using them *"is just a load of hassle"*, letting the battery die and having *"lost everything on it"*. The significant issue in this category is how officers were deterred from using the kit because of one or more factors that could have been addressed easily. For instance, a participant described his inactivity in using the kit in the following way - *"I've never really got the hang of the logging in or had the opportunity to get the experience and so I've never really bothered to use it that much"*. The officer concerned could easily have been reminded of the logon procedures and provided with opportunities to use the kit, and indeed could have sought the information needed and the opportunities to use the kit - but clearly did not. This implies that some officers had an attitude which did not facilitate their use of the kit. Officers identified quite a lot of areas of concern and, generally, felt that the equipment they had been given was failing to live up to the potential and, indeed, failing to live up to what the Force had promised.

There are two specific areas of contradiction - the first is that users, in discussing limited usefulness of the equipment as issued, commented that the kit is unlikely to be able to *"reduce bureaucracy"* and it was explained by an officer that *"they may allow you to do the bureaucratic things faster but the systems need to be redesigned if we are actually going to get rid of some of the bureaucracy"*. However, there were also diametrically opposed comments from a number of users with regard to the potential for the devices to reduce paperwork and bureaucracy in the future. The second area of contradiction is around safety with some officers making comments which indicated that they did not use the device in certain situations because they felt it compromised safety. Other users, however, have also identified, in the same situations, that they believe that the use of this kit can materially improve their safety.

### Positive issues

Whilst officers did identify many concerns and issues with the use of the equipment, they were not, however, totally critical. They identified positive aspects of the kit which I have categorised as *Positives about the kit* and summarised in Figure 6.6 below. Positive comments about the kit, fall into three key ideas together with several individual comments which I have shown in Figure 6.6 as *Positive uses*.

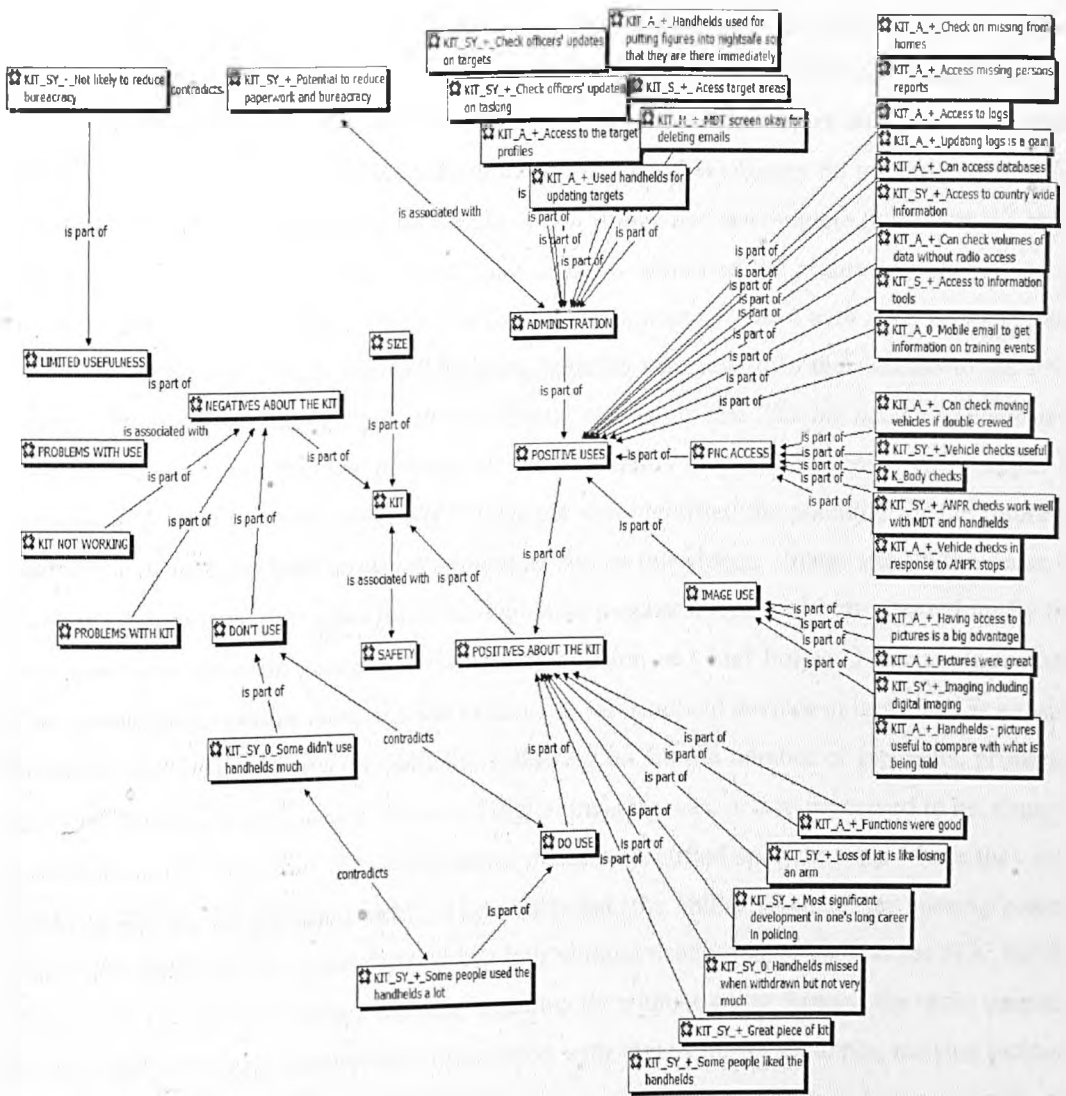


Figure 6.6: Positive perceptions of kit (Trial)

Officers identified positive uses which I categorised into three categories – administration, PNC access, and image use. The category, *Administration*, reflects officers' views that the equipment they had been given provided them with the ability to discharge administrative tasks or to have access to administrative information. They identified a number of areas where the ability to check information whilst out of the station was a positive advantage; these included checking the officers' updates on targets, checking updates on tasking, getting access to target areas and getting access to target profiles. They also identified two areas of input where they believe the equipment was making a positive contribution and these were the ability to update targets whilst out of the station so that supervisors and other officers were able to access the information, and the ability to put figures into the 'Night Safe' system so that they are accessible immediately. The night safe system is concerned with safety for those returning late from clubs and similar venues and was normally updated over the radio, when this was possible, by information intermediaries in the control room. The category, *PNC access*, is about the kit providing



officers with direct access to the PNC systems without having to go through an information intermediary in the control room. Checking PNC is a very common task for officers and one which, when the radio is busy, may take up far more time than the actual basic transaction needs. The ability to access these systems directly means that officers do not have to wait for access and that they can choose to do checks which if they had to complete them over the radio they may have chosen not to do. Specifically officers identified the ability to *"check moving vehicles when you are double crewed"*, to use the equipment to *"work with ANP systems"*, and the ability to do *"more body checks"* as being benefits with regard to their access to the PNC system. The category, *image use*, reflects officers' comments that *"having access to pictures is a big advantage"* and that the pictures on the handhelds in particular are *"really useful to compare with what you are being told"*. Officers also identified the potential for the future in making use of imaging both as still photographs and as full videos. Image use, in the sense of taking images and making use of them for evidential purposes, was subject to restrictions by the force who were awaiting guidance from the Association of Chief Police Officers. Individual officers were also cautious about the use of cameras on handheld devices in large part as a result of considerable levels of adverse publicity following on from a number of incidents, primarily involving paramedic staff, where the use of digital imaging was, or was perceived to be, abused. In addition to the categories discussed above, officers identified specific areas where they saw benefit in the use of this equipment. These included: the ability to check on missing person reports, the ability to have access to incident logs without needing to go back to the FCC for the information, the ability to update incident logs directly without going through the radio channel, and the ability to access countywide information with regard to, for example, missing persons reports. The officers also identified the ability to check volumes of data as being a significant benefit. By this they meant that they could carry out numbers of checks which they would not have carried out if they had to take up time on the radio to do so. For example one officer cited the ability to check cars in the local college car park where, by dint of experience, he had learned that there was a higher than normal proportion of vehicles which were not insured, not taxed or which had not passed the MOT test. Before having a PDA this officer said that he could not check all of the vehicles he wanted to because he knew that he was taking up *"more than my fair share"* of time on the radio. A further set of specific positives were also raised by the users, and I have attached these to the category of positives about kit. Users commented that the functions with which they were provided were appropriate and valuable, and a small number of users, primarily from traffic assignments made extremely positive comments. These comments were that the kit was *"a great piece of kit"*, the functions were good, and that for some the kit had become so much part of how they now worked that *"when the kit is not available it's like having your right arm chopped off"*. It was also described by two Sergeants in Road Traffic Policing as the *"most significant development"* which they have had during their careers in traffic policing.

### 6.2.3 Officers' perceptions of the infrastructure

Officers' views about the infrastructure are summarised in Figure 6.7 below. The officers involved in the trial were generally quite critical about the level of infrastructure which supported the issue and use of the equipment they were given.

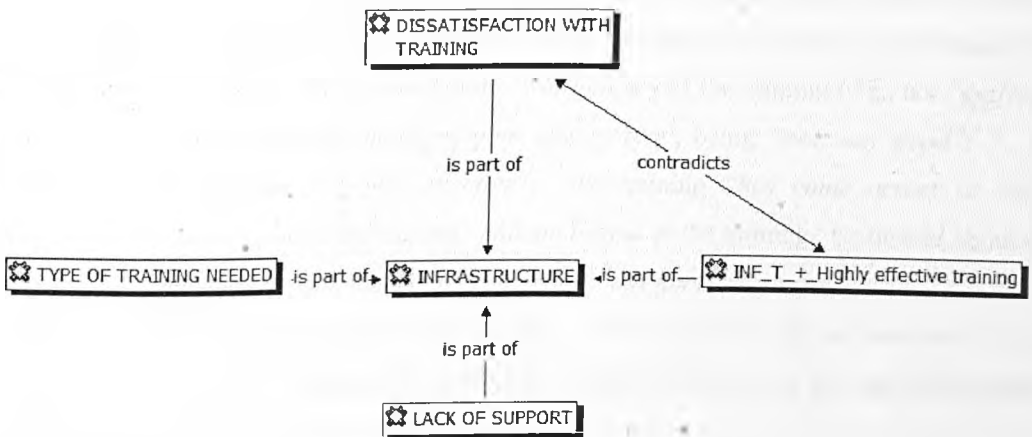


Figure 6.7: Perceptions about the infrastructure – overview (Trial)

Figure 6.7 above identifies three main issues about the infrastructure. Two are overwhelmingly critical and express, firstly, concern at what the users saw as insufficient support, and I have categorised these as *Lack of support*, and secondly, their discontent with training, which I have categorised as *Dissatisfaction with training*. Officers were constructive and suggested the type of training they believed was needed and this is the third main issue. I categorised their suggestions as *Type of training needed*. A minority view was also expressed that the training was very effective and I have presented it in Figure 6.8 above as *Highly effective training*. I have provided more detail on each of the three main issues relating to the infrastructure in Figure 6.8 below, and a discussion of each.

The category, *Lack of support*, reflects some officers' dissatisfaction with the level of support they had. The lack of support stemmed from not being able to find someone to give assistance when needed, for example, one participant noted:

*"I know that people were supposed to help train each other, and that there were some people who got extra training to help people, but in practice everybody's got a job to do and finding somebody is hard enough - but finding them when you need to find them, and when they have time to help you with this is next to impossible". (PC M YISN 8)*

The dissatisfaction was also due to difficulties encountered when trying to report problems with the kit – the reporting of problems could only be done individually and not on a divisional basis

– as one participant explained:

*"... when we tried to put in a list, to get it together and say 'look here's a whole load of them that needs them attention', we were told it has to be the individual officers who report things so we can't do it as a division, we can't schedule to get the kit brought up to speed because it all has to be done piecemeal rather than done and coordinated at a Divisional level". (S M OIS 2)*

The support system clearly did not match the needs of the users of the mobile technology and this was indicated by the comment from one participant who described getting his mobile device set up after having lost the data due to the battery being allowed to go "down" and losing "everything on it" as a result, as "just more hassle than it was worth to send it off to headquarters to get it all set up again". The category, *Dissatisfaction with training*, represents officers' comments that they were dissatisfied with the training they received. Their reasons for dissatisfaction were varied. They included the insufficiency of the training (e.g., not "get[ting] a lot of training"), the training being of poor quality (e.g., being "not very good"; "...the training that we had was not very effective"; the training "has come across as being disorganised"), the content of the training, and the format of the training. Criticisms about the content of the training were that it was "too general", "did not seem to concentrate on how the technology was actually used in the real world", "did not cover the full potential of the system", there was a lack of "updating information" and that the training was not differentiated according to the user and, as one officer pointed out:

*"... some people are pretty good with technology, they'll have a computer at home and they'll have all the gadgets, and there are some people here who can barely use e-mail and they regard that as a big challenge.... but the training was the same for everyone; so for some people it was Yawn-yawn, and for some people they might as well have been talking Greek". (PC M OIS N 12)*

The format of the training was criticised for being "most[ly] ... done on a cascade so a few people were trained and maybe they were trained properly but they certainly didn't pass it on to everybody else as well as could be". Another criticism of the cascading of the training was that "the realities of life on division mean that very often this is done sketchily or it isn't done at all". The category, *Type of training needed*, reflects my findings that some officers described the kind of training they felt was needed. They mentioned there being scope to deliver some training in a mobile way, that training could be differentiated to take account of the fact that users are "starting from different places and will have different levels of comfort with technology" and that training is most effective for operational users when it is "operational" and "focused on jobs". Overall, the majority of participants were dissatisfied with the infrastructure that was supposed to enable the trial. However, there were a small number of positive comments from respondents who felt that the training had been effective and appropriate for their needs.

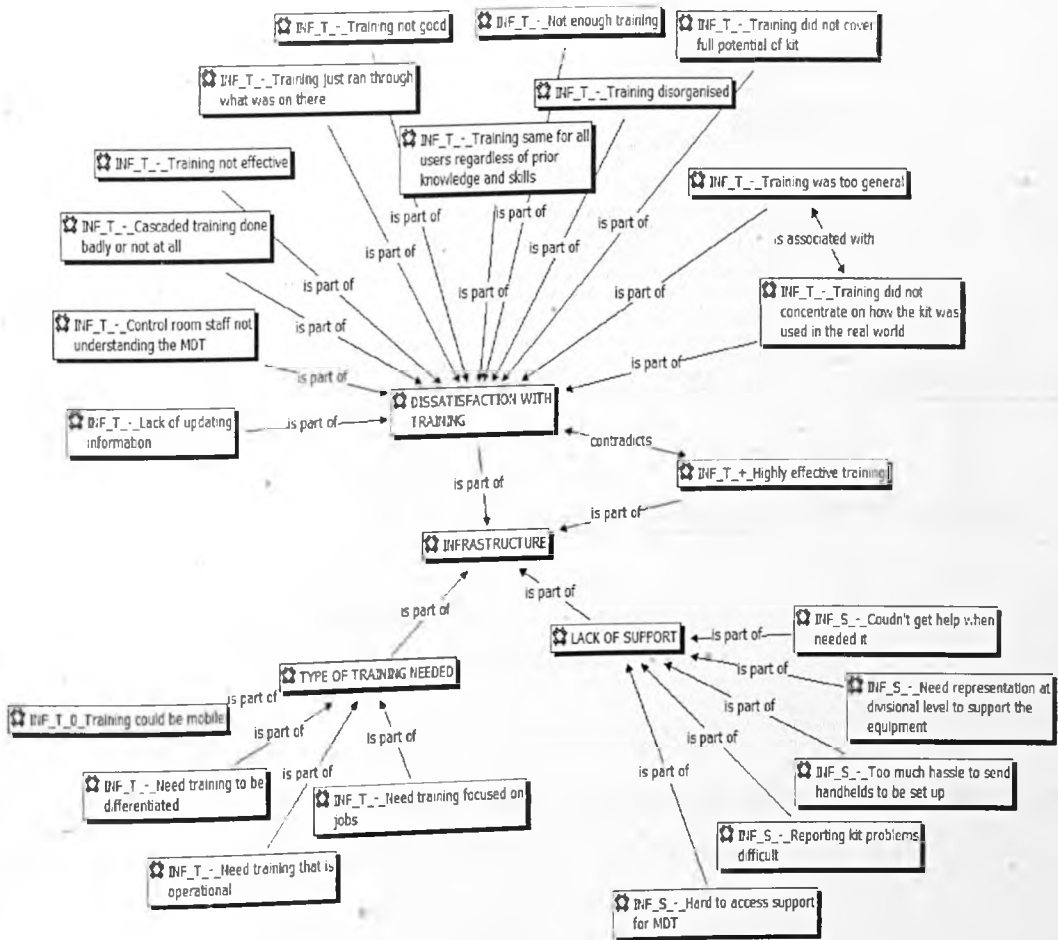


Figure 6.8: Perceptions of the infrastructure – expanded network (Trial)

### 6.3 WORK PRACTICE

Views about the way the technology changed the job roles are summarised in Figure 6.9 below which shows there were many ways in which officers' perceived the job to have changed as a result of the introduction of the new technology. This area of work practices, and the impact of the technology on the way that officers undertook their job roles, was the one which attracted the most comment during the trial. Figure 6.9 above shows three key areas. The first area consists of three linked categories - *Informational gains*, *Decision-making and risk*, and *Safety*. The second area deals with issues I have categorised as *Where*, *When*, *Whom* and *Content*, and the third area deals with efficiency and effectiveness gains and the categories in this area are: *Increased productivity*, *Efficiency gains*, *Faster pace*, *Quality gains*, *Improved workflow*, *Process and tools* and *Can work autonomously*. The final area consists of one category, *Feelings about the job*, and a second, *Visible* (which is a category that is linked to the categories *Increased productivity* and *Where*). I have discussed each of the areas and associated categories below.

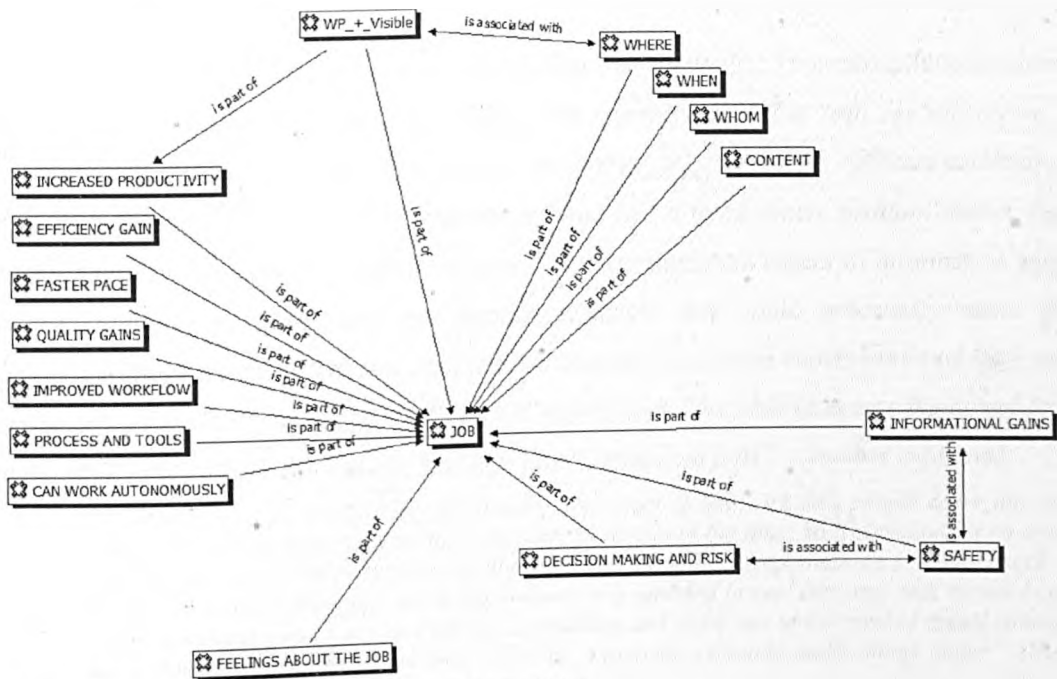


Figure 6.9: Impact of MICT on job roles – overview (Trial)

### Informational gains

The most commonly mentioned change area was informational gains and there were several aspects to this as shown in Figure 6.10 below.

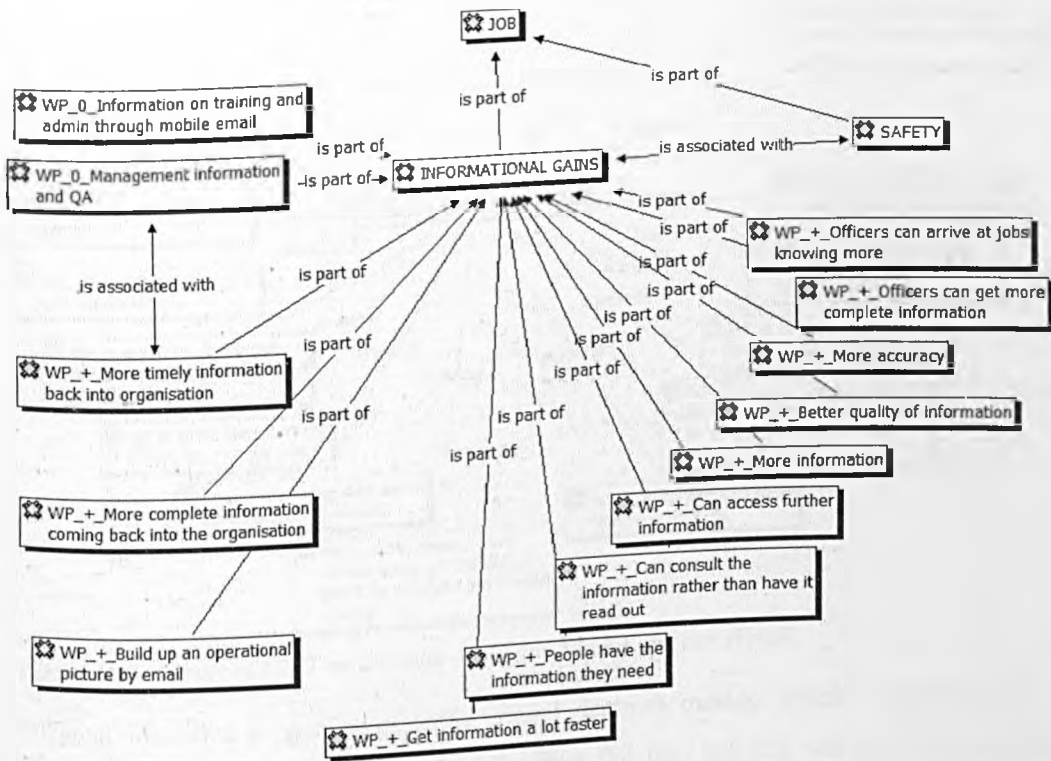


Figure 6.10: Impact of MICT on job roles – informational gain (Trial)

First, was the idea that “better” quality information was available. This relates to information being “more complete” and “more accurate”. The second idea is that “officers will arrive at jobs knowing more” and therefore “they know what they’re going into”. Officers commented that they can “get the information a lot faster” and in “a more timely fashion” rather than having to “wait for access to the radio system”. A third important aspect of information gains is the management information that became available that could potentially make the supervisory process easier. For instance, in a focus group discussion supervisors said they saw the potential for supervision to become easier if supervisors “are able to access the actual logs to see what officers have entered and how they have carried out jobs”. Another explained:

*“A lot of what I do is checking and quality assurance of the work that people carry out and potentially mobile data gives me the possibility to do this at the time; so if somebody is on a job and it’s sensitive I don’t have to remember to go and find them and check on it; I can check at the time, I can see what they are doing because it is updated in real time and that means I can check compliance, and it means I can update tasking and so for me, at the level of actual control, management information rather than statistics, yes it can certainly make things better”.* (M F OIS 1)

### Decision-making and risk

Linked to information gains are the ideas that officers can engage in decision making and risk analysis and there were several aspects to this idea as shown in Figure 6.11 below.

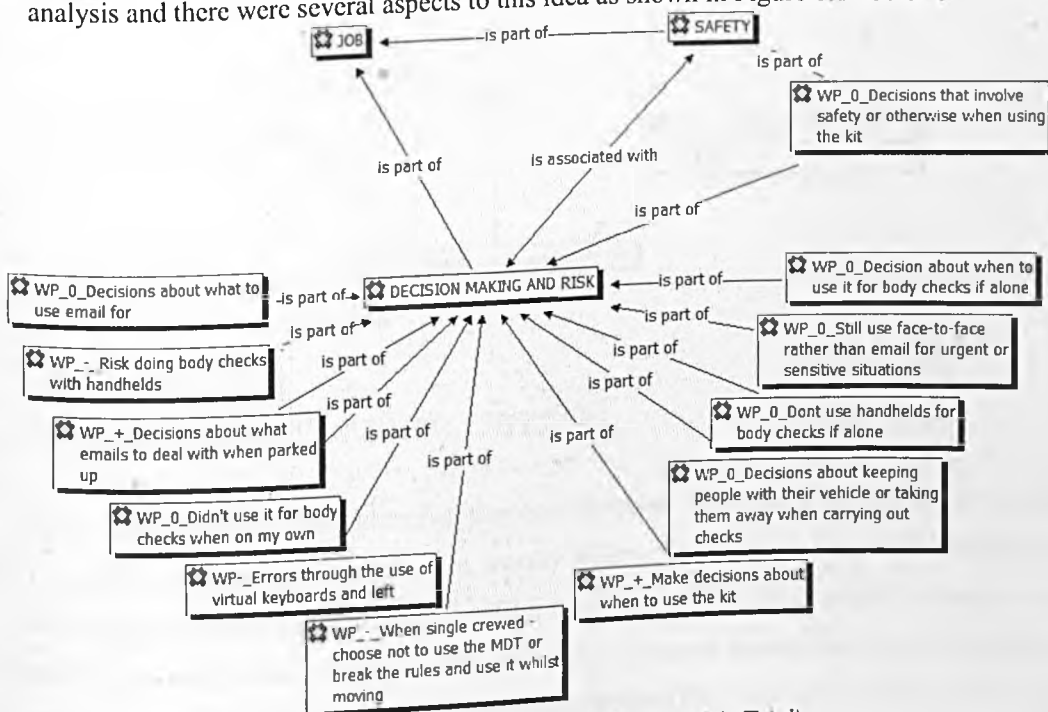


Figure 6.11: Impact of MICT on job roles – decision making and risk (Trial)

Officers identified a number of areas around decision making which are affected by the equipment they have been given. Broadly these fall into two key sets of areas; the first is concerned with decisions about when to use the equipment and the second deals with the ability to make decisions based on the information provided to the officers by the systems they have been given. Police officers are used to evaluating risk in situations and will undertake risk

assessments, often almost unconsciously, as a routine part of going into any situation. Such risk assessments are rarely formal although in the event of some problems occurring they may well be formalised later. Officers identified that there are occasions when it is clearly not appropriate to make use of a hand-held terminal and they also identified that this is clearly associated with safety (discussed below).

### Safety

Safety for police officers is always a vexed issue. Almost by definition many of the situations in which they find themselves present some level of risk or danger. The use of the equipment, brought with it safety issues, as summarised in Figure 6.12 below.

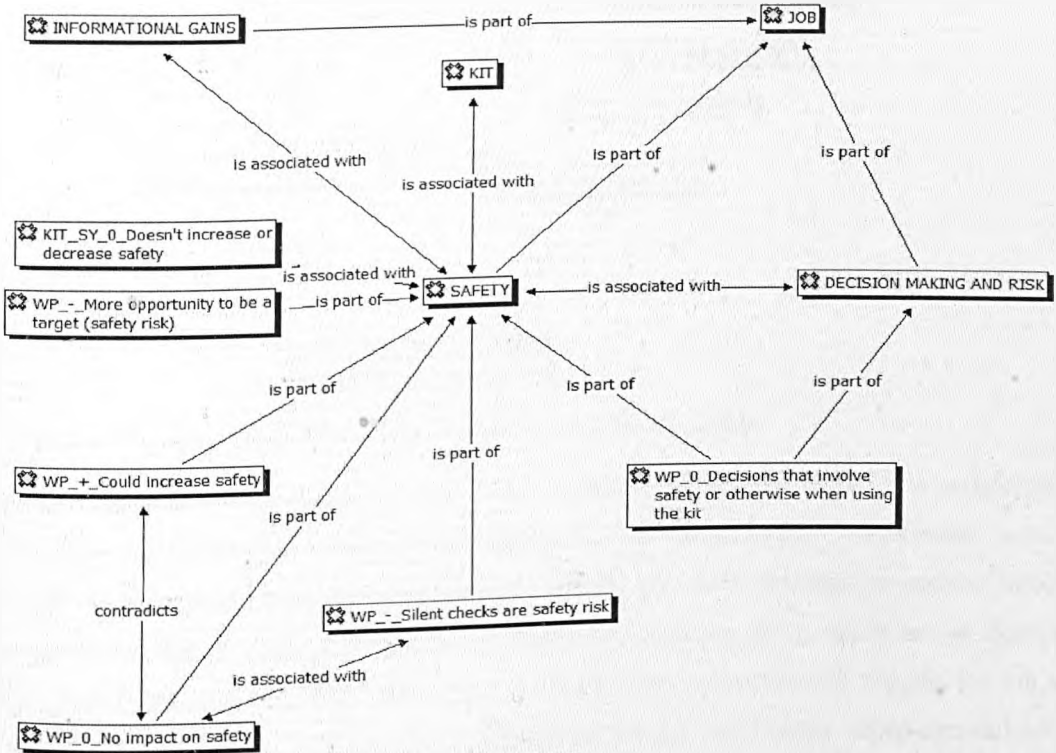


Figure 6.12: Impact of MICT on job roles – safety (Trial)

Users during the trial clearly identified that there are some situations where the use of hand-held or mobile equipment is not appropriate, usually where officers are dealing with somebody who either presents a clear safety risk to the officer or to themselves. There are also situations where having more information allows an officer to carry out a risk assessment more effectively and thus to be safer in the situation. As happened with the TPOC and SPOC stages, safety issues tended to be raised at the initial stages of the trial and then reduced. As one officer commented:

*“Really it’s a matter of common sense. There are some times when you would use this [PDA] because you’re not in danger and if you know more about what you are going into then you will probably handle it better. Equally there are some situations where you would be an idiot to take your eyes off somebody. In between it’s a judgement call, but then that’s always been the case and, yes, sometimes people will get it wrong but, when it really comes down to it, having more information, or the ability to get it, can’t be a bad thing.” (PC F OIS R 5)*

## Feelings towards the job

Officers commented on their feelings towards the job, and I have summarised these in Figure 6.13 below. There were both positive feelings as well as worries articulated.

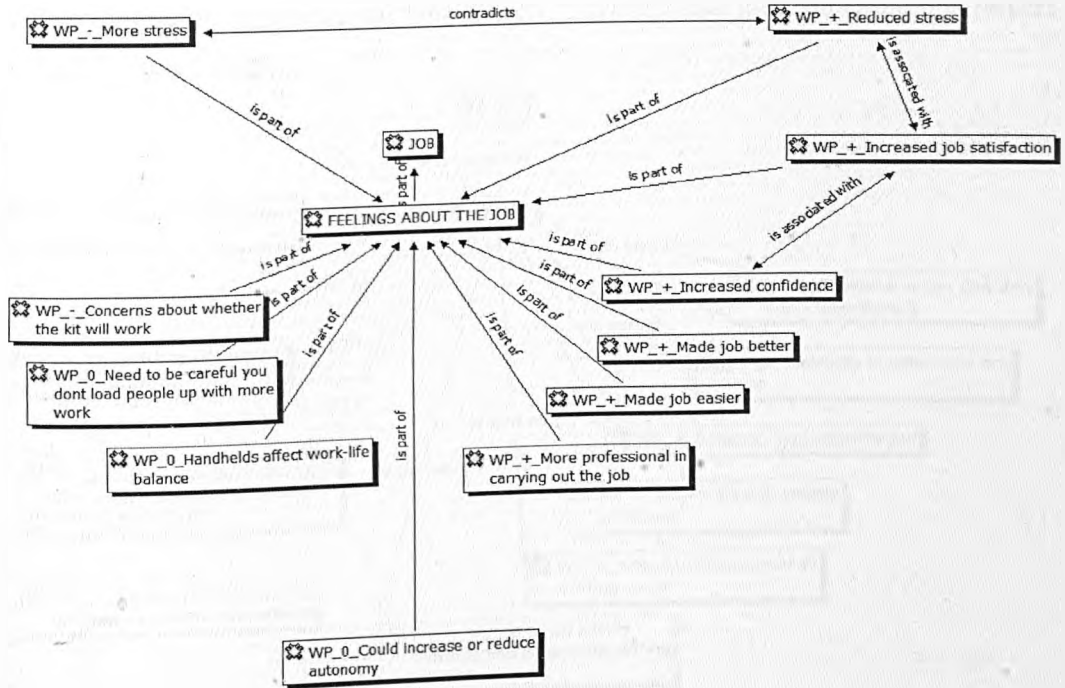


Figure 6.13: Impact of MICT on job roles – feelings about the job (Trial)

The feelings that were mentioned most, were increased “confidence” and “job satisfaction”, however there were others that were mentioned a few times such as the job was made “easier”, “better” and less stressful. These feelings towards the job can be described as positive feelings in the sense that the technology had made officers feel more positive towards the job than they previously felt, however, there were a few comments that indicated some felt that the job had changed for the worse. For instance, some felt that the job had become more stressful rather than less stressful; one worried about whether or not the kit would work saying that “at the moment you can't be confident in the kit [as] it isn't reliable ... [due to] logon issues and so your heart is in your mouth as to whether it will actually work”, and one felt that the mobile technology affected the work-life balance for the worse because the PDAs could, and probably would, be “taken home”.

## When, where, whom and content

Officers reported changes in **when**, **where**, with/by **whom**, and the **content** of the work undertaken as a result of using the PDAs. These issues are summarised in Figures 6.14 to 6.17. The issues relating to content deal with potential changes in the nature and management of work whereas the issues relating to whom, when and where deal with shifts in the way existing work is managed by users. There are, clearly, a significant number of areas of overlap between these



issues but I felt that the issue of difference in the content of work was sufficiently different to be noted and treated somewhat separately.

### When

Figure 6.14 below summarises the how officers' perceived their jobs had changed in respect of when work is undertaken.

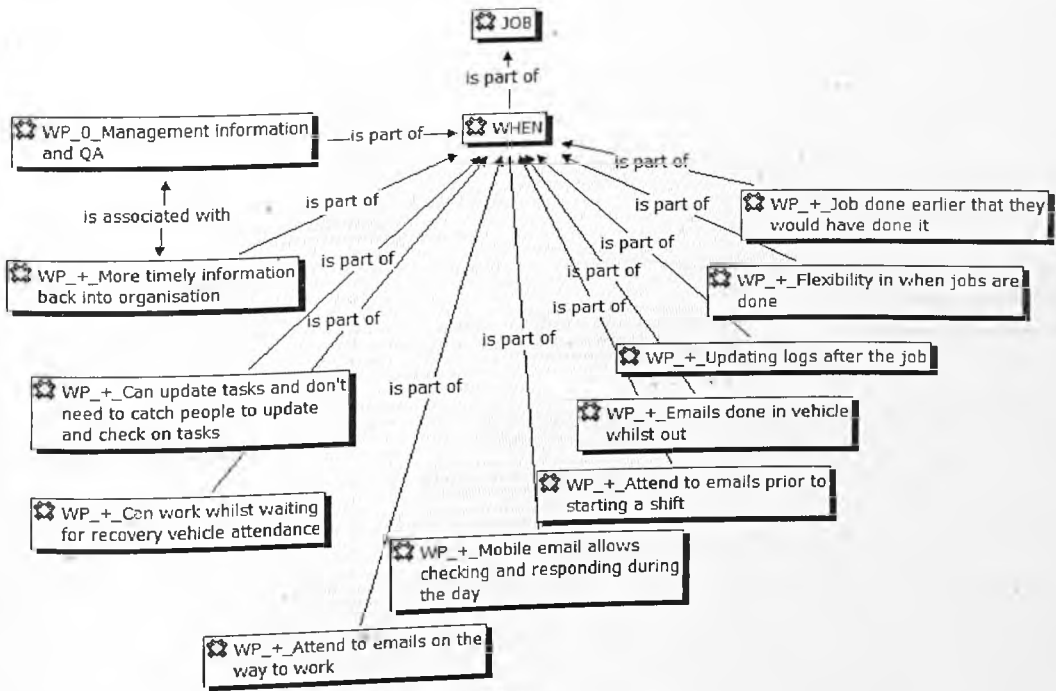


Figure 6.14: Impact of MICT on job roles - 'When' issues (Trial)

Figure 6.14 above illustrates four main areas - the ability to: deal with e-mail, access information out from the centre of the organisation, provide information in from the field to the centre of the organisation, and to work flexibly, making a choice as to when tasks are done rather than having this dictated by the availability of equipment, or systems within a police station or the non availability of this equipment while out of the police station. In discussing the ability to deal with e-mail there is a strong link with the issue of flexibility with officers identifying that e-mails, which officers would have had to remain in a police station to deal with, can now be dealt with whilst out of the police station. One specific comment with regard to e-mails, made by supervisor, was that the availability of the PDA meant that the officer could check emails during the journey into work and be aware of some of the issues which would face him on arrival at work. With regard to the ability to get information into the centre of the organisation from the field, officers noted that this information could be provided in a more timely manner and there was also a link between provision of such information and the ability to work flexibly with officers able to make use of time which would otherwise not have been as productive without access to the central systems. A specific example was given by one officer of time spent acting as a scene guard (i.e., somebody who protects a crime scene in order to prevent the public gaining access before scientific support have been able to carry out



the officer will take up more time than purely that which is required to complete the task which they have returned for. One user commented:

*“When you come back in here people grab you. It might be something they need to tell you, it might be something they want you to tell them or it might just be that because they see you kicking about in here they think you’re a spare body and try to pull you into something of theirs. But the fact is a five-minute job in here is never a five-minute job.” (PC M OIS N 17)*

As already noted above with regard to the issues of when work is completed, officers particularly noted that e-mails, which were formerly a significant anchor to the police station, could now be completed whilst out of the station. They did note, however, that it is not practical to compose lengthy e-mails using a small virtual keyboard or handwriting recognition. Most users indicated that e-mails can be read quite comfortably on the PDA screen, that short responses, up to maybe eight or ten words, could be quite comfortably composed and sent, but that anything larger or more complex would probably still wait until the officer had access to a full sized keyboard and ergonomically acceptable workstation within the police station. Alternatively, if the matter was urgent it could potentially be dealt with by a phone call or radio conversation.

It should also be noted that a number of users, albeit very much a minority, expressed the view that while the PDA systems in particular have the potential to allow users to reduce the amount of time spent in police stations the reality was that there are more drivers for officers to return to the station than simply to complete administrative tasks. These officers noted that there is a social component to return to the police station and that inclement weather was also more likely to make people feel that it was more appropriate to return to the police station to complete some tasks.

### Whom

Figure 6.16 below summarises the how officers’ perceived their jobs had changed in respect of who completes tasks.

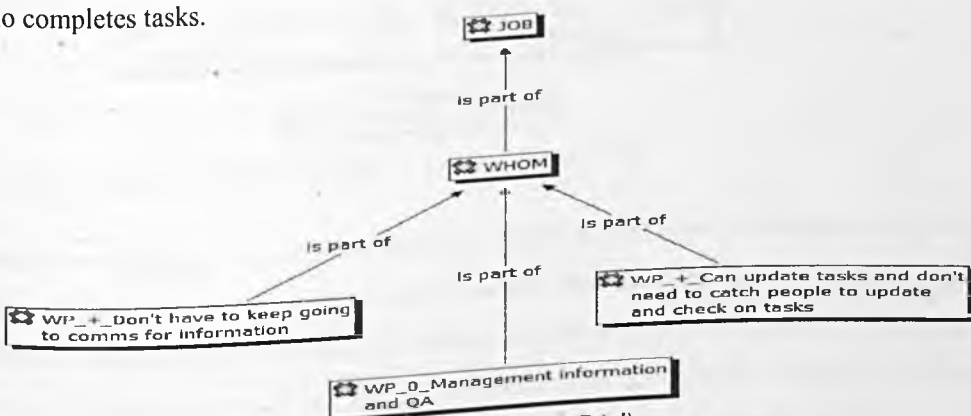


Figure 6.16: Impact of MICT on job roles – ‘Whom’ issues (Trial)

The issues with regard to who completes tasks attracted relatively congruent comments which centre around three areas. The first is that officers are now able to access information

independently from central systems rather than having to use information intermediaries either in police stations or, more commonly, within the FCC and radio function. The second is that a significant amount of management information and quality assurance processes can now be undertaken directly by supervisors who can access systems which officers have updated whilst out in the field (at the moment many officers and supervisors spend a significant amount of time looking for each other in order to be able to exchange information which is required for quality assurance purposes). The third area is the ability for the officers themselves to update systems and provide information in to the organisation from the field. This information can be provided in a more timely manner and, as already noted, both reduces the need to use information intermediaries within the organisation and the need to update managers and supervisors at the end of a shift or at the end of a job.

### Content

Figure 6.17 below summarises how officers' perceived their jobs had changed in respect of job content.

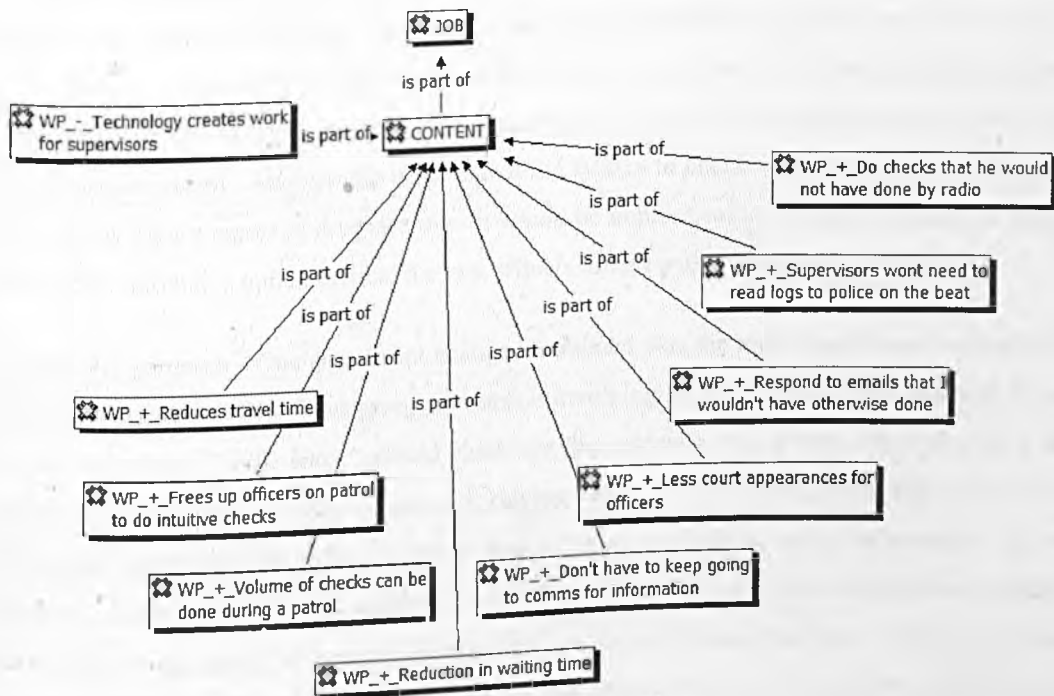


Figure 6.17: Impact of MICT on job roles – 'Content' issues (Trial)

I believe the issues of content are qualitatively different from those relating to *where*, *when* and *whom* discussed above. The issues about *content*, although they may be relatively minor at present, indicate changes that represent shifts in the nature of work as opposed to changes in the way that the work is done. There are four key positive areas of change which officers identified - these are what I have termed below *Wait and fill*, *Intuitive checks and volume*, *Court Appearances*, and *Email and other jobs* - together with some factors that centre around the work of the supervisors.

*Wait and fill* - Users identified that the nature of the work carried out whilst out of the station was affected by the ability to reduce the amount of time spent waiting to access information and to use what officers referred to as "slow time" or "dead time" more productively than had been previously done. Whilst this is partly an issue about the volume of work which is done, it also changes the nature of the working day and the rhythm of officers' interactions with the public, central systems, information intermediaries and the supervisory function. Reduced travelling time, reduced waiting time, not having to go to "Comms for information", all mean that officers are seeing a concentration of work and a shift in established patterns of activity.

*Intuitive checks and volume* - Officers can make "intuitive checks" on vehicles, addresses or people - done on the basis of what officers referred to as a hunch, intuition or "copper's nose". When the radio is quiet officers may carry out such intuitive checks over the radio using an information intermediary to access systems such as the PNC, QAS system, and the force intelligence system. However, officers tend to be reluctant to take up too much operator time on such speculative checks even when the radio is quiet. When the radio is busy with urgent calls they are even more disinclined to take up radio time on checks for which they do not have a clear basis. Nonetheless, when carried out in volume, such checks can produce either positive results in terms of detections or additional intelligence which can be added to the overall Force intelligence system. An example is the use of the system to check vehicles in a car park or on a motorway after a report of drug dealing. It would be impractical to do such a volume of checks over the radio but is quite practical for two officers armed with a PDA each to undertake.

*Court Appearances* - One significant change mentioned was the reduction in court appearances that officers made. In a focus group discussion involving traffic officers I was told that it used to be that those "in the know" would challenge the evidence of a police officer that they had been asked to produce driving documents; relying on the delay between being told to do so and the court appearance for failing to do so, which could be anything up to six months. As one officer commented "after six months a half decent brief can make you realise that you don't have a bleeping clue if it was the same person, unless you know them well". They estimated that most traffic officers could be making on the order of three to four court appearances a month with a total of up to ten court appearances for a typical traffic section in a given week. They now estimate that court appearances are down to "one every couple of weeks" and attribute this directly to the effect of using MICT.

*Email and other jobs* - Officers reported that there are some administrative tasks, notably e-mails, which are left to the end of the working day to see if there is any time left to deal with them. Often there is no 'spare time', as the end of the shift is taken up in other administrative tasks and, in any case, officers do not want to block the use of a terminal in a police station in order to deal with what they regard as administrative trivia. Being able to access e-mails on the

PDA system also means being able to respond to emails that may otherwise not have been seen, noted or responded to.

*Supervisory issues* - A change for Sergeants as result of using MICT is that is they no longer need to read logs to police on the beat as supervisors can “ask officers to look at logs while they’re out” and this “saves an awful lot of time”. This changes the job for the officers and supervisors, as supervisors do not need to be “glued to desks”.

Another factor significant for both officers and supervisors, although addressed from a supervisory viewpoint is that tasks (shown on the PDA system as either incident logs or crime management tasks) can be updated by officers so that the supervisors do not need to “catch people” to update and check on tasks. This also means that officers do not need to return to the station to update the tasks and the supervisors do not need to look out for them.

Whist all the changes to job content discussed above can be seen as positive changes, there was one participant, working in a supervisory role, who commented that “the technologies actually create work”. The participant gave examples of supervisors having to “sort out the issues” with the technology, “trying to liaise with headquarters”, “telling people and advising people how to handle problems” that “otherwise you wouldn’t have to do”.

Efficiency and effectiveness gains

I found three ideas about efficiency and effectiveness - improved workflow, autonomy, and increased productivity – and I have discussed each below.

*Improved workflow* relates primarily to the ability of the technology to give officers the potential to “smooth out some of the demand” in their working day and I have summarised the issues around this in Figure 6.18 below.

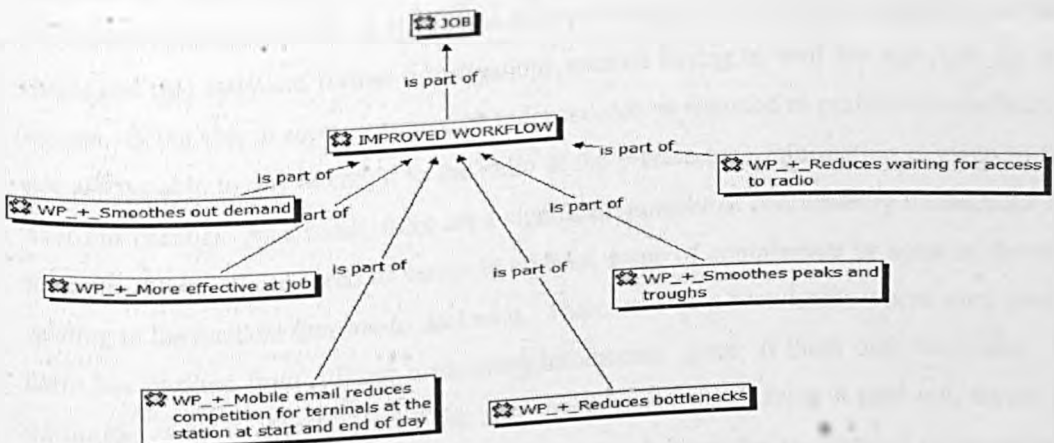


Figure 6.18: Impact of MICT on job roles – Improved workflow (Trial)

Officers identified two key areas where workflow was improved. The first was on the demand for computers in the police station so that “some of the bottlenecks when people are looking to get onto computers at the start and the end of the day” are reduced. The second was more concerned with the ability of officers to use “slow time” or “dead time” to progress tasks which otherwise would have had to wait until they had access to terminals in the station or be carried out via an information intermediary over the radio. As a result of reducing radio traffic, the system also has a smoothing effect on radio communications. Overall, officers commented that they felt that this improved workflow made them more effective, in part because they did not have to wait for information but could access information themselves.

*Autonomous working* relates to officer perceptions that they have more autonomy in the way in which they deal with work; the findings are shown in Figure 6.19 below and are concerned with information.

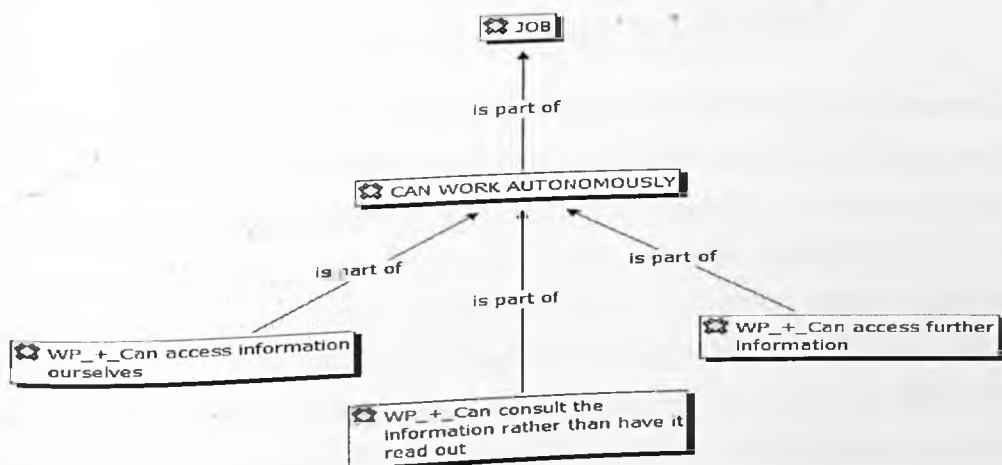


Figure 6.19: Impact of MICT on job roles – Autonomous working (Trial)

Officers commented on their ability to (i) access information independently rather than having to wait for access via an information intermediary, (ii) have the information in a semi-permanent form on a screen where they are able to consult it rather than having it read out to them, and (iii) carry out further investigations without having to wait for access to the radio system. Being able to access information independently is regarded as preferable as officers are not always able to pay attention to the radio at the precise time information is given to them over this channel. As a result, there are a significant number of confirmatory transactions over the radio where officers need to verify an address, name of complainant or some of the detail relating to the incident they are to deal with. There have also been issues where some level of harm has resulted from officers mishearing information given to them over the radio. The advantage of being able to consult the information rather than having it read out, means that officers can decide on what information they need and check the accuracy of information for themselves thus reducing the load on the FCC and improving information quality. Officers' ability to carry out further investigations without having to wait for access to the radio system

means that they are more able to progress transactions and to follow up intuitive questions, particularly at times when there is significant radio traffic.

*Increased productivity* relates to officers' perceptions that they can be more productive as a result of using MICT and I have summarised their ideas regarding this in Figure 6.20 below.

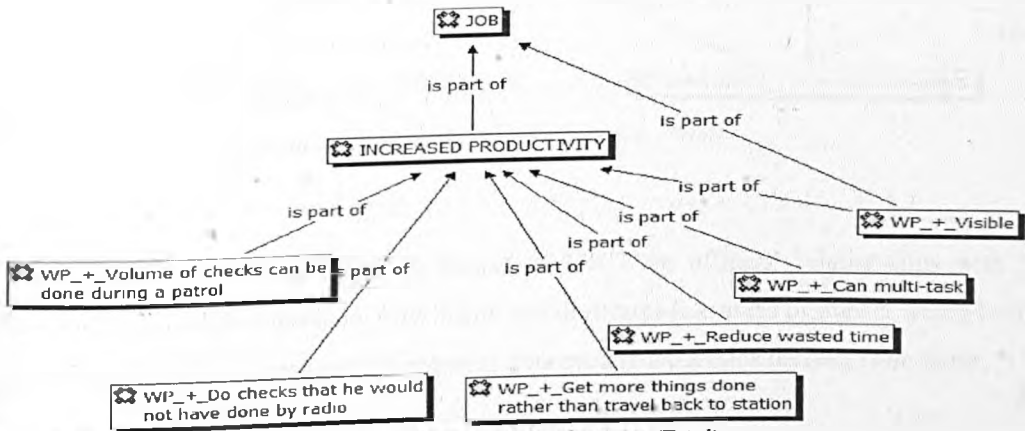


Figure 6.20: Impact of MICT on job roles –Increased Productivity (Trial)

There are six ideas displayed in Figure 6.20. Three are related to the idea of smoothing the workflow which I have discussed above, and are the ability to: reduce wasted time, multitask and progress issues which would otherwise have had to wait, and “*get more done rather than travel back to the station*”. Two relate to doing checks and are the ability to carry out without having to access the radio system and, equally, to carry out a greater volume of such checks including intuitive check. The sixth is related to officers' increased visibility as a result of not having to travel back to the police station to carry out tasks during the day or the shift. Officers have also identified that the mere fact of increased visibility is, in itself, a form of productivity gain. Even if the officer was not doing anything particularly productive in the sense of completing policing tasks they are, so to speak, more productive if idle out of the police station than idle in the police station.

### 6.4 RELATIONSHIPS

The use of MICT affected officers' relationships with people they came into contact with when undertaking their work. I found four groups with whom officers had relationships as shown in Figure 6.21 – immediate team relationship, wider team relationship, managers and supervisors relationship, and public relationship. Figure 6.21 also illustrates important linkages between the immediate team relationship and wider team relationship as well as between the immediate team relationship and public relationship. The two areas of *public as victims of crime* and *public as perpetrators of crime* have been conflated due to the relatively small volume of comment.



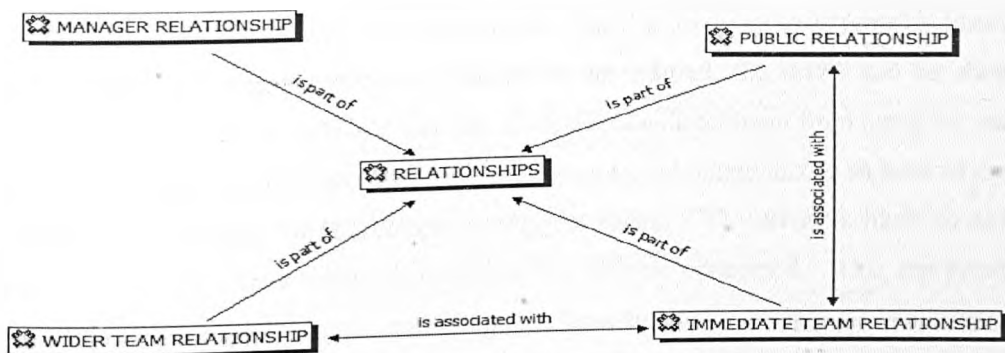


Figure 6.21: Impact of MICT on officers' relationships – overview (Trial)

### Immediate team

A summary of the findings regarding impact of MICT on officers' relationships with the immediate team is shown in Figure 6.22 below and illustrates five areas of impact which lead to higher efficacy and less stress and the potential improved relationships derived from these.

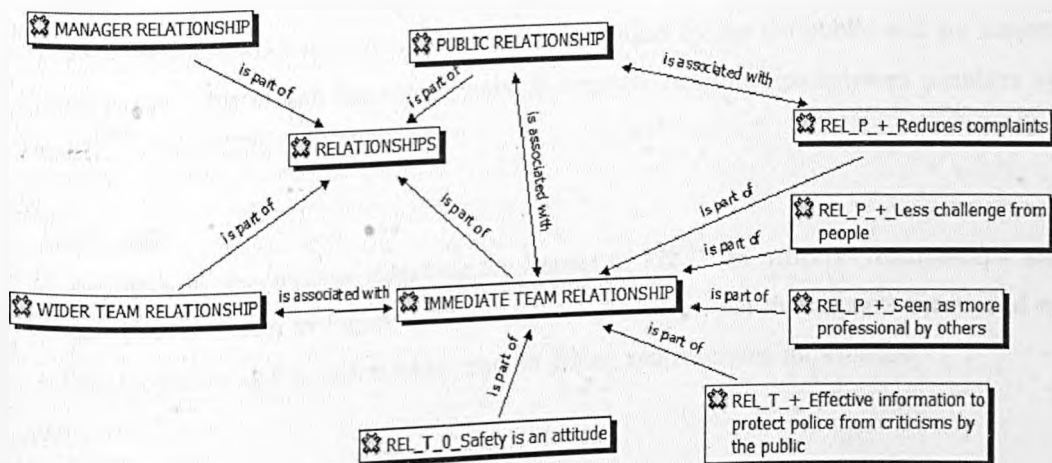


Figure 6.22: Relationships with the immediate team (Trial)

The most frequently mentioned impact was that complaints were reduced and officers gave examples of scenarios to illustrate how complaints could be reduced. For example, it was pointed out by one officer that the fact that people see the information on-screen has led to a reduced number of complains because people who would otherwise have "tried it on" perceived there to be is "no point" because the officer is able to document having carried out a check which returns a result (for instance of "No insurance justifying a section 165 seizure"). Another officer suggested that the use of the equipment should reduce complaints about "incivility" explaining:

*"quite often that actually comes down to the fact that the officer doesn't have all the facts, so they have gone into something and maybe they've made light of the situation trying to deal with it ... not realising that the person who's made the complaint has had some sort of a long-running issue that [has] really driven [him/her] up the wall. When that happens we get a complaint."* (M F OIS 1a)

Another example (given at the focus group) was that if a driver (who is properly insured) has been stopped and whose vehicle is showing as not insured, the driver can be shown this information on the screen and told that this is a result of a direct input from his or her insurance company. This means that the driver will, on the whole, not regard this as an issue of the police making an accusation, but of incompetence by the insurer. The driver is likely to direct any complaint to the insurer rather than against the officers concerned. This represents “less challenge from people”. In all scenarios given the reduction in complaints would come from information captured and retrieved using the mobile devices. Officers believed themselves to be “seen as more professional by those who we come into contact with”, that it is harder for people to lie (about their identity, insurance status, or previous record with the police), and that the technology can protect them from criticism. To illustrate this, an example was given by an officer that due to having more up-to-date and more effective information the police could counter an allegations by residents that they have “never seen a police car round here for months”. These factors can lead to higher levels of efficacy amongst team members, and reduce the stress involved when officers are challenged by the the public and are subjected to complaints. This in turn has the potential to improve relationships between members as they undertake their daily work.

### Wider team

A summary of the findings regarding the impact of MICT on officers’ relationships with the wider team is shown in Figure 6.23 below and illustrates that the impacts mentioned mostly reflect the declining role of the wider team in giving and receiving information.

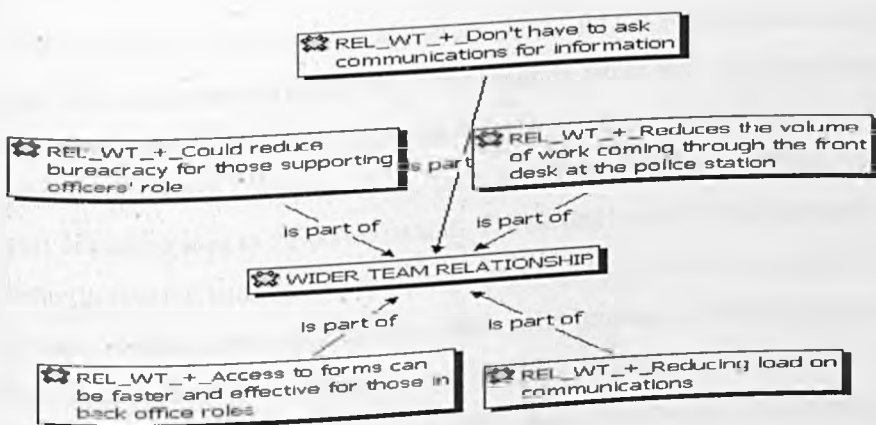


Figure 6.23: Relationships with the wider team (Trial)

There were five impacts raised. Firstly, officers no longer needed to ask FCC for information as they could access information using the mobile devices. Secondly, this reduced the “load” for communications staff. Thirdly, there was a reduction in the volume of work “coming through”

the front desk" in the police station because officers were able to deal with situations directly rather than asking people to go to the police station to be dealt with, and there was a reduction in complainants as discussed above. Fourthly, was the "potential for electronic versions of forms" and "making access to them faster and more effective for those in back-office roles" which could increase efficiency or, indeed, reduce workload for those in back office roles, and fifthly, was the potential for bureaucracy to be reduced because of the ability of information technology to remove stages from business processes which currently take up time and effort from both front-line officers and back office staff. These five factors can improve the relationship with the wider team as they represent a reduction in workload and the associated frustrations caused by lack of autonomous working.

### The public

In Figure 6.24 below, I have illustrated four benefits which officers saw as resulting in the public being dealt with more effectively and making their interactions with them easier, thus improving their relationship with the public.

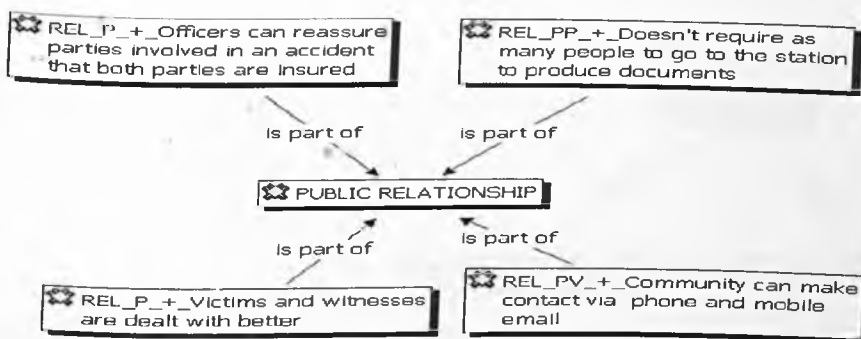


Figure 6.24: Relationships with the public (Trial)

The first benefit is that because almost all checks on the vehicle, insurance, MOT, tax and on the driver can now be carried out at the roadside rather than requiring somebody to attend a police station with documents, many people are no longer required to go to the police station to produce documents. This makes life easier for the public who do not have to bear the time and cost of making trips to the police station. The second benefit is that the public can be supported better in stressful situations. An example provided by an officer was the ability, at an accident, to reassure both parties that the other holds valid insurance; (officers are unable as a result of data protection rules to give policy and company details, but they are able to make sure that drivers do know that valid insurance is held). Such reassurance would benefit those involved in the accident. The third benefit is that due to the smoothing of workflow, the technology enabled the officers to have a "little bit of space and that in turn is going to improve the way they handle the people". Thus the public could experience enhanced quality of interaction with the police. The fourth benefit is that because the PDAs have "phone and e-mail" officers who are "out and about ... are more easily contactable by the community and they are more easily able to

respond". This was particularly seen to be an advantage when community officers are "dealing with people for whom e-mail is a primary form of communication and so the mobile e-mail effect is probably going to be quite important for them". These significant benefits can result in the police having a better relationship with members of the public as a result of dealing with them more efficiently, having more time to deal with their concerns and being able to give much-needed reassurances in stressful situations.

### Managers and supervisors

A summary of the impacts on the officers' relationship with managers and supervisors is shown in Figure 6.25 below.

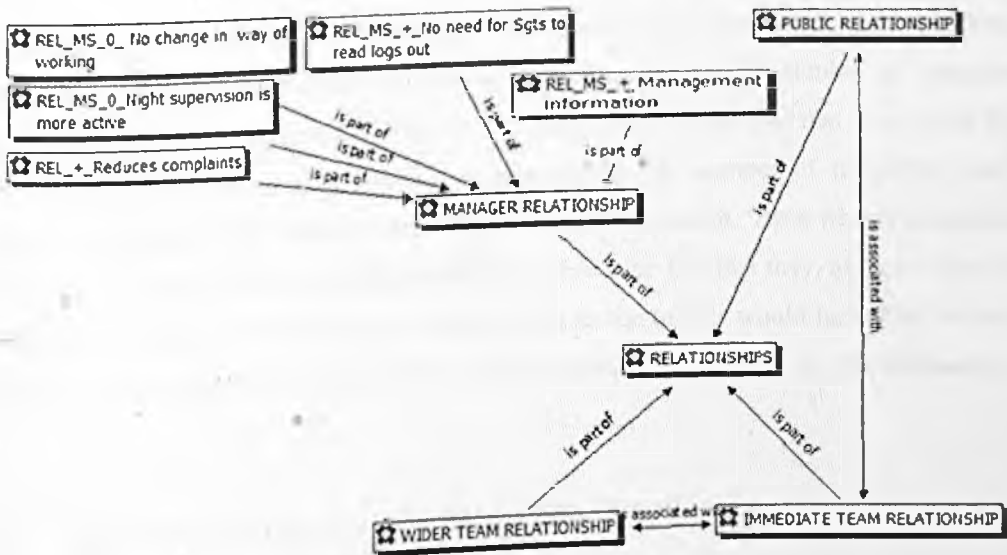


Figure 6.25: Impact of MICT on officers' relationships with managers and supervisors (Trial)

Overwhelmingly, users indicated that they did not expect there to be any significant shift in their relationship with their managers and supervisors as a result of the introduction of the technology. This was based on the fact that, although the technology had the potential to reduce the interaction with managers and supervisors in the police station if officers were spending more time out of the station, there was still sufficient interaction for a good working relationship to be created and maintained. This idea is illustrated in Figure 6.25 as *No change in way of working*. There were however, four benefits of the MICT raised by officers who felt that the benefits improved the working relationships between officers, supervisors and managers. The first benefit, illustrated as *Management information* in Figure 6.25, is the ability for supervisors and managers to access information which officers have updated whilst in the field. Being able to do this means that supervisors and managers can be better informed and therefore, do not need to "catch officers" as frequently at the end of a shift, when they are keen to get away, in order to work through quality assurance procedures and to check the status of jobs which officers have completed but have not yet been able to update. Not having to "catch officers" at the end of their shifts reduced frustration between officers, supervisors and managers. The

second benefit, illustrated as *No need for Sgts to read out logs* in Figure 6.25, is that due to the PDA providing officers with the facility to either access incident logs directly or consult them whilst stored on the PDA, supervisors can allow officers more autonomy and also do not have to read incident details out to officers. Not having to undertake tasks like reading out logs gave supervisors more time to support officers which had a positive effect on their relationships. The third benefit is that the equipment allows supervisors to be more active, particularly during nightshifts because they are no longer tied to having computer access on in-station terminals in order to be able to relay information to members of the team; this is illustrated as *Night supervision is more active* in Figure 6.25. Being active in their task of supervision meant that supervisors were able to have more supportive and meaningful encounters with officers rather than relaying information, which meant that a more productive relationship could be fostered. The fourth benefit is the potential of the technology to reduce the number of complaints, illustrated as *Reduces complaints* in Figure 6.25. Supervisors commented that a reduction in the number of complaints led automatically to reduction in the number of times they had to approach a member of their team in order to investigate a complaint. Even when a complaint is not founded supervisors felt that officers tended to resent the fact that they, as supervisors, had to raise the complaint and investigate it rather than, as the officer would have liked to see in many cases, dismissing it out of hand. This reduced unwelcome tension from the relationship.

## 6.5 ORGANIZATIONAL CAPABILITIES

Officers reported that having the XDA did not add any completely new abilities to the way they worked. However, they offered ideas about what they thought the technologies such as the XDA could do for them in the future. I classified their perceptions into two main areas – uses and features. Naturally, there are interrelationships and this division is merely intended to provide a framework for discussion rather than to imply a complete separation between the features of the technology and its use. A summary of the findings is shown in Figure 6.26 below.

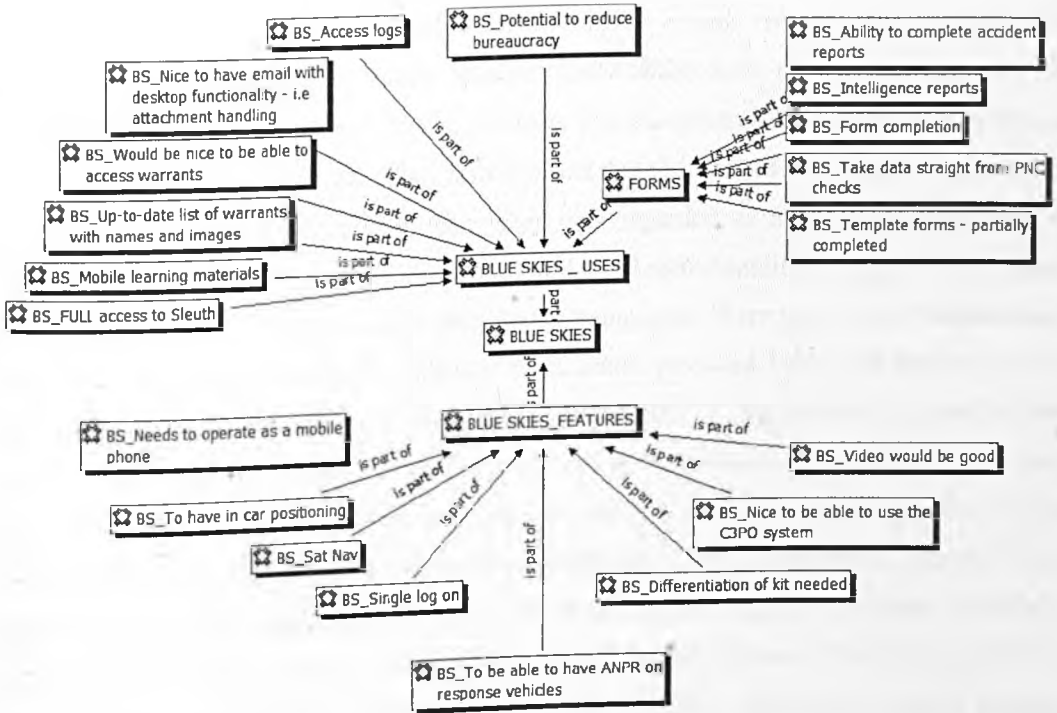


Figure 6.26: Blue skies (Trial)

### Uses of the system

The single largest area of comment concerns uses of the system to give access to, and handle, forms and this was seen as being a clear area of potential for development in the future as officers identified that the completion of paperwork is a major part of their role. There were three groups of ideas about forms. Firstly, that the devices could include access to more forms than was currently available and partially completed template forms would be useful. This view was summarised by one participant who said:

*“It would also be useful to have access to quite a lot of forms, to have templates, which we can fill in all which are partly pre-filled and reduce the amount of time needed to do that”.* (PC F OIS N 6)

Another felt that the “availability of common forms” on the device would be useful and this was a typical response; specific forms were also mentioned, such as “to be able to input intelligence reports” and to “complete accident reports” would be advantageous. The second group of ideas related to better uses of data captured by forms “so things like intelligence reports could be generated automatically if we can then take the data straight from PNC checks”. The third area of comment, linked with the idea of automatic transfer of details into forms was the potential to have template forms already partially completed with the details of, say, a two vehicle traffic accident. At the moment this is not practicable as officers would need to carry a huge number of partially completed template forms. The PDA, however, has the potential to store a large number of template forms which would reduce the level of input required by officers.

In addition to the ideas about forms, officers suggested other ideas such as the potential for such a system to actually reduce the level of bureaucracy by re-engineering workflows and

automating some areas of work which currently require manual intervention. Notably such areas include the recording of details on paper forms which have then to be re-entered into computer systems at a later time or date. Officers find this frustrating and also note that it can be a significant source of errors. They also reported that they would like to have access to full desktop e-mail functionality rather than what they regarded as an impoverished level of functionality, particularly with relation to input and attachment handling, on the mobile devices. Three specific system areas were also identified as being ones where they would like additional functionality. Some level of functionality is currently provided but could usefully, in the opinion of users, be augmented in the future. One system is the incident log and officers identified that they would like to be able to get access to more detail on logs and also to historic logs. This ability would be useful where, for example, there is a history of domestic violence associated with an address rather than with an individual. The second system where officers would like to see augmented functionality is complete access to the force intelligence system as opposed to the limited access currently available on the mobile devices. The third system is an extension within the PNC system to provide details of live warrants and expired warrants against person searches. The system as currently implemented does not give detail on warrants, merely the fact of their existence which then requires officers to get this information either directly, if they are appropriately trained, or via an information intermediary, usually the FCC.

In addition to the above, officers commented on the ability of such mobile technology to provide them with access to training materials and decision support materials. Many officers, particularly those who are new to the job or new to role, carry quite extensive reference materials with them as a matter of routine. These reference materials are seldom used, date quite easily and, as one officer commented *"you never have the book you want when you want it, it's always the one that you've left back in the locker room"*. One manager, in discussing the potential of the devices to provide reference materials, took a wheeled case out of the corner of his office; the case was completely full of reference materials which he used, or could need to use, as duty PCAE Inspector in connection with ensuring compliance with PACE.

#### Features of the system

Officers identified a number of areas where they would like to see either improved or additional features of the system. The first of these was for the mobile phone capability on the devices to operate more effectively and intuitively as their own personal mobile phones do. Officers found the switching from phone function to other system functions to be *"clunky"*. A set of issues were concerned with the ability of the devices to interact with geographic information and make use of GPS for satellite navigation, for pinpointing incident locations and for alerting officers to information tagged to a geographic location. A further set of issues were concerned with imaging and officers reported that they would like to see a device with a sufficiently high quality camera to operate automatic number plate recognition, to record high quality video

securely and to give access to the secure custody system which provides clear and up-to-date images of individuals. Officers also identified the current security arrangements on the PDAs as cumbersome, and they would like to see devices with some sort of biometric two factor authentication to replace current systems. They felt that this would make the systems considerably more friendly and accessible to users. A final group of comments addressed the choice of device at the force level. Officers commented that they could walk into the mobile phone shop and see 10 or 15 different devices, any of which would work on the mobile phone network. They would like a similar level of choice so that individual officers could prioritise, for example, battery life or portability in order to suit their own personal preferences, their work roles, and their operational requirements.

## 6.6 SUMMARY OF TRIAL FINDINGS

This section is intended to provide a summary of positive and negative aspects of impact. The section includes a summative statement, very much at the level of qualitative judgement on the evidence collected, as to whether the implementation, overall, could be regarded as a success in the short and medium term. The section then goes on to provide slightly more detail and this is structured as a table which indicates positive and negative impacts of the introduction of the technology and does so by role (primarily neighbourhood and response with some minor references to the minority traffic role) and grade (Supervisor/manager, PC, PCSO) indexed by the key areas of attention which have been highlighted above. The table (Table 6.1) also seeks to indicate, although not in a rigorously quantitative manner, the weight of evidence and opinion in each of the areas. This table is then drawn on as a part of the final discussion chapter. In general the users saw the trial as being successful in proving the technology and the potential rather than delivering a final system which met their needs as users. The actual equipment was seen as being a good compromise between portability and power and was accepted as such. The carrier and applications were regarded as being acceptable with some developments wished for in the applications. However, when taken at the composite level of 'kit' there was significant dissatisfaction and much of this stemmed from the lack of training and support which users felt impaired their ability to use the system as a holistic whole. Work practices were reported as having benefited from the introduction, with better information quality and the ability to make more efficient use of time being the two key enabling factors here. As far as the impact on relationships was concerned users reported cautious optimism. No adverse effects had been reported but there was a clearly expressed fear that the technology could be used for good or ill – and that this was a management decision rather than an affordance of the technology per se. Users feared a future of DIY policing – where facilities available were scaled back because officers have direct access via mobile devices.



Table 6.1

Summative impacts of MICT by area and officer role/rank

Area of attention	Response officers		Neighbourhood officers		Summative notes and supervisor perceptions
	Positive	Negative	Positive	Negative	
<b>Area of reporting</b>					
<b>Equipment</b>					
Hardware	<p>Overwhelmingly users commented positively on the devices issued to them, as well as the fact that they integrated a number of different functions and tools within a single device. This ability to replace other devices without adding to the load which officers carry was seen as a positive. While users recognised there was a tension between portability and facilities on the devices they generally felt that the equipment issued to them was a good compromise.</p>	<p>A minority of users commented adversely on the hardware supplied. The key negative comments were around:</p> <ul style="list-style-type: none"> <li>• screen size</li> <li>• virtual keyboard</li> <li>• stylus loss</li> <li>• potential fragility.</li> </ul> <p>It should be noted that most officers identified both positive and negative issues – liking some aspects of the devices and expressing concern with regard to others.</p>	<p>Neighbourhood officers commented specifically on portability. As they operate mainly on foot the ability to put the device into a pocket and for it to last a shift without needing to be recharged is particularly important. Officers generally felt that the equipment issued represented a good compromise between portability and capability. Integration of mobile telephone with personal computing was also seen as a key positive – foot officers feel the weight of kit more than those who are car based.</p>	<p>In the case of neighbourhood officers the key areas of concern centred on battery life. A fully charged device would last a shift but in the event that somebody came to work and was unable to top a charge, or had not charged device there was a significant risk of it failing mid shift., or a fear of it doing so.</p> <p>It should be noted that most officers identified both positive and negative issues – liking some aspects of the devices and expressing concern with regard to others.</p>	<p>Overwhelmingly ( almost all officers, and almost all commented) officers felt that the devices per se were a good choice. It should be noted that officers were prompted to deconstruct the 'kit'. Differences in their perceptions were mainly a function of differences in their roles. So, as an example, battery life was a significant issue for neighbourhood officers (who rarely have access to top up charging facilities) whereas the key issues and concerns for response officers tended to centre around difficulties of input and output. Portability, given that they spend much of their time in a vehicle, was of less import.</p> <p><b>Supervisor Preceptions:</b> There was no significant difference between the perceptions of supervisors and managers and those of other uses. The devices per se were seen as being an effective, or potentially effective, tool and a good balance between the tensions of portability and functionality.</p>

Area of attention	Response officers		Neighbourhood officers		Summative notes and supervisor perceptions
	Positive	Negative	Positive	Negative	
<b>Area of reporting:</b>					
Carrier	<p>This area attracted very few comments overall with under 10% of interviewees noting the issue. The comments that were made were almost entirely negative, in the sense that officers noted that there were areas where they had no mobile telephone or mobile computing coverage. It should be noted, however, that few users regarded this as a major problem. They were already aware of areas where they had no mobile phone coverage and accepted that this was a necessary corollary to using a commercial network. They also noted that the Tetra radio system had full coverage and so there were no safety issues associated with the loss of mobile computing. Thus, while this area can be construed as a negative it was not expressed with any undue force, nor was it attributed to any failings in the issued equipment.</p>				

Area of attention	Response officers		Neighbourhood officers		Summative notes and supervisor perceptions
	Positive	Negative	Positive	Negative	
<b>Area of reporting</b>					
Applications	All the officers commented on this area. The fact of access to core systems was seen as a positive by almost all officers. In particular response officers noted that access to PNC and to the Force intelligence system provided them with the ability to undertake enquiries independently of information intermediaries. The ability to update targets while out of the station was seen as a key positive, as was the ability to update the night safe system.	Response officers noted the specific lack of access to warrants data and to the full reach of the Force intelligence system. This often meant that a 'hit' the mobile system meant a follow up call to the FCC – given this , “Why not just do it through Comms to start with if you think it will be a hit?” It should be noted that the negatives were seen as lacks rather than disabling factors.	The fact of access to core systems was seen as a positive by almost all officers. Whilst neighbourhood officers also made a comment about access to PNC and the Force intelligence system they also noted a specific benefit from access to e-mail. Neighbourhood officers often deal with organisations such as local housing authorities for whom e-mail is a primary form of communication. Prior to having these devices neighbourhood officers were cut off from this form of communication when not in the station. The ability to check and update missing from home applications and records was particularly valuable for neighbourhood officers.	As with response officers, neighbourhood officers identified specific parts of systems to which they would like to have access. In particular they noted that access to custody images and to CCTV archive data would be particularly useful. It should be noted that the negatives were seen as lacks rather than disabling factors.	In general all users felt that the applications provided to them were of potential benefit. Where criticism was made its tended to be of systems not going far enough or not being "personalised" to the specific role of the officer concerned. Roughly half of the officers interviewed noted that the actual speed of return of information through applications could be slower than accessing the same applications via the Force control centre. They did also, however, all note that on occasions when the radio was busy it was significantly faster to use the mobile computers. <b>Supervisor Perceptions:</b>  Supervisors generally felt that the applications provided were sensible and could make a significant contribution to officer effectiveness and efficiency. They did note, however, that the role of supervisor is quite different and they felt that the applications as developed and delivered during the trial did not cater for the particular needs of supervisors in keeping track of staff.

Area of attention	Response officers		Neighbourhood officers		Summative notes and supervisor perceptions
	Positive	Negative	Positive	Negative	
<b>Area of reporting</b>					
<b>Infrastructure</b>					
Support	Roughly a quarter of officers interviewed had some comment around the level of support for the devices and systems. Of these only two comments were positive and related to prompt resolution of support requests.	Users were generally highly critical of the level of support provided, citing poor responses, and poor speed of response as being the main drivers of their dissatisfaction. Specific problems included the inability for support systems to batch process problems and the requirement to physically return devices rather than being able to support over air	Roughly a quarter of officers interviewed had some comment around the level of support for the devices and systems. Of these only two comments were positive and related to prompt resolution of support requests.	Neighbourhood officers had a similar general issues to their colleagues in response roles.	Support was generally perceived, by the minority of users who commented, as not being matched to the needs of the user base and not providing an effective service to support active policing roles. Only two positive comments were made and one of these in fact acknowledged that he had probably "just fallen lucky"
					<p><b>Supervisor Perceptions:</b></p> <p>As with frontline officers supervisors perceived support services as somewhat lacking. They also noted, however, that an additional load was placed on supervisors as a result of having to liaise between officers and support services. They further noted that the scheme to provide "super users" had not been effectively thought through in the sense that such users were, by definition, on a specific shift and therefore not available when they were off shift – making them unavailable to up to two thirds of the users in the normal course of events.</p>
Training	Nearly three quarters of respondents had a comment about training and with the exception of	As already noted almost all reaction to training was negative with officers identifying a number of key problems:	Nearly three quarters of respondents had a comment about training and with the exception of five comments these were all negative.	Neighbourhood officers had a similar response to their colleagues in response roles.  As with response officers they were concerned that training	Training, as with support, was almost universally regarded as inadequate. Officers noted that there should have been a virtuous circle with training effectively supporting officers so they did not need to call on support services and support

Area of attention	Response officers		Neighbourhood officers		Summative notes and supervisor perceptions
	Positive	Negative	Positive	Negative	
<b>Area of reporting</b>					
	<p>five comments these were all negative. Positive comments were mainly concerned with the ability of the training to "give you enough to get you going".</p>	<p>timing of the training level of the training content of the training.</p> <p>Response officers in particular noted that training was not tailored to their job role and was not delivered by staff who had experience of a job role.</p>	<p>Positive comments were mainly concerned with the ability of the training to "give you enough to get you going".</p>	<p>was generic and failed to address the particular needs of their role. They noted that neighbourhood policing draws on different systems and requires different skills and information from other policing roles.</p>	<p>services informing training of areas where users needed to be given additional skills. Both groups of officers identified that training was not differentiated according to knowledge or role. They also felt that the timing of training was inadequate in that training was either delivered well before devices were issued or after they had been issued and was not followed up with any additional or refresher training.</p> <p><b>Supervisor perceptions:</b></p> <p>Whilst supervisors agreed that training was less than ideal some did also note that they felt some users were too keen to blame the training. Two (of four supervisors/ managers) commented with variants on the theme that some users had lit upon poor training as a good excuse to "not do something they didn't want to do."</p>

Area of attention	Response officers		Neighbourhood officers		Summative notes and supervisor perceptions
	Positive	Negative	Positive	Negative	
<b>Area of reporting</b>					
<b>Work Practices</b>					
Informational	<p>This area was the most commonly mentioned area under the overall heading of work practices. Users in response roles noted some significant benefits from the use of mobile devices. The first and most important of these was a generic issue of better quality information being received from the organisation. The positive comments, which came from nearly all of the officers interviewed covered all of the dimensions normally associated with quality of information. They also noted that information going back</p>	<p>There were no significant problems noted although one officer did raise the potential that if more input is required from mobile devices there may be a drift towards what he referred to as "text speak". He noted that this could materially reduce quality of information on one dimension, although its immediacy and accessibility could well be improved.</p>	<p>Neighbourhood officers also noted the ability of mobile devices to improve the quality of information supplied to them on all of the normally discussed dimensions. In particular they noted the ability to build up an operational picture by e-mail. Neighbourhood officers tend to deal with more slowly developing incidents and to be more concerned with trends than response officers. E-mail is an effective tool for building up this sort of longer term operational picture. They also noted that the ability to have access to some level of historical information provided context in dealing with community interests. The final key benefit noted was in the ability to write up logs so</p>	<p>As with response officers neighbourhood officers did not note any significant problems or potential downsides. They did note that portable keyboards of some form would be of significant benefit to them in terms of allowing additional input whilst out of the station.</p>	<p>Virtually all of the comments received (and over half of the officers interviewed commented on this area) were positive. They centred on the ability of mobile computing to provide informational gains in the sense of better quality information and did so across the dimensions of information quality.</p>

Area of attention	Response officers		Neighbourhood officers		Summative notes and supervisor perceptions
	Positive	Negative	Positive	Negative	
<b>Area of reporting</b>	into the organisation, in particular as a result of the ability to access incident logs, was also of an improved quality. A single "standout" example was the issue that having incident logs on screen meant that officers did not have to make check calls back to the control centre and did not make errors as a result of having misheard information.		that the log said what the officer wanted it to say, rather than what somebody in the control centre thought they wanted it to say		<b>Supervisor perceptions:</b>  Supervisors agreed that the mobile devices provided officers with better quality information. They noted that in particular supervisors need to be able to track "who when where and why" with regard to police constables and support officers as a key ability. The mobile devices as currently constituted deliver some of this functionality but have not been developed, as noted above, with the specific needs of supervisors in mind. One supervisor noted that there was a tendency for some users to stay with, or revert to, old ways of working from "inertia".
Process	All officers commented actively on this area. Response officers noted that having mobile devices provided them with two key process gains. The first of these, noted	Officers noted three key areas of potential negative impact. The first of these was in the use of the devices, or more accurately the temptation to use them, while single crewed in a vehicle. This is	All officers commented actively on this area. Neighbourhood officers, as with their response colleagues, noted the potential for better information to improve risk assessment and decision-making on the basis of that	As noted above neighbourhood officers (about a third) suggested that, even though it is another thing to carry, some form of portable keyboard would be particularly useful for them. One suggested that it was a	Most of the users interviewed saw the introduction of mobile computing as providing far more benefit than problems with regard to their processes of work practices. Just under half of the officers interviewed commented on this area.

Area of attention	Response officers		Neighbourhood officers		Summative notes and supervisor perceptions
	Positive	Negative	Positive	Negative	
<b>Area of reporting</b>	<p>by half of the respondents, was as a result of having better information; they had an improved ability to risk assess situations and make appropriate decisions.</p> <p>The second was in the ability to carry out intuitive checks which, particularly when the radio channel was busy, would probably not have been carried out without access to a mobile device.</p>	<p>strictly against regulations but is a significant temptation and could result in injury. The second issue was with regard to the potential for errors in data entry, as a result of the use of the small virtual keyboard, not being picked up by QA processes. The final issue, and the largest, was around the issue of safety. Officers particularly at the start of the trial had concerns which centred around potential for the changed work practices (silent checks in particular) to put officers in danger. As the trial progressed this fear reduced and officers came to perceive this as the same judgement call, as they would put it, that they have always faced.</p>	<p>risk assessment. They also noted that having more information provided them with more flexibility in response to tasks and calls, as a result of having more contextual information. A specific gain which they noted was in the ability for mobile devices to carry out multiple checks, particularly into the PNC system for vehicles, which would not be possible over the current radio channel. An example given was the ability for a community officer to rapidly check a set of vehicles in the local further education college car park. Although this has proven to contain vehicles which are not taxed or not insured in the past the officer has had to restrict herself to targeting a few of what she regarded as the likeliest vehicles each day.</p>	<p>good "halfway house" to being able to establish a temporary police facility, during a community meeting for example.</p> <p>Neighbourhood officers, in large part as a result of the different pattern of work, did not see safety as being as much of a live issue. With only four comments being made, and those with little emphasis.</p>	<p><b>Supervisor Perceptions:</b></p> <p>Supervisor perceptions in this area were not significantly different from those of other officers. Supervisors did note that there were different views on safety between response and neighbourhood officers.</p>
Efficiency and effectiveness	Virtually all of the officers interviewed commented quite extensively on both actual and potential increases in efficiency	Response officers viewed e-mail as a distraction and did not see it as adding positively to their working day. It is not something they use extensively and	Neighbourhood officers, as with response officers, almost all commented on the ability of mobile devices to reduce the number of returns to station. In the case of police	Neighbourhood officers did not identify any major problems with regard to mobile devices and their contribution to efficiency and effectiveness. One person did	Almost all officers commented on the ability of the mobile devices to improve efficiency and effectiveness and did so in a highly positive manner.



Area of attention	Response officers		Neighbourhood officers		Summative notes and supervisor perceptions
	Positive	Negative	Positive	Negative	
<b>Area of reporting</b>					
	<p>and effectiveness. Key issues identified for response officers were the ability to use the device to fill in dead time, the example being given waiting for road traffic investigators after having arrived at the site of a road traffic accident. Better quality of information, identified above was also identified as increasing efficiency. The ability to update logs and carry out transactions on the mobile device reduced both the load on communications and the requirement for officers to return to the station. The ability to identify people positively meant that a particular facet of the work of those response officers who dealt with traffic as a routine part of their day was significantly reduced. This was as a result of not having to issue forms which</p>	<p>while only a few commented on it they said it was something they would deal with at the station and did not want to have access to whilst out and about. They identified this ability to be contacted as part of what one of them described as "the thin end of the wedge of do-it-yourself policing"</p>	<p>community support officers, who almost never have access to police vehicles, it can take up to 40 minutes to return to a police station from the beat. They also noted that as police community support officers and neighbourhood officers they are at the bottom of the "pecking order" for radio access. As one of the noted "it's a bit hard to justify radio space to know how many times graffiti tags have been reported near the local primary school when somebody else is asking for the armed response unit". Mobile devices give them the opportunity to do this independently. They also noted the ability to use slow time and dead time more effectively.</p>	<p>comment that when they had first been issued with the device it had tended to be a distraction but they have now learned to set it to silent and ignore it when they are doing something else.</p>	<p><b>Supervisor perceptions</b></p> <p>Supervisors also noted that the mobile devices had contributed to efficiency and effectiveness and they also noted specifically that the ability for them to see in real time entries on to logs and crime management asking systems meant that the administrative interaction with officers was significantly reduced. One supervisor commented that they had "never been able to let this lot go as fast the end of the shift as I can now".</p>

Area of attention	Response officers		Neighbourhood officers		Summative notes and supervisor perceptions
	Positive	Negative	Positive	Negative	
Area of reporting					
	required people to produce documents the police station and which those "in the know" had been able to widely abuse, leading to officers spending (wasting) a lot of time in court appearances.				

Area of attention	Response officers		Neighbourhood officers		Summative notes and supervisor perceptions
	Positive	Negative	Positive	Negative	
<b>Area of reporting</b>					
<b>Relationships</b>					
Immediate team	<p>Almost all users commented in this area and the overwhelming majority of comments were positive. Officers noted that, from a response perspective, there were two operational gains which impacted on the relationship with the immediate team. The first of these was that having better quality information had tended to reduce the number of complaints and the second was that (subject to the caveat of <i>if it works</i>) the public tended to see officers using mobile technologies as being more professional; but simply "it looks good".</p> <p>The officers also noted that for the vast majority of officers the improved access to information improved their confidence in their ability to do the job as</p>	<p>Relatively few negative points were raised and officers did not see, certainly in the short term, that there would be any negative impacts from the use of this technology. They did note that in the longer term larger process changes could mean that officers were expected to undertake more work and, if current resources such as the force control centre were significantly reduced then users might see an increase in stress and a fall in safety. It</p>	<p>Neighbourhood officers noted the issues of confidence and job satisfaction also mentioned by response officers. They also noted as a specific issue that the ability to contact colleagues whilst "out and about" through an additional channel was a key benefit for them. They tend to work alone and once out of the station are less likely to see other officers until they return. The ability to use text messages and e-mail as well as telephone and radio gave them added communication potential.</p>	<p>As with response officers neighbourhood officers did not see any immediate impact in a negative sense. They did, however, also identify two issues of potential negative impact. The first of these was the potential to be asked to bring themselves on duty on the beat rather than at the station. Whilst this could be more effective and efficient it would mean that they would not see and interact informally with, colleagues at the start of their shift. They felt this could materially damage their access to what, in intelligence terms, would be regarded as sub level one intelligence. They also noted the potential for information technology to replace and therefore reduce functions which they</p>	<p>At this stage none of the users had seen any negative impact on their relationship with the immediate team. There were, however, a significant number (on the order of a fifth of respondents) who had misgivings about the potential for mobile technologies to reduce the team ethos and reduce contact between the immediate team members. No one felt that this would be a good move.</p> <p><b>Supervisor perceptions</b></p> <p>As with police constables and support officers supervisors had not seen any negative impacts. Supervisors were, however, more optimistic than the other staff with regard to the longer term potential. None of the supervisors interviewed believed that the police force had any intention of dramatically changing away from team-based operation.:</p>

Area of attention	Response officers		Neighbourhood officers		Summative notes and supervisor perceptions
	Positive	Negative	Positive	Negative	
<b>Area of reporting</b>	well as their job satisfaction.	should be stressed that these were seen as potential rather than actual effects.		can now draw on for support such as the force control centre.	
Wider team	<p>Response officers noted that the ability to carry out independent and intuitive checks, taken together with the ability to use a range of different tools for communicating with colleagues in the wider team had to keep effects. The first of these was to reduce reliance on the force control centre as information intermediaries. Particularly at times when radio traffic is quite dense this was a significant gain. And, officers noted that this was a gain for the wider team in the sense that reducing reliance on the control centre allowed them to attend to other matters and also allowed the officer to progress</p>	<p>There were two key areas where response officers noted concerns. It should be noted that these are potential issues and the officers had not yet encountered them. The first was that as reliance on the force control centre reduced so the relationship with those people would also be reduced. Officers had not encountered this as a significant problem at this stage but they did comment</p>	<p>Neighbourhood officers have less interaction with the wider team than response officers do. The key advantage which most neighbourhood officers saw in interaction with the wider team was the ability to use e-mail in order to communicate asynchronously with people who they had to interact with such as housing associations and local authorities - who might not be available at a time when the officer was dealing with the issue which would, in due course, require their input or intervention. This ability to pursue tasks through to a logical conclusion without having to interrupt the task and complete it later at the police station was seen as a key gain. Officers noted that it meant that they were able to be seen to be dealing with something at a time when it occurred and also it meant that there were fewer issues of updates and information transactions which officers simply forgot.</p>	<p>As with response officers the neighbourhood officers had a level of suspicion and although they noted that there had been no negative impacts on the relationship with the wider team, in fact quite the reverse, they felt that in the long term there was the potential for support through the force control centre and through central administrative resources provided in the police station to be withdrawn. There was also a minor issue expressed, by five officers, that, over time, the ability to use asynchronous communication tools</p>	<p>The general view, expressed by the officers who commented (nearly three quarters) was that mobile technologies were not going to have a detrimental impact on the relationship between users and the wider team in the relatively short term. The suspicion was expressed however that the impact could well be in the form of reducing the team so that there is no one to have a relationship with which could be altered by the mobile technologies.</p> <p><b>Supervisor perceptions.</b></p> <p>Supervisors did not see any current negative impact on the relationship with the wider team and, indeed, noted that in fact the feedback from senior colleagues in the force control centre was that the ability of mobile data to allow officers to read logs have reduced one of the significant irritations of staff in the force control centre - which was officers not listening to, or not hearing, what was said to them and making calls back to the control centre to check details which they had already</p>

Area of attention	Response officers		Neighbourhood officers		Summative notes and supervisor perceptions
	Positive	Negative	Positive	Negative	
<b>Area of reporting</b>					
	<p>their particular demands more effectively. The second key area of gain noted although this was very much subsidiary was in the ability to use mobile phone or potentially e-mail (although response officers are not great e-mail users out of the station) to keep in contact with the wider team while out of the station. One of the other indicated effects of mobile data is, of course, reducing return to station and, as a result, interaction with colleagues.</p>	<p>that knowing who you are dealing with as information intermediaries can be particularly important in some of the situations which they have to manage. The second key area of concern, expressed mainly by police constables, was that in the longer term the availability of mobile computing and the ability to reduce the load on the control centre would lead to a reduction in skill level and capacity of the control centre. So the potential</p>		<p>such as text messages and e-mails would mean that the level of personal interaction, particularly with colleagues in allied agencies, would fall and levels of relationship would be reduced. They were not able to identify exactly why this might have an impact and, given that this was merely conjecture, they were clearly unable to supply examples, but it was a real fear.</p>	<p>been given. Supervisors also noted that the ability for officers to update logs reduced a source of conflict with the control centre as officers could no longer blame the control centre for not accurately reflecting in a log entry what police officer wanted to say. As with other areas where suspicion was voiced by police constables and police community support officers supervisors did not have similar apprehensions with regards to the potential dismantling of support services.</p>

Area of attention	Response officers		Neighbourhood officers		Summative notes and supervisor perceptions
	Positive	Negative	Positive	Negative	
<b>Area of reporting</b>					
		to manage transactions as an independent entity gaining access to databases and information sources would impact directly on staffing levels.			
Supervisors and managers	<p>Response officers suggested that there were two impacts on the relationship between users of mobile technologies and their supervisors and managers.</p> <p>The first of these was in the ability of the mobile technology to allow supervisors and managers to see, at least to an extent, in real time what an officer was doing on the particular case or incident. As a result the supervisor had less need to interrupt the officer to find out what they were doing or, indeed, to ask them to</p>	<p>The key potential issue, as negative impact, was in a lack of day-to-day interaction. As with a number of areas of potential negative impact officers stressed that this was only potential. They did, however, see this as a part of the potential trajectory of development of mobile technologies within the</p>	<p>Neighbourhood officers, whose situations tend to develop more slowly than the type of incident with which response officers have to deal, identified that for them a significant benefit was the potential for a supervisor, monitoring the development of the situation, to intervene proactively. So, for example, an officer who has scheduled a meeting at the school to discuss a particular issue with regard to road safety could be supported with regard to that meeting before or during the meeting rather than having to report back later and being given information which could have been useful at the time.</p>	<p>Neighbourhood officers did not note the same potential negative impact as response officers. They tend to see supervisors at the start and end of the shift anyway and noted that this at least in the short term, was unlikely to change. They did, however, note the potential in the longer term for officers to self brief and bring themselves on duty at their beat rather than at the police station. If this were to happen, as noted above, they would start to have concerns about the</p>	<p>Officers had not seen significant impact on the relationship with supervisors and managers. They saw supervisors in very much the same way as they had before and store managers as being just as remote as they had been before. The ability of mobile technologies to support interaction in different ways was noted but the 40% or so of officers who commented could not be said to have a negative view.</p> <p><b>Supervisor perceptions:</b></p> <p>Supervisors generally felt that the potential of the technology was to improve the relationship, allowing them to supervise people actively without intrusion and to reduce the level of reporting back and highly visible checking, which can make officers feel that they are not trusted. All supervisors commented, and all were positive.</p>

Area of attention	Response officers		Neighbourhood officers		Summative notes and supervisor perceptions
	Positive	Negative	Positive	Negative	
Area of reporting	<p>wait at the end of the shift in order to update the supervisor on action taken. This led to officers feeling more trusted and also meant that they could get away more promptly at the end of the shift.(The ability to get away at the time you should is highly valued.) The second issue where officers felt that was a potential for gain was in the reduction of uncertainty in transactions with the public leading in turn to a reduction in potential complaints. So, for example, someone who has seen that their insurance company has not listed their vehicle as insured is more likely to direct a complaint to the insurance company than they are to the police. This might not have previously been the case where the police officers could be perceived as "accusing" the person</p>	<p>police force. The view was expressed by approximately 10% of officers that, over time, if supervision could be done remotely then the force would require it to be done that way leading to fewer supervisors supervising more officers in less personal and more remote ways.</p>		<p>ability to exchange sub level one intelligence and to maintain an appropriate relationship and camaraderie with other members of the immediate team which, for most officers, includes their immediate supervisor at least some of the time.</p>	

Area of attention	Response officers		Neighbourhood officers		Summative notes and supervisor perceptions
	Positive	Negative	Positive	Negative	
<b>Area of reporting</b>					
	concerned.				
Public	<p>Response officers noted that they tend to divide the world into two distinct categories: these are the public as victims of crime and the public as perpetrators of crime. With regards to the public as victims of crime the officers firstly make the caveat that the technology has to work. If it doesn't work then officers are left, in their perception at least, "looking stupid". Given that the technology works as it should the officers felt that the impact on the relationship with the public as victims of crime was positive. They had more and better information, could potentially arrive more quickly and were seen as</p>	<p>Negative perceptions and impacts fall into two key areas. The first of these is around the issue of the technology performing as it should. Failures in systems and the perceived lack of support for the technology and the officers as users of it meant that the officers perceived a real risk of the technology letting them down.</p> <p>The second potential area of concern,</p>	<p>Neighbourhood officers felt that the relationship with the public as victims of crime, both potential and actual, was generally improved as a result of their ability to access more and better information, to be seen to progress tasks at the time when they were with the member of the public rather than writing something down to "do later", and the ability to use the additional communication channels which the devices afforded them to ensure the involvement of appropriate agencies in the minimum time..</p> <p>Officers views with regards to the perpetrators of crime were very similar to their colleagues in response roles. Two police community support officers did note that younger members of the community in particular were very quick to realise the limitations of the devices, but also their potentials.</p>	<p>Neighbourhood officers did not report any significant concerns apart from one issue raised by two officers who worked in a particularly deprived area. These officers suggested that particularly with regard to the public as perpetrators of crime the fact of having a mobile computing device, either in a vehicle or on their person meant that the police officer could be targeted for the device to be stolen from them either as an act of bravado or simply as something to be sold; the devices were commercial and people could go into shops on the high street and see</p>	<p>The consensus, and most officers commented, was that the devices improve the relationship with the public as victims of crime, mainly as a function of better information. When working they "look good". Equally, officers felt that they tended to unsettle and unnerve actual and potential criminals - something that the officers concerned approved of wholeheartedly.</p> <p><b>Supervisor perceptions.</b></p> <p>The perceptions of supervisors around this area were very similar to those of the officers.</p>



Area of attention	Response officers		Neighbourhood officers		Summative notes and supervisor perceptions
	Positive	Negative	Positive	Negative	
<b>Area of reporting</b>					
	<p>being more professional in part because of the fact of having a mobile device and in part because of their access to both initial and follow-up information with regards to the incident.</p> <p>With regard to the public as perpetrators of crime most officers felt that the mobile computing facility had, initially at least unsettled and unnerved some of their regular customers.</p> <p>Whilst they accepted that fairly quickly the capabilities and limitations of the devices would become known they felt that, in the short term at least this was a real win.</p>	<p>expressed by a small minority, on the order of 10% of officers, was that the public would not perceive a wired and connected information savvy road warrior but rather someone who had been de-skilled to the level of a parcel delivery operation. This concern comes in part at least from the potential for mobile devices to structure transactions in way that make police officers seem less like investigators and more like form fillers.</p>		<p>them there with a significant pricetag.</p>	

## 6.7 SUMMARY

This chapter reports the findings from the Trial stage of the implementation of MICT with the front line officers in the Force. Key points are:

- This was the third stage of implementation of the technologies, and was the final one prior to the roll out of similar equipment to all front line officers in the Force.
- The aim was to prove business value, and robustness of back office systems, based on existing proof of technical capability (TPOC) and system capability (SPOC).
- The scale of the implementation was increased significantly over the SPOC stage with over one hundred users in the Trial stage.
- Data was collected primarily by observation and interview and used the set of areas of attention developed for the SPOC stage.
- The implementation can be characterised as broadly successful, but with significant caveats.
- Officers reported significant problems with the systems in some respects. Some of this dissatisfaction stemmed from an aggregation of the system as 'kit' in a broad way, and one which took in more elements of the system at this stage than had been the case in the TPOC and SPOC.
- Officers reported some gains in work practice and reported strong potential for MICT.
- They also, however, felt that the systems as implemented were not mature and needed further development.
- As with the TPOC and SPOC a cycle of attention to technology, to systems and finally to utility was observed.
- Officers perceived there to be a trajectory of development for the systems and, in this trial, perceived this more in terms of organisational development based on the affordances of developing technology than they did on the affordances of the technology per se.

## **Chapter Seven: Activity Theory Based Analysis**

### **7.1 INTRODUCTION**

This chapter aims to apply the AT structure to analyse the data from the three stages of implementation. The structure was applied retrospectively to the data from the TPOC stage of implementation and this is primarily descriptive of the manner in which that data can be explored using the concepts provided by AT as a framework. The SPOC and Trial stages of implementation are treated somewhat differently. AT was used as a structuring device to assist in the process of data collection and this structure followed the process for data collection described in Chapter Three. This process provided data which has then been analysed across the SPOC and trial stages to provide a picture of three activity systems. The first is a composite system – that of front line operational policing, the second and third are both subsets of that first, higher level structure and deal with neighbourhood and response policing respectively. The activity systems, and the key issues within them, are described in section 7.3 and the overall activity systems are provided in Appendix 4. This is followed by an analysis of the key areas of similarity in the two activity systems of neighbourhood and response policing, together with some explanation of the areas of difference (Table 7.1). This analysis is intended to highlight the points of similarity at the level of activity and operation as well as the central role of placing the activity in context. In order to examine the actual and potential impact of MICT on the activity of front line policing Table 7.2 provides a characterisation of the impact against the common action elements (i.e., tasks). The chapter concludes with a summary of key points and an indication of some of the key areas of tension and contradiction. The model derived from this process is outlined in Chapter Eight.

### **7.2 ANALYSIS OF TPOC USING ACTIVITY THEORY FRAMEWORK**

This section presents an analysis and discussion of the findings from the TPOC stage of implementation, structured using the Activity Theory framework discussed in Chapters Two and Three. This framework was adopted, as discussed in the methodology, to help to organise the findings from the TPOC and to structure the data collection process for the next stages of data collection. The unit of analysis has been taken as the activity system of front line policing and the central viewpoint in this activity system is taken as that of the front line officers who are making use of the equipment. This has been done in order to emphasise the issues which affect these officers in the context of a POC which is designed to demonstrate the ability of the technology to support policing. One of the goals of a POC such as this, for the organisation, is to provide learning on which to build a further iteration of the system and much of that learning

has to be concerned with the experiences and issues of the eventual end users of the technology. This does not imply that there are not other factors at work and a number of these larger motivations ( such as the NPM drive) and more political motivations have been discussed in the literature review and as a part of the overall setting of cultural and historical context for the introduction of MICT. The discussion starts with Tools, then moves to Subject, Object and Outcome and finishes with Community.

*Tools* as a concept has been interpreted broadly, to include a wide range of the factors officers identified and discussed under their perception of "the kit" – the entirety of the use of MICT for policing tasks in a front line uniformed role. This area has been discussed above and this discussion is used to inform this section of the account.

*Subject, object and outcome* have been treated as a set of linked concepts or components, and incorporates discussion of the motivations for the use of the technology. This structure has been adopted to emphasise the fact that this is a complex interaction with different actors and agency having a range of impacts on the way that the technology influences the work of the officers. This area draws on the officers' discussion of their work practices and the capabilities that the technology offers.

*Community* has been analysed in terms of the overall communities which the officers interact with, and are a part of, and this area draws on the earlier discussion of the nature of the relationship changes which officers experienced as a result of the introduction of the technology. It also has a significant level of overlap with the AT concepts of "*Rules and Norms*" and "*Division of Labour*". These have not been treated separately here.

Where there are potential areas of tension and contradiction these are outlined. This structure was used to help to structure the next stages of data collection and further emphasis is placed on the areas in later chapters as well as in the summative discussion of the overall experience of MICT in the Force.

## Tools

Figure 7.1 below illustrates the findings in relation to *Tools*.

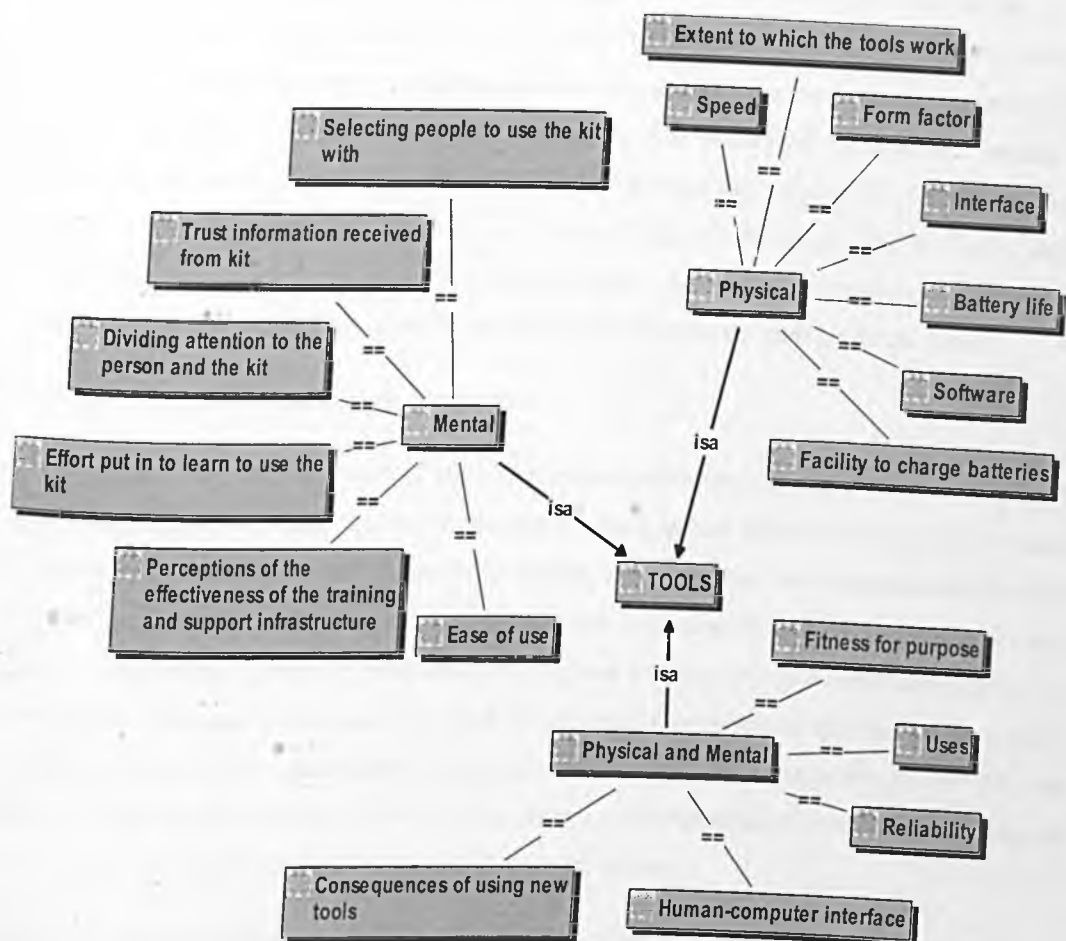


Figure 7.1: *Tools*

Figure 7.1 above highlights three aspects of *Tools* (i) *Physical* aspects (ii) *Mental* aspects, and (iii) *Physical and Mental* aspects (which in some areas of the analysis I found to be so intertwined that they were inseparable).

The *Physical* aspect of *Tools* relates to the extent to which the physical tools (in effect, the hardware) worked as the users wanted and includes, speed, form factor, the interface, battery life, software and the facility to charge the batteries. These represent key factors relating to the physical tool because if these factors are not present the physical tools can be impoverished and, as highlighted in discussions above, can fall into disrepute and end up being unused. If the physical tools are unreliable the users give up and return to their previous practices. Reliability is critical with policing as officers identify that the tools have to become *effectively invisible* in order for them to be part of the culture.

The form factor is a clearly linked area but is treated separately to distinguish between the physical form of the device and the factors such as speed, and battery life noted above. The

physical form of the hardware is a key part of what makes the "kit" as a whole easy to use and this will include the weight so that they can be transported easily, the robustness so they do not get broken easily, and the size so they are transportable / pocketable and information can be input easily and the output can be seen easily. The interface needs to be such that the tools are useable and cannot be simply a miniature version of a desktop machine; this is important to be able to input data, scroll down, and read the output. The battery life is important so that the officer can be sure to be able to conduct the business for that day without the tools dying due to battery problems, and as the officers in my research said, the batteries need to "last a shift". People also need to have easy access to battery chargers. The software needs to be such that the users are provided with access to sufficient information that meets their particular needs.

The *Mental* aspect of *Tools* has six components:

Firstly, there are issues about ease of use i.e., whether the person finds the physical tools easy to use. Although, this in part can be determined by the physical nature of the tools, it is also determined by the aptitude and characteristics of the user as well as the circumstances in which the user uses the physical tools. For instance, a person with large fingers, or who needs to wear gloves, will not find it easy to press small keys or use a stylus on a handheld computer if the buttons are very small. Users may also find the kit easy to use because they have been able to transfer skills they have gained from using other similar tools, whereas a novice will find the task of using the tools more difficult as they have never experienced similar tasks. This, of course, has implications for both training and training transfer.

Secondly, there are perceptions of the effectiveness of the training and support infrastructure held by users which they bring to bear on their use, or lack of use, of the physical tools. Those who feel they have had adequate training and support are more likely to use the kit than those who feel untrained and unsupported. If users are relying on training and support from the organisation in order for them to be able to use the physical tools then the provision of this is important, as it shapes their understanding and skills in using the tools. Without training and support people in this category are unlikely to use the tools.

Thirdly, there is the effort people put into using the tools. People faced with using new tools put different levels of effort in to learn how to use them. The proficiency will be, at least in part, related to the effort. Therefore, an organisation could consider a reward system being in place to reward people for putting effort in to learn how to use the tools.

Fourthly, the users need to trust the information they receive from using the tools. If they cannot trust the information the use of the tools offers no advantage and can be disadvantageous as the users wonder, or even worry, about the level of accuracy of the information. If they have

to check the information due to lack of trust, their efficiency and productivity could actually be reduced.

Fifthly, the user needs to be able to divide their attention between the tools and the person they are with, for instance the officers in my study needed to be able to interact with the victims, perpetrators, and suspects as well as work the tools – clearly some struggled with this interaction as they said they had reduced levels of active listening due to using the tools. This capacity to use the tools and interact positively with people is an acquired skill, as it involves multi-tasking and a good knowledge of the tools as well as high level skills in interacting with others.

Finally, the users need to be able to be selective regarding the circumstances when they use the tools and those in which they do not use the tools. In the context of my study, this is partly composed of being able to remember people who are difficult or dangerous, and being able to observe signs that indicate that a person may be dangerous or difficult, processing that information and then making the decision not to use the mobile data tool but revert to the use of another familiar tool such as voice radio.

The *Mental* aspect of Tools illustrates that the physical aspect of tools is only part of *Tools* and overall concept and part of an activity system, and that the *mental* tools are at least as important in the use and interpretation of the physical tools. This analysis highlights this importance and points organisations to consider the mental tools of users in relation to the six areas just discussed.

There are five ideas in which the **Physical and Mental** aspects were so intertwined that I felt them to be inseparable – they are **fitness for purpose, uses, reliability, human-computer interface** and the **consequences of using new tools**. For a device to be accepted as **fit for purpose** it needs to do what it is supposed to do in physical terms, but it also must be perceived as fit for purpose by the users. This means that users must have knowledge about what the device is officially supposed to do and, of course, they have to have a certain amount of understanding too, and this relies on their previous experiences and attitudes. If there is an overestimate of the device's potential by users, and the device does not live up to their expectations, then they may quickly become disillusioned with the technology / system, criticise it, and quite possibly not use it. The **uses** that the device has rely on the physical capabilities of the tool but also on the expertise of users to be able to make the physical tool perform the functions. This, therefore, relies on users having an appropriate training and support infrastructure to help to provide them with the knowledge and skills to be able to use the device. The **reliability** of the device is dependant on the physical tool actually working as it should on each occasion that it is used, on the software and connectivity being effective and also on the skill and knowledge of the users to be able to make the device work, and if the device does not

work the users need to identify and the cause of the failure. Without a level of understanding of the way the system works as a whole, users may attribute the failure to the physical tool being unreliable or to their own lack of skill and knowledge when in fact the problem lies outside their control. This was illustrated during the POC when a server went down after a small group of officers had been trained – the effect of this was that the systems were unusable for 2 days but no one bothered to tell the officers. The officers attributed the failure initially to their lack of experience:

*“I thought I was doing what they'd said in the training, but then I thought it must be me. Then I found out other people were having the same problem and they were sure they were doing it right – so at that point you think ‘This just isn't much good really.’ And you put it away.” (PC M OIS 2)*

If users identify a failure as coming, at least in part, from their own lack of knowledge and skill, they can take steps to rectify the problem, but if they simply attribute the failure to the unreliability of the device, they may not use it, and may also criticise it. **Human-computer interface** is a function of the form of the physical tool and the users. For instance, users with small fingers may find it easy to input data into the device whilst those with large fingers may not. This is an important aspect because it indicates that there may need to be differentiated devices and interfaces rather than a one size fits all approach. The consequences of using new tools will rely on the physical nature of the tools and the users' experiences of using them. For instance in my research, an officer said the kit would not delete and “it didn't look good at all”. Not looking good was his interpretation of the situation. If the consequences of using the tools are considered to be negative by users then they are less likely to use them whilst, on the other hand, if the users interpret consequences as positive, with comments that the “public quite like to see police officers with technology” for example, they may be more predisposed to using the device.



## Subject, object and outcomes

Figure 7.2 below illustrates the findings in relation to *Subject, Object* and *Outcomes*.

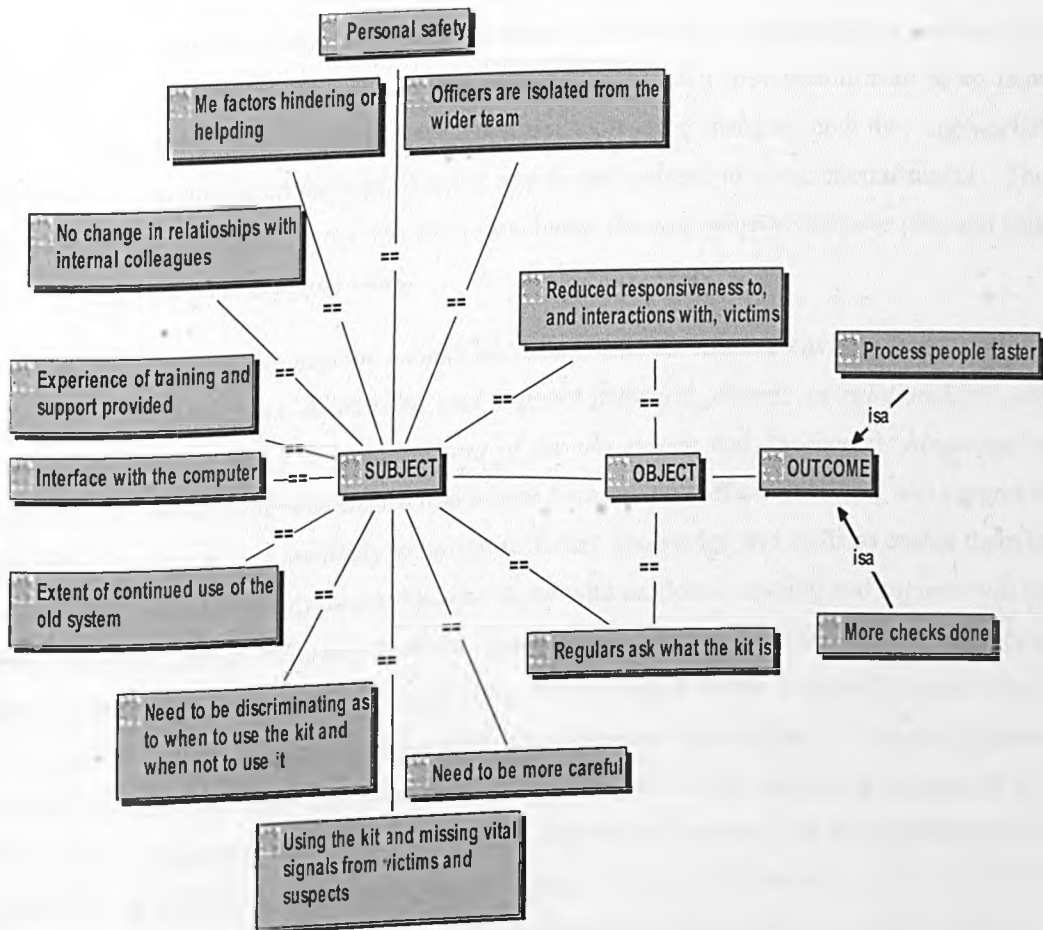


Figure 7.2: *Subject, object and outcomes*

Figure 7.2 above shows that I identified twelve factors associated with the **Subject**, two of which are also associated with the **Object**. There are also two key factors identified with the **Outcome**. In the paragraphs that follow, I discuss **Subject, Subject and Object**, and **Outcome** in turn.

### *Subject*

Three factors relate to the subject doing the job safely or otherwise; these are **Personal safety**, **Isolation from the wider team** and **Need to be more careful**. These indicate that, perhaps unsurprisingly in a job like policing, safety is a matter of great significance to the officers who are engaged in dealing with policing services. Such officers are described as “front line” officers and will refer to “the sharp end” or the “coalface” when talking about the work they do. In dealing with such users when planning the introduction of new technology, it is vital to consider the safety aspects. In my research officers were concerned about their personal safety as a direct result of simply having the tools as they thought having them would make them a

target for people wanting to steal the equipment as an item of value in itself. A second issue was that the way the new system (tools) worked ( checking PNC without going through the control centre) left some officers feeling isolated from the wider team and concerned that if they were facing a dangerous person or situation no-one would know and, therefore, no back-up would be sent to assist them. This in turn meant that they felt they would need to be more careful with some people. In other words, the new tools were changing how they approached their work and engendered feelings of being unsafe and isolated in some circumstances. This means that having, and using, the new tools can change the way subjects see their jobs and their feelings about the nature of their work.

Four factors related to the way the subject interacted with the internal environment and tools; these are their *experience of training and support provided, change in relationships with internal colleagues, extent of continued use of the old system* and *Me-factors; hindering or helping*. The first of these is of critical importance because if insufficient training and support is provided for subjects they are likely to have insufficient knowledge and skills to enable them to use the new tools to their advantage, likewise those with sufficient training and support will be more likely to be equipped to use the tools. Equally, if support is provided when it is needed, subjects are enabled whereas if it is not, they may simply become frustrated through their experience of failure. Change in the subjects' relationships with internal colleagues happens through the use of the tools. In my research, subjects did not use the equipment sufficiently for there to be a change in relationships with internal colleagues, however, had the equipment been complete and reliable it may have changed relationships. The extent to which subjects continued to use the old system (tools) related to their experience of the new system (tools) in terms of their reliability and fitness for purpose, being able to use the tools, and the safety issues mentioned above. However, subjects may also be predisposed to using the old system (i.e., old tools) due to familiarity and it takes effort from subjects to be able to break away from the familiar, old system (i.e., old tools) and use the unknown, new system (i.e., new tools). This, of course, links with the fourth aspect, *Me factors hindering or helping*, which indicate that subjects partly determine their experiences of success and failure using the new tools because they can choose to expend effort to learn to use the new tools or not.

There are two factors related to the subjects' decision making processes regarding their use of the tools. Firstly, subjects need to be *discriminating in when to use the new equipment (kit)* and when not to use it, and secondly *using the kit and missing vital signals from victims and suspects*. Thus, just because the subjects have the new tools available does not mean that they will use them on every occasion. Thus, subjects engage in a decision-making process concerning the use or non-use of the tools. In my research, this was linked with safety as there were situations in which officers did not feel that they could use the new tools and watch the suspects at the same time; they were afraid to take their eyes off potentially dangerous people.

They were also afraid of missing vital information gained from observing suspects and victims when they were inputting data into the kit and reading output. This idea is concerned with the loss of vital information gained through observation that is critical to the officers being successful at their jobs. Thus, in some circumstances the physical tools can absorb the subjects' mental tools to the detriment of the job being done effectively. The final idea that concerns the subject and not the object is the subjects' interface with the tools. In my research this was the subjects' interface with the computer and one officer explained how he had to twist and bend his body to be able to operate the car terminal. Having to do this for a large part of the working day would lower subjects' quality of working life and could lead to health problems.

### ***Subject and Object***

There are two ideas that are shared between *subject* and *object*. These are that *regulars ask what the kit is* and *reduced responsiveness and interaction with victims*. In the first idea, the object (in the case of my research the suspect) asks the subject about the kit. In this situation the subject could simply explain very briefly what it is. However, in doing so, the subject risks being distracted and the object could use it to his/her advantage to escape or to attack the subject. If the subject ignores the request for information made by the object, the object may perceive the subject as rude. Thus, we see here the inquisitiveness of the object resulting in a problem situation for the subject. The second idea, *reduced responsiveness and interaction with victims*, illustrates that using the tools may actually reduce the level of interaction and, in turn, the perception of client care perceived by the object and potential dissatisfaction perceived by the subject. In the case of my research, some officers were clearly concerned because they were unable to engage in active listening with victims due to using the kit (physical tools).

### ***Output***

In the case of my research there were simply two *Outputs* from using the new tools – firstly, the officers could do more checks and, secondly, they could process people faster. When change is made to the tools, it is intended to have some tangible benefit and despite the teething problems which officers cited, it was clear from my research that there were outputs in the form of productivity.

### ***Community***

Figure 7.3 below illustrates the findings in relation to the *Community (Rules and Norms)* and the *Community (Division of Labour)*. There were twelve factors relating to the *Community (Rules and Norms)*, ten relating to the *Community (Division of Labour)*, and two which relate to both *Community (Rules and Norms)* and *Community (Division of Labour)*. In the paragraphs that follow, I discuss firstly the factors relating to the *Community (Rules and Norms)* solely,

secondly to those relating to the *Community (Rules and Norms)* and the *Community (Division of Labour)* jointly, and thirdly, those relating solely to the *Community (Division of Labour)*.

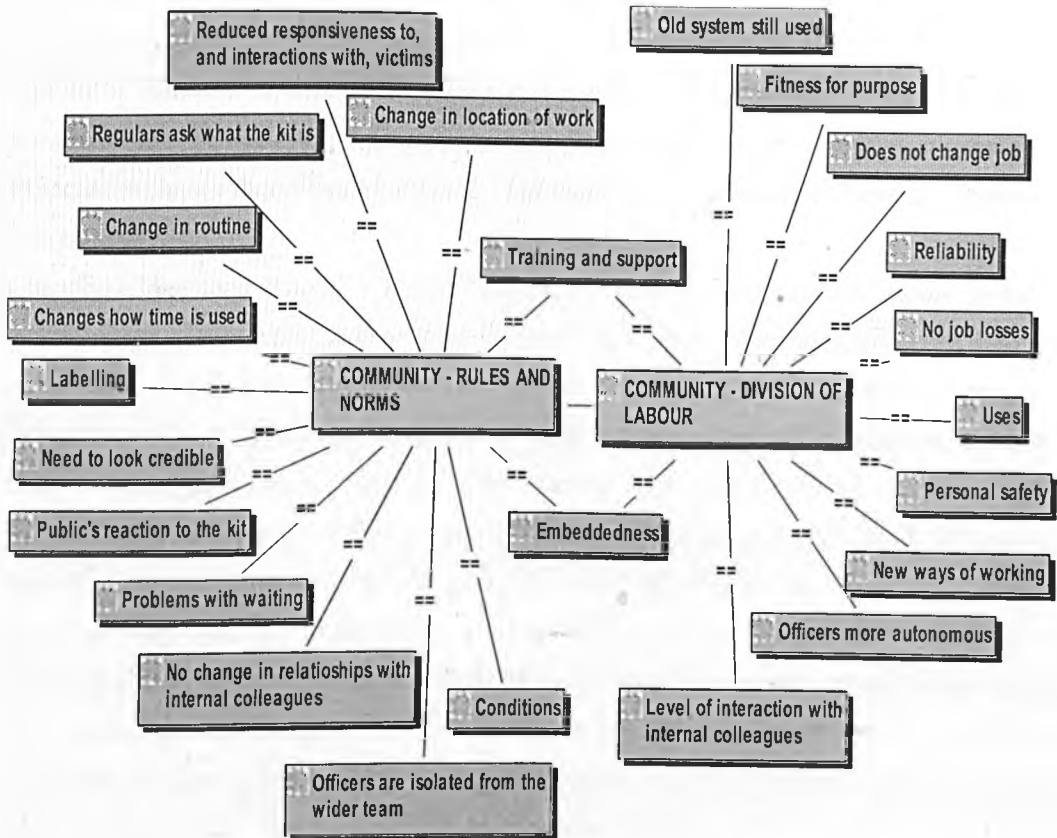


Figure 7.3: *Community – Rules and Norms and Division of Labour*

### ***Community (Rules and Norms)***

Six factors relate to the way the subjects' rules and norms in their job roles have changed because of the new tools. They are:

Change in location of work – In my research the officers were able to use the mobile technology (i.e., their new tools) to give flexibility to their work location. Specifically, they were able to undertake tasks at locations which suited them rather than having to return to their office to undertake the tasks. The change in work location potentially has an impact on performance because instead of spending time travelling back to the office to undertake tasks, the officers could do them at quiet times and increase their productivity by making more efficient use of the time they would normally spend travelling back to the office. It also has a potential impact on relationships within the community as the officers can spend more time in front-line policing in activities where they can be seen by the public, rather than behind the scenes. However, they will potentially spend less time with colleagues in the office which, over time, could result in diminished relationships and less sharing of information that could help them in their work.

Change in routine - In my research there was a clear change in the routine that had been the norm. When people have to change their routine that they have become used to over a long time they can experience anxiety and depression before they let go of the old habits and embrace more fully, and find meaning in, the new. Indeed there are many models of the individual transition to change to indicate that people go through these stages when they are faced with change which highlight that there needs to be attention given to the individual who is expected to change their ways of working. The change process must be managed effectively for it to be successful.

Change in how time is used - It was clear in my research that officers' access to the new technology (i.e., new tools) changed how they used their time. When they did not have to return to the office to undertake tasks because they could do them on the mobile devices, they changed how they used their work time. They also learned to engage in multi-task activities that had not been the norm, for instance, when they were waiting for a response from the mobile computer they walked around the car to do a visual check. The change in the use of time has implications for self-management strategies and the provision of appropriate training.

Problems with waiting - In my research I found that waiting for a response from the mobile terminal initially presented officers with problems. The public became irritated on occasions as the waiting impacted on them (bearing in mind they would not be expecting to have to wait very long) and the officers had to deal with their behaviour. They also had to learn to manage their time differently whilst relating positively to the waiting public.

Reduced responsiveness to, and with, victims - I believe this to be one of the most important issues concerning the norms being changed because it touches on the very core of police activity as seen by officers, and that is listening to victims of crime. The officers felt that using the new tools made them less able to engage in active listening with victims because they were filling in the questions asked by the computer in the order required by the computer. This is a highly significant aspect in terms of norms because it changes the role that officers were used to i.e., listening, to filling in forms in a dictated order. Reduced responsiveness to, and with, the object is one that could happen in a different setting when new technology is introduced at the point of contact between subject and object. In a situation when it is vital that such contact is conducted sensitively or indeed caringly, then the technology could pose problems if it requires the subject to mechanically follow a list of set questions when, in reality, a more personal approach is needed.

Isolation from the wider team - I mentioned above in the discussion of the *subject* that some officers felt isolated from the wider team due to using the new technology and this had an impact on their feelings of safety. This isolation, however, means that the officers experienced a change in being part of a community. In community terms, the norms had been that the officers knew that they were being *looked after* because if they were dealing with someone who was known as difficult or dangerous the community of officers knew that, and officers from that

community were sent to support their colleague. This isolation divided the community, breaking its norms and making the individuals in it feel more vulnerable.

The remaining six factors concerning the *Community (Rules and Norms)* are firstly, *the need to look credible*, which relates to the rules and norms about the way the subjects (in my research police officers) want, and indeed need, to be viewed by the objects (in my research the public, usually as victims, but also as perpetrators of, crime). Thus, when new tools are being used by subjects, it is vital that they work and the subjects are able to use them effectively; if these do not happen the subjects will feel that their credibility in the eyes of the objects will be tarnished, and of course, it may be. This could lead to the objects losing confidence in the subjects, and the subject losing confidence in the new tools and in their use of the new tools. In turn, the subjects could abandon the new tools and return to the old tools that they are used to. Linked to this is the second factor, *conditions*, which are the conditions under which the subjects will be prepared to give up their use of the old tools that had become their norm and use the new tools. For instance, they may be prepared to give up the old tools if the new tools are totally reliable and they know how to use them well. *Conditions* is an important factor because it implies that some kind of bargaining takes place in which the subjects are only prepared to use the new tools consistently if certain conditions are met. These conditions must not be overlooked when the organisation is planning the introduction of new technology, because if they are not met, the subjects return to their old norms of using the old, familiar tools. Therefore, efforts that have been put into the change process are, to a great extent, wasted. The third factor, *regulars ask what the kit is*, has been discussed above in relation to *subject and object*. It is of importance in the *Community (rules and norms)* too, because the public see that there is a change to the norms and become curious but it is not usual for suspects to ask police officers about the equipment they are using and by asking they break the rules and norms of how a suspect should act and what they should discuss with a police officer. The questioning usually comprises police officers questioning suspects and not the other way around. Therefore, the tools change the norms and the subjects need to decide how to respond. In my research, the response was ignoring the question, which as previously discussed, could cause ill-feeling. Linked with this is the fourth factor, *the public's reaction to the kit*, and in my research this involved the public being interested in the new tools and, of course, to some extent they expected the police Force to be using up-to-date technology. Thus, the public expected the old rules and norms to be changed so that new technology is embraced and used to good effect. The fifth factor is *labelling* and I found this particularly interesting because it was clear, in my study, that the police officers had labelled particular members of the public, as being problematic and with these people they were not prepared to break away from the existing rules and norms of using the radio. However, they suggested that it would be good if the kit had a voice recorder so that they could record conversations with known complainant to protect themselves from false accusations. In the case of my research the labelling was linked with *keeping to the familiar*

and suggesting *breaking the mould*. This implies that, when introducing new technology, the consideration of groupings through the process of labelling could be used advantageously because it means taking account of diversity that already exists through what has become, over time, the rules and norms of work practices. The sixth factor is *no change to relationships with internal colleagues*, and this is one that has already been discussed above under the topic of the *subject*. However, in relation to the *community (rules and norms)* the new tools did not change the relationship of some officers with their internal colleagues because they did not use the new tools sufficiently and continued to use the existing system. Thus the rules and norms about the way operations took place, and the relationships that allowed them to do so, stayed the same.

#### ***Community (Rules and Norms) and Community (Division of Labour)***

The two factors that were shared between *Community (Rules and Norms)* and *Community (Division of Labour)* are *embeddedness* and *training and support*. *Embeddedness* refers to the extent the new tools are embedded into the system. To change the community in respect of *rules and norms* and *division of labour*, the new tools must be fully embedded into the system. If they are insufficiently embedded, they will not significantly affect the community. In my research, I found that some officers used the new tools and there was a resulting change to the community in terms of rules and norms and the division of labour. The rules and norms changed because the way subjects undertook their work activities changed. Because they made much less use of their *communications* colleagues, the division of labour changed as the officers undertook checks themselves and this meant that their communications colleagues did not have to. For the rules and norms to be fully affected by the new tools, there has to be a change in culture – in other words, *the way we do things round here* has to change so that the norm is to use the new tools and there are new rules associated with their use such as, in the case of my research, officers having to charge batteries and take responsibility for the handheld computers. A change in culture will only happen when the new tools are fully embedded and, when this happens, the division of labour will be significantly changed. *Training and support* is part of the infrastructure that can facilitate the embedding of the new tools. If the training and support provided are successful in facilitating change by helping the new tools to become embedded, the norms and rules will be affected in turn, and the division of labour will change accordingly. Since the stage being investigated is *proof of concept (technology)*, such a cultural shift would not be expected across the organisation as a whole but would be expected to happen at a sub-culture level. In my research it was evident that, for some, there actually was a change in subculture as some officers used the *kit* consistently. The issues of *embeddedness* and *training and support* have been brought to the fore and their importance cannot be underestimated.

#### ***Community (Division of Labour)***

Of the ten factors that relate to the *Community (Division of labour)*, three are concerned with the new tools, six with change (or indeed lack of change) to the job, and one with the relationship with internal colleagues.

The three that are concerned with the new tools are: *reliability, fitness for purpose* and *uses* and have already been discussed above under *physical and mental* aspects of tools. However, they equally relate to the division of labour, because if the tools are unreliable, not fit for their intended purpose, and have a restricted range of uses, they are unlikely to change the division of labour. If they are totally reliable, are fit for their intended purpose, and have an appropriate range of uses, they will affect the division of labour as they will allow subjects to undertake tasks that are normally done by others. This was the case with my research; I found that officers were able to make checks on vehicles, a task that had normally been undertaken by their communication colleagues. The extent of this activity, however, was related to the three factors just mentioned.

The six factors which relate to the changes, or indeed lack of change, to the job are: *does not change the job, new ways of working, no job losses, officers more autonomous, personal safety* and *old system still in use*. The factors *Does not change the job* and *Old system not in use* are clearly linked. If organisations run the old system side-by-side the new system (which can be advantageous and necessary) the staff may continue to use the old system rather than use the new one and therefore the new tools do not become embedded and as a result there is no change to the job and the division of labour remains the same. The factors *New ways of working, officers more autonomous, no job losses* and *personal safety* are all concerned with change taking place which affects the division of labour. Subjects who use the new technology have to find new ways of working, and in the case of my research, the new tools gave the subjects more autonomy to undertake tasks rather than rely on others to undertake the tasks. The division of labour changes because subjects are undertaking different tasks when they devise, or adopt, new ways of working, and undertake tasks which had previously been done by others. *No job losses* represents the idea that the technology (i.e., new tools) provides a gain to the subjects using them rather than a loss. In my research, the officers had more tasks to fulfil rather than less, which means that they did more work, some of which was previously undertaken by others. *Personal safety* has been discussed above under *subject*, however, it is also relevant to the *division of labour* as in my research the subjects know that if they used the new tools they would not have back-up sent to them automatically and would be alone when potentially dealing with difficult situations.

The final factor relating to the *Community (division of labour)* is *level of interaction with internal colleagues*. This relates to the division of labour because if subjects do not need to liaise with their internal colleagues because they are more autonomous, the relationship with



those colleagues will change. Likewise, the relationship continues as usual if subjects continue to use the old tools and the old system that relies on their colleagues undertaking tasks for them.

### **7.3 ANALYSIS OF THE SPOC AND TRIAL USING AT**

The previous section dealt with the technology proof of concept and identified a number of areas of attention which provided the basis for the initial AT analysis of the way the technology was used in that setting. It also provided the basis for a further development of the questions and areas of attention in this chapter; as a result the AT analysis used here is more structured than was the case with the earlier chapter. In this discussion there are two phases:

- A high level picture of the overall context, including the subject, object and outcome and the motivation for undertaking the activity, the key tools in use, the communities involved, the rules and norms which apply and the division of Labour in the activity. Whilst this has been developed at this stage much of the content is also applicable to the earlier technology proof of concept – although the officer roles are different.
- An overview of the identification of the overall activity system and of the secondary systems to this. Where I have felt it appropriate I have also further broken this down to examine some of the key actions and operations which officers undertake. Some of these are directly affected by the mobile technologies which have been introduced, some are indirectly affected and some are not affected at all. It is not possible to be completely exhaustive in either the identification of the activity systems or the actions and operations undertaken within them. Nor is it possible to directly apply the way in which the technology affects the activity system in one policing role to the way in which it will affect another. The section contains an overview, the Activity System conceptual models can be found in Appendix 4.
- A summative section which attempts to identify the key areas in which the introduction of mobile technology has affected the activity systems discussed. This section draws on the structure of the first section and seeks to identify areas of commonality, areas of gain and areas of tension and contradiction.

#### ***Overall context***

This section attempts to provide an overall context and setting within which to understand the activity systems, which are then discussed further in the next section, and presented as conceptual models in Appendix 4. The section outlines the overall context and the roles of the officers involved in the systems proof of concept, some of the key tools available to police officers, the subject-object-outcome of the activity system, the motivations of the subjects, the communities potentially involved, the rules and norms applying and the potential division of labour.

The SPOC and Trial deployed mobile technologies, in the form of handheld mobile computers, to police officers in generalist police roles. These officers were almost all police constables and, as such, represent the most numerous group within both this police force and the police service in the UK generally. Whilst various other initiatives, both in this force and in others have identified the potential for mobile technologies to assist those in specialist roles, such as detectives or crime scene investigators, as well as those in senior positions as police officers or police staff, the force was particularly keen to develop systems which could impact on this most numerous group of officers. The reasoning being that even a relatively small impact, say on the level of visibility, when multiplied by the number of constables in generalist roles becomes a significant impact at the level of the force overall. The two key roles for the officers concerned with the systems proof of concept were community and neighbourhood policing, known as neighbourhood patrol team within the police context but probably better known as *police on the beat* to the general public, and response policing which is the role most popularised in the media through programmes such as *The Bill*. This role involves officers reacting to incidents and dealing with them as they arise. The two roles, although there is significant overlap between them, are quite different. Both sets of officers are required to undertake basic administrative processes which are a part of their jobs, these include attending briefings, dealing with internal and procedural requests in regard of things such as overtime and booking leave. These tasks have been omitted from the activity systems described in this and the next section as they do not contribute directly to front line operational policing. It should be noted, however, that without these background administrative tasks the officers could not in fact function in the longer term.

Neighbourhood patrol will normally deal with a relatively small geographic area and, while they will clearly deal with any incidents they come across during the course of their working day, the role has a number of other facets to it beyond simply enforcing any laws which are seen to be broken. Visibility is a key part of this role, with officers assigned to a geographic area as part of the neighbourhood patrol team whose goal is to become known to the residents and users of the particular area policed. Becoming known means that the community with which the officer deals will feel more able to make the officers aware of the issues which matter to them, they may more readily provide the officer with information on antisocial or criminal activity and the very fact of the officers being known and seen will help to reduce the incidence of criminality and antisocial behaviour. Becoming known also means becoming knowing, and neighbourhood patrol officers build up, over time and as a group as well as individuals, a considerable level of knowledge about the area they police and the people who live in or use that area. A knowledge of these key individuals and networks means that neighbourhood patrol officers build up not only knowledge of the geography of the areas in which they work but also knowledge of the social geography of these areas. The role is, therefore, quite strongly proactive with officers aiming to build relationships with the community as a whole as well as with those members of

the community who feel at risk, who can provide information, and who may be involved in antisocial behaviour or criminality. The antisocial behaviour and criminality which officers in neighbourhood patrol roles deal with is often of a relatively low order when compared with some of the major criminality in society and in the world as a whole. Nonetheless, this antisocial behaviour and criminality can have a significant impact on the communities in which it takes place. It is not easy to generalise about the work of neighbourhood patrol officers, in part because different geographic areas are very different in their social geography, and in part because seasonality and other factors (such as a grudge match between local football teams) mean that something which is normal at a particular time on a particular day is unusual on another day or at another time. Nonetheless most neighbourhood patrol officers would identify some key common elements in their work. Dealing with youth and antisocial behaviour is probably one of the most common, particularly for those officers who work in an area where there is a school serving the local community or where there are attractions, such as the town centre, which will bring young people to the area in numbers. Incidents involving disputes between neighbours are also common, as are minor vehicle violations such as parking or failure to display a valid tax disc. In areas which include licensed premises some level of alcohol related antisocial behaviour would also be common.

Response officers will deal with a relatively larger geographic area and will normally be vehicle-based. The basis of the role is to carry out routine patrol work whilst waiting for incidents which require urgent attention. Incidents requiring urgent attention will be relayed to the officers by the FCC using the radio system, whereas routine patrol priorities will normally be set through the crime management system and through daily briefings. Routine patrols will normally cover a number of specific geographic areas within the overall geographic area and are intended to act as a visible presence. This visible presence may include parking outside licensed premises at the time of day when trouble could be expected, driving around an area of shops or industrial units at a time when they may be vulnerable to burglary, or checking car parks for vehicles which are not taxed or not insured. Response officers will often work in pairs, known as double-crewed, and will do so particularly at night or when some specific problem may be expected, such as during major football matches for example. They will also work, particularly during the daytime, on their own; which they refer to as single-crewed working. The response officer's role is, therefore, mixed between urgent reactive calls and, usually less urgent but equally reactive in many cases, routine patrol work. As with neighbourhood patrol officers it is difficult to generalise about the types of incident that the officers will have to deal with but there are some which are more common than others. Domestic disputes are a common part of the response officer role, with officers being called either by one of the parties to the dispute or by a witness to it. Such disputes, while sometimes involving physical violence, are rarely life-threatening and many arise repeatedly between the same participants. Whilst many Forces, this

one included, have policies that they will arrest and prosecute for any domestic violence officers are aware that, once parties to a dispute have reconciled, their chances of a successful prosecution are very low, with the Crown Prosecution Service refusing to progress many such cases in the face of a victim who refuses to appear at court. Burglary is another key part of the response officer role when householders or shopkeepers return to their premises to find that they have been burgled. Theft is also the basis of another common part of the response officers daytime activity which, particularly in areas with a significant concentration of retail premises, is often taken up by dealing with shoplifting; usually where a shoplifter has been apprehended by shop staff or by shopping centre security staff. Antisocial behaviour and alcohol related nuisance are also common calls on response officers time, although relatively low level antisocial behaviour would probably not be made the subject of an urgent call but would be passed on for either patrol action (e.g. tasking a vehicle to be outside certain premises at certain times) or neighbourhood patrol team action (e.g. a visit to the licensee by the local officer to discuss how the incidence of loud and abusive late night revellers exiting from an establishment can be tackled). Response officers will also deal with some traffic offences and will, whilst on routine patrol, routinely check moving or stationary vehicles which arouse their interest to see if they are stolen, not taxed, or not insured. They are often among the first at the scene of road traffic accidents.

There are, as already mentioned, some clear areas of commonality between the two roles. Both sets of officers will deal with offences relating to vehicles, with antisocial behaviour and with disputes between individuals. There are also clear areas of commonality in the systems and tools the officers use to carry out their jobs. This next section attempts to provide a guide to some of the most common tools officers use - using the term in the broad AT sense.

## Tools

There are a number of basic information tools which most police officers will use repeatedly during their working day. These include access to the force's crime management system which sets out key targets for officers in different roles in different geographic areas. These targets refer both to individuals who are targeted, and to targets in the sense of performance targets, such as making a visible patrol through an industrial estate at least three times in any given week for example. Officers also use the force intelligence system which lists people of interest, vehicles of interest, places of interest and some of the interrelationships between them. So, the force intelligence system may record details relating to a known drug dealer, the addresses they frequent, and the vehicles they are known to use together with the places within such vehicles where they have been known to hide drugs or money. Access to the police national computer is also a common transaction. The police national computer provides details on individuals and vehicles for the entire country which are of interest to the police. These details are far more restricted than those on the force intelligence system and include, with relation to people, any criminal convictions, any formal warnings, any outstanding warrants for arrest, and if the person concerned is on bail, the conditions of that bail.

Other key tools, physical or screen based representations and records of information, which officers use include the reporting forms which are needed to generate a crime number so that individuals and the police can communicate about the incident effectively and accurately. These are not the only forms which officers complete and there are a range of common ones which include stop and search records, stop and account records, missing persons forms, speeding and other fixed penalty notices, penalty notices for disorder, and youth stop forms. Access to incident logs, which are the computerised record created to identify and track the handling of an incident, also forms an integral part of most officers working day.

Officers also use their knowledge of the law and procedures relating to it, of the areas within which they work (local knowledge), of the current priorities and initiatives undertaken by the force, and of the key individuals and networks which form a part of their working lives, both within the police force and outside it. They also use what they term 'copper's nose' – an intuitive response to something which leads them to investigate it further. Such intuitive checks often yield results although officers can rarely be precise as to what has actually aroused their interest. One senior officer, in conversation on the topic, commented that;

*"You just get to know, you feel it. It's about fit I guess, what fits and what doesn't and that depends on what you're seeing, when you're seeing it and where. So in some areas a kid in a flash car would stand out – in others it's just some spoilt brat in his dad's Chelsea tractor. One's worth stopping just to see, the other isn't. Unless it's four in the morning; then they both are."*

Officers also have access to other, physical, tools with which to do their jobs. One that has become almost emblematic of policing is the police radio which officers use to communicate both with the central control room and, to a more limited extent, with each other. They are also equipped with a uniform which is designed to signal both their presence and status, and to provide a level of protection from the elements and from attack. They are issued with handcuffs, police baton, incapacitating gas spray, a stab proof vest and a belt or harness on which to carry it all. Many police officers have routine access during the working day to police vehicles which are, in turn, equipped with highly visible Battenberg markings, a radio set and the blue lights and two tone sirens (*blues and twos*) which are intended to signal their presence to other road users while responding to urgent incidents. Within the police station police officers have access to the facilities needed to restrain prisoners, to consult the force and wider national information systems, to interview witnesses, suspects, and people who have been arrested, and to meet with other police officers in small or larger groups.

Officers also have access to some other specialist tools. They can call on specialist underwater search units, scientific support, dog handlers, drug specialists and a wide range of other specialist staff who are equipped with their own specialist tools.

#### *Subject - Object - Outcome*

A central component of the AT model is the relationship between the subject, the object and the outcome of the activity and this is, in turn, linked to the motivations for the activity. The exact subject, object and outcome of the activity will, necessarily, depend upon the exact activity system analysed and the next section attempts to provide some more detail in this regard. This brief overview is based on the highest level of activity system analysed in this work which is that of operational front line policing. The subject of this activity is the police officer engaged in the activity of policing, in the case of the systems proof of concept the two key roles of NPT and response, and some of the day-to-day activities, actions and operations they undertake are outlined above. The object of the activity is the member of the public or group of members of the public with whom they are interacting in order to undertake the core activity of policing and the outcome is that the appropriate policing objective, whether that is collecting intelligence, arresting a drink driver or responding to an urgent call to a violent domestic incident, is appropriately met. Sitting behind this characterisation of subject object and outcome is the question of motivation. Quite clearly the different parties involved in the activity system will have different motivations for their involvement, however, the perspective involved at this stage is that of the operational front-line police officer. Their motivation for doing their job, which is what this activity system is all about, will have different aspects to it depending on them as an individual and on the situation in which they find themselves but, at base, their motivation for doing the job as a police officer has to be an acceptance of the overall legal structures and social

structures of policing. Depending on circumstances there may be occasions where they find their job unpalatable and, given a completely free and personal choice, they might, on those occasions, do their job in a different way. However, given their role as a police officer and given the economic and social realities of failing to discharge this role the basic motivation behind their part as subject in the activity system has to be a belief in, or at least an acceptance of, the criminal justice system in this country, allied with a contractual obligation to behave as it is set out for police officers to behave.

### *Communities*

There are a number of different communities around the central activity system of operational front-line policing. Clearly, the police themselves form a community, and in many cases a very cohesive one, with a number of subdivisions around role, around team and around friendship groupings. Within the police as an overall community there is quite a clear division between warranted police officers and other police staff. This division has been blurred slightly, of late, by the introduction of quasi police officers in the form of police community support officers (PCSOs) and, in the traffic context, highways agency traffic officers (HATOs). Interacting with the activity system there are some other communities; other parts of the criminal justice system, such as the Crown Prosecution Service and the Courts Service, and of those allied with it such as local authority and social work communities. The geographic community policed also clearly has a legitimate interest in the activity system and, just as the police community can be broken down, so the geographic communities policed can also be broken down. Young people form one of these communities in many areas, as indeed do older people in many. NPT officers will also often identify large employers, or schools and colleges as communities within their areas as well as occupational or interest groupings such as farmers or shopkeepers. Criminals, although not cohesive as a community perhaps, do have a level of community and certainly there are communities which do not see themselves as criminal although the law characterises their activity as such. Drivers caught by road safety (aka speeding) cameras could form an example of such a group. Communities spring up around causes, and so the campaign for the construction of speed calming measures outside the local primary school will be a community with maybe slightly more permanence than the angry mob of football hooligans who believe that one of their number has been dealt with unjustly.

### *Rules*

Policing is an activity which is subject to many rules. These rules range from the laws of the land, which the police are charged with enforcing, to internal rules which determine ways of working with particular groups and in particular circumstances. It is also, of course, an activity undertaken by people interacting with other people and the rules and norms, such as those of politeness and courtesy, which apply to many interactions also apply to this activity, in some

cases at least. It is, however, also an activity in which opposed communities come into contact, and norms which guide the behaviour of drug dealers, for example, tend not to be well aligned with those of neighbourhood police officers. It is not possible to be exhaustive about the different rules and norms which come into play in the overall activity system but the laws of the land must be among the key groups. These laws include both powers for the police and limits on those powers.

### *Division of Labour*

The division of labour within the overall activity system of operational front-line policing is also subject to the precise nature of the incident being dealt with and it is not possible to be prescriptive about it. However, as with the other key components of the activity theory model, some general observations can be made at the level of this overall activity system. Some of the work of bringing incidents to the attention of the police falls to the general public who will alert police officers, police staff or other agencies to actual or potential antisocial behaviour or criminal activity. Identifying and providing an appropriate police resource to deal with whatever matter has been brought to the attention of the police force will be handled either directly by a supervisor or manager in a setting such as a briefing or indirectly by such a supervisor or manager making use of the force control centre in order to dispatch officers to deal with an urgent incident and maintain the incident log which provides a record of the way the incident was dealt with. The police officers who carry out the overall activity system of operational front-line policing clearly provide much of the actual labour, either individually or as a group, to complete the activity. Consequent on the initial activity other police officers in specialist roles may be called on as, indeed, may police staff specialists in roles such as forensic support, counselling or professional affairs. Administrative police staff will probably be involved at some stage in documenting action taken, notifying members of the public of action such as a fixed penalty notice, or recording some level of detail of the incident in order to provide statistical returns as required by the Home Office from the force.

Agencies external to the police but forming a part of the larger criminal justice system, such as the courts, may well be involved in the action following on from an incident which police officers have dealt with. Other agencies which are allied with the criminal justice system, such as Youth Offending Teams, social work or local housing associations, may also have some level of work as a result of an incident. At a yet further remove other organisations and communities may become involved. So, for example, a speeding vehicle which narrowly misses a schoolchild outside a school may result in a conviction for dangerous driving for the driver concerned. It may also result in a police liaison action with the school to inform both pupils and the Parent Teacher Association of the levels of danger, of action being taken, and of good practice both for pupils and for the school in road safety. It may also result in a local community action group starting a campaign to provide physical traffic calming measures to reduce the



incidence of such occurrences at that particular school, at schools in general or, indeed, more widely.

## Analysis

This section is based on the conceptual models of the high level activity system of front line policing and the two associated systems of neighbourhood and response policing. The models of these systems, based on the structure for data collection outlined in Chapter Three and serving as the base for the framework proposed in Chapter Eight, are presented in Appendix Four. The analysis sought to uncover areas of commonality as well as areas of tension and contradiction and these have been used to identify common tasks within the day to day activity of the officers involved in the activity systems. The component parts of the activity system identified in this way for both response and neighbourhood patrol officers are a useful unit of analysis to examine the actual or potential impacts of mobile technologies on the day-to-day activities of the officers concerned. The lists have considerable overlap but the frequency with which these components are used would be quite different for officers in the two roles. Where they are used they are, however, similar as actions or operations, although, as already noted they may be carried out under quite different circumstances. The two lists of component activities, actions or operations have been conflated below and have also been re ordered from the conceptual models. This reordering groups the components under five subheadings. The first set are mental processes, the second involve information retrieval the third set are concerned with communication, the fourth set with physical activity and the final set with administrative tasks. Clearly, these are not cut and dried divisions but they are a convenient way of structuring these components which make up some of the actions and operations needed to deliver the purposeful activity described in both the overall and second-order activity systems. For each of these components the actual or potential impact of mobile technologies has been briefly explored in the table below.

*Table 7.1: Key process areas*

Process area	Components
Mental processes	Identify vehicle or person of interest or potential interest Ascertain whether an arrestable offence has been committed
Information retrieval	Carry out checks on PNC, Force Intelligence system, voters roll Liaise with Force Control Centre for information required Access information directly Access crime management system
Communication	Call for backup as required Arrange prisoner transport Deal sensitively with people under stress Inform supervisors or managers as required Arrange and participate in community liaison meetings Identify and develop relationships with key individuals and networks
Physical activity	Stop person Stop vehicle Search person or vehicle Arrest person

	Respond rapidly and safely to get to the location of an incident
Administrative tasks	<p>Issue fixed penalty notice for disorder</p> <p>Issue conditional fixed penalty notice</p> <p>Issue stop encounter form</p> <p>Issue stop search form</p> <p>Issue youth stop form</p> <p>Complete missing from homes report</p> <p>Record appropriate incident details</p> <p>Read and update incident logs</p> <p>Submit information into the intelligence system</p>

Table 7.2: Impact of mobile technologies on key process areas

Component	Actual / Potential impact of mobile technologies	Areas of actual or potential impact on the activity system(s)
Identify vehicle or person of interest or potential interest	<p>The initial identification of a person or a vehicle as being of interest or potential interest to a police officer can come from three key sources. The first is a direct instruction, perhaps over the radio or during a briefing, or on the force crime management system that a person or vehicle is of interest and should be stopped. The second is where a person or vehicle becomes of potential interest as a result of an incident. So, for example, the driver of a car which has been involved in a minor accident may become of interest if officers identified that they may have been drinking. The third is on the basis of intuition.</p> <p>Mobile technologies make it easier for officers to consult the briefing system in the crime management system whilst out of the police station and, as a result, they report being able to more readily identify both people and vehicles of interest and make the initial confirmation that they are of interest. One of the key drivers for the police force in issuing mobile technologies to officers is to improve visibility and keep officers out of stations. As a result, if officers spend more time out of police stations, they have a better chance of seeing people or vehicles of interest.</p>	<p>Tools – PDA</p> <p>Tools – Radio, reduced usage</p> <p>Outcome – policing objectives</p> <p>Subject – autonomy</p>
Ascertain whether an arrestable offence has been committed	<p>For the most common offences with which officers come into contact they have a very clear knowledge of the conditions required for an arrestable offence to have been committed. In situations which are not common many officers will rely on contacting either the police force control centre or a supervisor or manager. Some vehicle-based officers also carry considerable quantities of reference material in the form of justice manuals with them. Some reference materials can be accessed from police station computer terminals such as the police national legal database which incorporates a quick reference table, known as <i>points to prove</i>.</p> <p>Mobile technologies do not currently provide access to any of these reference materials, although one officer did recount having received and retained an e-mail which outlined a minor change to some part of the vehicle construction and use regulations and which he was able to consult on a handheld computer. There is, clearly, potential to provide further access to training and reference materials which could support officers in determining</p>	<p>Tools – reference materials</p> <p>Division of Labour – reduced call on FCC, reduced calls on supervisors / colleagues</p>

	when an arrestable offence has or has not been committed.	
Carry out checks on PNC, Force Intelligence system, voters roll	<p>Police officers investigating a person, vehicle or incident will, as a matter of routine, often require access to three key information systems, being the police national computer, the force intelligence system, and the voters roll. Such access has, historically, been available only through two routes; direct access by the officer concerned to an in station terminal and access by an information intermediary, almost always an operator in the force control centre.</p> <p>Mobile technologies provide officers, in situations where the use of this channel is appropriate, with direct access to all three of these key information systems. Such direct access allows officers to carry out more checks and often allows them to carry these checks out more quickly because they do not have to wait for access to the radio.</p> <p>Access to the force intelligence system also includes access to images of the people on the system and officers report this as being especially valuable when somebody tries to give false details. Access to images is available on police station computers but has not, hitherto, being available to officers outside the police station who have had to rely on either description being read out to them or having the image on the system described to them. Providing officers with direct access to information systems reduces the load on information intermediaries such as the force control centre.</p>	<p>Tools: PDA, PNC. Force intelligence system, voters roll.</p> <p>Norms: Increased volume of use. Improved speed of checks. Improved quality of results (images).</p> <p>Outcome: policing objectives ( e.g. uninsured vehicle detection) met</p> <p>Division of Labour: reduced call on FCC</p>
Liaise with Force Control Centre for information required	<p>The three key information systems above apart, the force control centre has access to a range of other Information Systems. Officers will normally request this directly by radio.</p> <p>Mobile technologies do not, currently, provide access to the wider range of information systems available to the force control centre. If such access does become available in the future then the potential impact would be similar to the point above.</p>	Potential only (please see above)
Access information directly	<p>The three key information systems above apart, officers have access to a range of other Information Systems via in-station computers.</p> <p>Mobile technologies do not, currently, provide access to the wider range of information systems available to the force control centre. If such access does become available in the future then the potential impact would be similar to the point above.</p> <p>The ability to send brief e-mails whilst at the scene of an incident, or at least out of the station, can mean that officers start the process of accessing additional information earlier than would have been the case without access to mobile technologies.</p>	<p>Tools: PDA, email</p> <p>Outcome – faster response to queries.</p>
Access crime management system	<p>The force crime management system provides details of key tasks and targets at a range of levels from the individual to the divisional. This information, and changes to it, will often form the basis of much of the briefing for a shift. This system would normally be accessed directly on an in station terminal at the start of a shift if an officer has been off for any period of time.</p>	<p>Tools: PDA, local (people and events) knowledge.</p> <p>Object: improved recognition</p>

	<p>Access to this system is available on mobile technologies issued to officers and allows them to check, and update, the key targets and tasks for them as individuals, for their team or their area as a whole. Officers have reported this as being particularly valuable when they have been off for a period of time or when they are working in an area with which they are not familiar, perhaps as cover for a colleague. Whilst officers will be familiar with their own key targets (target in this case referring to a person) the ability to check images of key targets from other areas is of value.</p>	Norms:
Call for backup as required	<p>Calls for backup, whether in the form of specialist officers or just more officers, will normally be made by radio. In case of emergency police radios have a panic button and this operates over the radio system.</p> <p>Mobile technology only impacts on this process in the sense that the handheld computers incorporate the functions of a mobile phone.</p>	No current impact
Arrange prisoner transport	<p>Prisoner transport will normally be arranged by radio to the force control centre. On occasions when this radio access is at a premium officers may use a mobile phone to contact colleagues and arrange prisoner transport.</p> <p>Mobile technology only impacts on this process in the sense that the handheld computers incorporate the functions of a mobile phone.</p>	No current impact
Deal sensitively with people under stress	<p>Officers spend considerable amounts of time dealing with people who are in stressful situations.</p> <p>Mobile technology can, in some cases, allow officers to either have more information about the situation with which they are dealing to hand or to obtain such information during the process of dealing with the situation. In both cases this may allow them to deal more sensitively with the people concerned.</p>	<p>Tools: PDA, SMS. Access to CMS and logs.</p> <p>Relationships with the public – more information available.</p>
Inform supervisors or managers as required	<p>Quality assurance processes mean that supervisors and managers need to be kept informed of the progress of particular cases. This has normally been managed by either phone or radio contact or by one of the parties finding the other at a convenient point during the day.</p> <p>Some of the actions which supervisors and managers need to be informed of can now be recorded directly by officers on to either the crime management system or the incident log. This information can then be checked by supervisors and managers directly without the need to contact or meet the officer concerned. This is unlikely to completely replace direct contact and meetings; as one manager commented “the log just gives you the bare bones, it’s only when you speak to people that you can start to put flesh on them.”</p>	<p>Tools: PDA</p> <p>Back office systems including logs and Crime Management Tasks</p>
Arrange and participate in community liaison meetings	<p>Neighbourhood patrol officers in particular are frequently involved in formal and informal meetings with a range of organisations to support community liaison. Many of these meetings are arranged by e-mail or by telephone.</p> <p>Mobile technologies provide the ability to both send and receive e-mails, and of course phone calls, whilst out of the police station. Officers report that they have, as a result, been able to more easily and quickly set up such meetings. This, in turn, they believe provides an image of</p>	<p>Tools: PDA as telephone</p> <p>Relationship with the public.</p> <p>Community : engagement with other organisations.</p>

	additional professionalism.	
Identify and develop relationships with key individuals and networks	<p>Neighbourhood patrol officers in particular are frequently involved in formal and informal meetings with a range of individuals and organisations which form the key individuals and networks in the neighbourhood patrol area. Many of these meetings are arranged by e-mail or by telephone. The ability to quickly and easily contact such individuals and networks as a part of maintaining and developing these relationships.</p> <p>Mobile technologies provide the ability to both send and receive e-mails, and of course phone calls, whilst out of the police station. Officers report that they have, as a result, being able to more easily and quickly set up such meetings. This, in turn, they believe provides an image of additional professionalism.</p>	<p>Tools: PDA as telephone</p> <p>Relationship with the public.</p>
Stop person	<p>These are primarily physical processes which are only minimally, if at all, impacted by the use of mobile technologies.</p> <p>There is a potential for mobile data to mean that officers, having carried out a check on person or vehicle, may have had information returned to them, such as warning markers, which materially impact on the way in which they undertake a stop or such. This information is, however, currently available through a check done over the radio.</p> <p>There is a potential for satellite navigation to be integrated with both in vehicle and handheld computer systems and this could assist officers in responding to incidents.</p>	<p>No current impact on the physical process.</p> <p>Process may be supported by one of the actions above having returned information making the officer safer, or more able to deal sensitively with individuals.</p>
Stop vehicle		
Search person or vehicle		
Arrest person		
Respond rapidly and safely to get to the location of an incident		
Issue fixed penalty notice for disorder	<p>These are common forms which officers make extensive use of. They are usually completed as handwritten forms with a copy given to the member of the public as object of the activity. Most of the forms can also be completed directly on to screen on in station terminals.</p>	<p>No current impact.</p>
Issue conditional fixed penalty notice	<p>The equipment as issued does not support access to these forms and does not include printers and so there will be no direct impact on these components as actions or operations within the activity system.</p> <p>There is the potential for many police forms to be mobilised in the future and if this were to happen there would be an impact both directly on the officer as subject of the activity system as well as on the division of labour as back-office processing of forms would be reduced by direct entry.</p>	<p>In the future impact could include a change in the division of labour, a shift in the transaction between the officer and the person they are dealing with as a computer generated form is issued and a use of an additional tool in the form of a printer.</p>
Issue stop encounter form		
Issue youth stop form		
Issue stop search form. (As of January 2009 this form is no longer required unless requested and it can then be supplied by other means including post or collection from a Police Station)		

<p>Complete missing persons report</p> <p><i>The completion of the Missing Persons form was removed from the Trial stage as a new national form replaced the local one. This was longer, more complex and not immediately available on the XDAs. The Force was seeking permission for partial form completion on the XDA followed by full completion later.</i></p>	<p>A missing persons report would normally be completed as a paper record by an officer interviewing parents or guardians of a missing child or the reporting person or next of kin for an adult. The officer would then return to the police station, taking with them an image if available, and enter the data into the missing persons system. The data would be immediately available but would probably only be accessed, unless there was good reason for urgent contact, by most officers at the start of the next shift.</p> <p>Mobile technologies provided both the ability to input missing persons reports and to read them and update actions on the record. An image, albeit of relatively low quality, could be captured on the camera on the device and made available immediately. This allowed a significant reduction in the time required to make missing persons details available and, because the system allowed officers out of the station to access the details it also dramatically reduced the time between details being available on the missing persons system and officers being made aware.</p>	<p>Tools: PDA, Camera</p> <p>Norms: ability to provide information to colleagues faster</p> <p>Relationships with the public improved</p> <p>Outcomes: information made available during the 'golden hour'</p>
<p>Record appropriate incident details</p>	<p>Incident details are normally recorded in a notebook and then later updated onto the appropriate computer system.</p> <p>With the exception of the ability, noted below, to read and update incident logs there was no access to the crime recording system. As with other forms if this system was made available on mobile devices there would be potential impacts on the speed of updating of systems, on the division of Labour and, potentially on the quality of information input.</p>	<p>Division of Labour : updating direct by officers of logs – reduce load on FCC, allow access by supervision</p> <p>Tools: PDA, Log record</p>
<p>Read and update incident logs</p>	<p>When an officer is dispatched to an incident the details which they require to help them to deal with that incident will normally be provided to them by radio. As radio communication does not necessarily take place at the time when the officer is able to pay full attention it is not unusual for officers to make calls back to the control centre to check details such as address, informant and access information. When an incident is not regarded as urgent then an officer may be asked to access the log when they are able to get to a computer system and then deal with the job. This is particularly the case with complex incident logs. Supervisors also get involved with updating officers on log details.</p> <p>Mobile technologies provide officers with the ability to read incident logs on-screen. This will, in the case of an incident to which an officer has been dispatched, be automatically sent to the officers handheld computer. In the case of non urgent incidents officers would normally be given the log number to access at a time convenient for them. The ability to access logs reduces the number of check calls from officers to the control centre and also reduces the requirement for sergeants to read log details to officers. Having the information available to consult on screen reduces the number of occasions, rare but by no means unknown, when officer response time is compromised by going to the wrong address. Being able to access the information while out of the station reduces both return to station and time spent in station.</p> <p>The ability to write to the incident log means that officers do not need to contact the control centre in order to update</p>	<p>Division of Labour : updating direct by officers of logs – reduce load on FCC, allow access by supervision</p> <p>Tools: PDA, Log record</p> <p>Relationship: supervisors able to supervise more actively and support staff</p>

	the log. This has advantages in that officers can put onto the log exactly what they want to appear there and reduces the amount of radio use, but has disadvantages in that data entry on a handheld computer can be slow ( and may, therefore be abbreviated) and that the updates to the log will still need to be signalled to the control centre so that they can close, hold or refer the incident.	
Submit information into the intelligence system	<p>Intelligence is currently submitted by officers into the force intelligence system using an intelligence submission form. These forms are assessed by the force intelligence unit and data is then entered into the intelligence system by back-office staff. Once validated in this way and entered it becomes available for use.</p> <p>The mobile technologies in the systems proof of concept did not provide access to submit information into the intelligence system. This is a potential of the system and there are both potential advantages and disadvantages. The advantages include immediacy of the submission, increased volume of submission, improved accuracy and the reduction in the numbers of back-office staff required. The disadvantages include the problems of data entry on mobile technologies and the potential for information not to be as effectively validated as the national intelligence model would require.</p>	No current impact.

#### 7.4 DISCUSSION

In the analysis and building of the conceptual models of the activity systems, along with the development of a way of isolating points of commonality, the analysis exposed a number of issues of tension and contradiction. Engestrom (1997) characterises such tensions as being the basis for expansive learning cycles, on which the development of the system is based and a number of the issues are extracted and highlighted in this section.

The context of activity is a central issue in AT terms and the high level context of policing as well as some of the local context of the Force have been addressed in the earlier chapters. Context, however, also operates on a more localised level and an example of this is the way in which the experience from the TPOC was passed over to later stages. So, problems and issues were perceived by officers on the basis of received experience and tended to be persistent across stages. So, just in the way that a failed technology makes attempts to introduce another technology to do the same thing harder, so experience in one stage of implementation became a part of the context of the next stage. Scheepers and Scheepers (2003, p. 2) note that "it is necessary to disaggregate the conflated notion of context in explanatory case studies to allow for finer levels of contextual analysis".

Motivations differ both within activity systems and across those who are associated with them. Thus, the activity system of 'community policing' has differential motivations within it – from managers, officers on the ground, community partners to name but a few. It also has differential

motivations associated with it from within the police Force (effective use of resources, demonstrating compliance with inspection requirements, meeting internal agendas) and around it (local councillors, interest groups, commercial bodies).

Users of technologies conceptualise them differently to those with other interests and motivations. So, police officers conceptualise 'the kit' as a tool. This is, in fact a set of different components (hardware, software, applications, wireless carriers, security) but they are only minimally deconstructed, if at all, by users. Developers characterise it differently – which is a source of tension between the activity system of introducing MICT into the Force and the activity system of policing.

Tools also have differential impacts and raise tensions – so, a PDA may allow an officer to check email while out of the station, which is an attractive prospect on a balmy summer day. The police station, a cup of coffee, and a desktop terminal may be far more attractive for this task on a wet evening in winter.

The division of labour raises opportunities and tensions, again dependent on perspective. Control room operators who are relieved of routine enquiries at a busy time of day may see a short term benefit (reduced workload, less low level routine work) and a longer term loss (fewer operators needed). Police officers able to access information systems independently may see a gain in this (they do not have to wait for the control room) but sense a longer issue (that maybe this is the thin end of the wedge, this is a trajectory where 'DIY policing' lies).

Different communities are impacted and affected in different ways by the use of MICT in front line policing. Again, tensions arise – so while a team may be able to spend less time in station this may reduce the opportunity to exchange low level information which forms a part of intelligence led policing. It may also, in the longer term reduce or impoverish relationships with the wider team (such as the FCC community) and even within the immediate team if presence in the police station becomes rarer. Members of the public coming into contact with officers who have this technology may perceive them as wired-and-connected guardians of the law, or as little more than form fillers following the dictates of a computer, or as disinterested spectators spending time texting their friends and playing computer games.

Rules and norms change over time and there may be resistance to this change. Changes in formal rules may be required to make the use of MICT acceptable or efficient – such as the recent (January 2009) change to the requirement to print and issue a written record of a stop-search encounter. Changes in norms and ways of working are potentially less certain – some may be quite quick – as an example the changes to the pattern of working for an ANPR officer given a PDA to carry out checks rather than making use of the control room. Others will take longer – such as the potential shifts to self briefing of officers and use of electronic forms.



In addition to the points above which map neatly to the AI structures, there are a number of other general points. Change takes place over time and any context has to be examined over a timescale suitable to allow this to become evident. So, the introduction of MICT will initially concentrate on the technical, then on the systems delivered and then on the business change required to make the technology effective. Equally, within a given implementation of technology there will be an initial concentration on the technical (getting the kit to work), then the systems (getting them to do what they should) and then on the process change needed (getting the most out of it). This parallels the automate-informate-transform continuum.

The use of MICT in policing requires engagement with other activity systems which sustain and require their own analysis. So, the use of MICT as an activity is dependent on the activity system of developing MICT for use and introducing it to officers. If this system / these systems are not effective than the activity system of 'use of MICT in policing' will also be less effective.

There is a level of 'nesting' of activity systems both across activities and over time. So, as the mechanics of the technology move into the background (actions becoming operations) so activities which were distinct become incorporated in a fluid interaction as a part of a larger activity. Attention also plays a part in this – so an officer who is engaged in a traffic stop may have this as an activity per se at the time of the stop; they are also, however, integrating it into a bigger system (making a case and taking the driver to court) or systems (current force emphasis on drink driving in the run up to Christmas for example). MICT will impact on some levels and stages of the processes but not all, and where it does impact, will do so in different ways.

## Chapter Eight: Discussion

### 8.1 INTRODUCTION

Chapters Four, Five and Six recounted the detailed findings of my research at each of the three stages of implementation of MICT with front-line operational officers. The analysis shows that the process was far from being a smooth one, both in terms of the actual impacts on the working lives of the officers concerned (individually and as a group), and in terms of the process which the organisation went through; both iteratively within each of the stages of implementation as well as summatively across the process as a whole to date.

The findings were structured according to my initial four areas of attention which came, in part, out of my earlier research in the police context. Chapter Four, which reports the findings of the TPOC, and the analysis of the TPOC data using an AT perspective in Chapter Seven, recount the process by which these areas of attention, although shown to be broadly effective, proved not to be able to provide an understanding of the impacts on the individual officer(s) as well as the process of introduction of MICT. To an extent this illustrates the issue raised by Scheepers and Scheepers (2003) that context needs to be subjected to a reasonably fine-grained analysis if it is to become more than an amorphous whole, serving as a background to a particular technology in use in a particular situation. Chapters Five and Six recount the findings of the next two stages (SPOC and Trial) of implementation of MICT with officers in the force. On a practical user level, although the technology had evolved as a result of learning from the earlier stages there were still common themes and issues which persisted across the stages of the implementation.

I have used Activity Theory as a lens to help to illuminate and understand both the process of implementation and the impact of the technologies on individual officers. AT helps to address the issue (Scheepers and Scheepers 2003) with regard to the danger that context may be seen as an amorphous whole, where it is considered at all. I used AT in order to structure the data collection in the two latter stages of implementation of MICT in the force. AT has been used in a form very much based on the work of Engestrom (e.g.1997, 1999) in elaborating the basic structures developed by Vygotsky (1962, 1978) and Leontev (1978) and in the light of the developmental work recounted in Wilson (2006).

Chapter Seven, which has two main sections, recounts the process by which I applied AT retrospectively to the data in Chapter Four, based on the TPOC implementation; this was a part of the process of ensuring that AT was able to contribute at a theoretical level to the analysis of the data already gathered, as well as helping to structure the areas of attention for future analysis. Chapter Seven goes on to use the findings from Chapters Five and Six in order to

construct and comment on the activity systems which are affected by the introduction of MICT into front-line police officers working lives. I characterised the activity system at the highest level as that of *front-line policing* and this is then broken down in order to examine in a slightly more detail the two related activity systems of *neighbourhood policing* and *response policing*. In the final section of Chapter Seven I have illustrated the levels of commonality which can be seen in the actions and operations which go to make up the component parts of the overall activities of neighbourhood and response policing. The key point to be taken from this analysis is that there are both points of similarity and difference to be accommodated. *Similarity* in that the building blocks of both activity systems are, in many cases, shared. *Difference* in that (although the building blocks of activities may be the same, in terms of the mechanical processes, actions and operations undertaken) the actual nature of the activity is profoundly different, influenced as it is by the overall context for the activity system concerned. The analysis also identifies the issues which were exposed as points of attention and contradiction both within the individual stages of implementation as cases as well as in the overall process of introduction of MICT into the setting.

This Chapter draws together the findings from the study and in order to do so it is structured in a similar way to the research process undertaken. That is to say the findings from each of the individual stages of implementation are recounted, and related to the research questions which I sought to address as well as to the issues which were raised in the overall police context, as well as the literature relating to MICT in work settings. I then go on to identify the key findings which came out of the activity theory analyses of both the individual stages of implementation as cases and the process of implementation and introduction as a whole. I then identify and develop three theoretical areas. These areas are based on having examined the findings with regard to the three stages of the process and not being able to find a coherent and full framework in the literature to explain and assist in understanding those findings. AT provided a lens through which to view the findings but did not offer a structure immediately tailored to the MICT context and I have attempted to provide such a structure; one which accommodates the findings from the separate activity systems of introduction of the technology and use of the technology. Within this structure a key issue from the findings, regarding the use of the kit and the process of implementation, was the level at which the officers conceptualised the 'kit' as an artefact in the system. There was a real tension and difference between the developers of the systems and the officers who used them with the IT artefact being conceptualised quite differently. This issue of the IT artefact has been addressed by the literature in IS but has not, so far been addressed in the MICT context from the perspective of the user conceptualisation of it. In both of the above areas of development I would not have exposed the issues I did without the use of AT and, in particular, its use to analyse the three cases sequentially as well as from

the perspective of a larger process of development, and it is this use of AT that I address as the final key issue. In sum, the three areas I have further developed are:

1. A set of areas of attention, based on AT as a process model, which indicates the importance of understanding and taking account of the complexity of context in trying to implement mobile technologies in this setting. These areas of attention are intended to provide a structure for understanding settings such as this, and for the basis for a process which is intended to be both predictive and, potentially, evaluative in that it indicates areas in which organisations can expect to see impacts, tensions and contradictions as a result of the implementation of MICT. This approach provides a holistic view of the areas which developers and implementers need to pay attention to if a mobile technology is to be adopted and used. It offers a broader approach to both the definition and evaluation of systems success than some of the existing models such as TTF or TAM.

2. The level at which the users of systems, in this context at least, fail to disaggregate the system as an artefact. There has been significant debate within the Information Systems field over many years as to the appropriateness of taking the IT artefact as a central tenet of the development of Information Systems as a discipline and there has also been significant discussion of the objective properties of that artefact in the systems evaluated. There has, however, been relatively little discussion of how users perceive the central artefact in a system such as this. The evidence presented here suggests that this is a neglected construct, with users conceptualising a complex system as a single artefact and developers and technical staff conceptualising it in quite another way. This is a source of tension and contradiction particularly between the activity systems of front-line policing, (whether neighbourhood, response or traffic) and the activity system of introducing MICT into front-line policing. Developers expressed frustration when users of the technology condemned it out of hand for what the developers saw as failures outside of their control. Users expressed frustration when developers and implementers of technologies insisted on deconstructing those technologies in a way which did not fit with the experience of users. It was also noticeable that users deconstructed the systems less as they went further through the organisational process from TPOC to trial.

3. The use of AT in a relatively novel manner. AT has not been widely applied either in the policing context or in the context of MICT in public safety, and there are areas of learning which can be drawn out from doing so. Also, my study provided the opportunity to apply AT sequentially to three individual cases, each being a stage of implementation which built up towards a larger process. This larger process, although related to the original activity systems within which the technology was implemented, was quite different in character. This use of AT as applied to sequential cases has exposed some issues, being points of difference, similarity,

tension and contradiction, which would not have been exposed by analysis at the level of the individual cases or at the level of a single larger process. It was the process of sequential analysis which highlighted, for example, continued (and indeed increasingly severe) failures in the manner of training and support which had a negative effect on the overall implementation of the technology both within individual cases and in the larger process of introducing MICT to the police force as a whole.

In addition, there are lessons for practice which can be drawn from this work. The analysis of the three cases provides a rich description both of the manner of implementation and introduction of MICT into the activity of front-line policing, as well as of the way in which the technology changes, and is changed by, the operational activity systems into which it is introduced. One of the key lessons to be drawn from the use of AT in this setting is the need to develop systems based in the activity, rather than in those drivers which enable the technology to make a contribution in a different context and which are presumed to apply in the policing activity system by default. An example of this is the development of mobile technologies as a response to the strictures and demands of political will, media attention, and organizational dogma. In this case the rhetoric of NPM, taken together with some of the other pressures placed on policing, has presented MICT as a way to deliver visibility and efficiency of police officers, thus meeting both performance indicators and the demands of modern policing models which mandate visible presence whilst being founded on processes which require absence. Unfortunately, the starting point of the rhetoric of NPM does not guarantee the development of a system which fits into, and improves, the activity system of front-line policing. An understanding of that activity system, as a complex and dynamic set of interrelationships, can help to provide focus for those charged with the development of mobile technologies in this setting.

Finally, I explain some of the routes for dissemination of this work and some of the areas for further research for which I believe this work will have value.

## **8.2 FINDINGS FROM THE FORCE**

The aim of my research was to understand the impact that MICT had on the work of the police officers who were issued with it, and to devise a framework to help to understand (and thus hopefully improve) this process. In order to structure the process of doing this I developed research objectives which I explored across the three stages I was able to research:

- explore the nature of the MICT equipment, police officers' perceptions of the equipment and the training and support they received to facilitate their use of the equipment

- explore police officers' perceptions of how MICT changed the way they undertook their job roles
- explore police officers' perceptions of how MICT changed their relationships with people
- explore police officers' perceptions of the added value the kit could give them in relation to undertaking their work roles

The following section explores officers' perceptions across the three stages of implementation and digests the issues raised. Individual sections, dealing with equipment and the infrastructure which supports it, work practices, relationships, and organisational capability and the future development of the technology as a part of the activity system of policing, are followed by a short summative section which highlights key issues. This is linked to the summative Table 6.1 above.

### *Officers' perceptions of the equipment, and of the infrastructure which supports it*

During the three stages of this research officers were issued with MICT which was intended to improve their ability to discharge their role as front-line police officers. This technology comes with a set of contextual and historical connotations which I have outlined in Chapters One and Two. A key finding, and one which will be expanded upon later in this Chapter, is the fact that the officers concerned conceptualized technology as being a far larger artefact than the physical representation of an actual computing unit. That is to say that they did not perceive the technology as starting and ending with the unit in their hands or in their vehicle. Nor, however, did they perceive the overall system as being made up of a complex series of component parts, some physical and others in the form of carrier networks and software. Instead the officers, across all three stages of the implementation observed, characterised the equipment they were issued with as '*Kit*'. Kit is the term which police officers use for much of the equipment with which they are provided. It can cover anything from a new pair of boots to a new high speed pursuit vehicle. In the case of the MICT under investigation officers conceptualised the kit as being a totality of the physical equipment in their hands, the applications provided on it, and all of the back-office and infrastructure systems which enabled it to discharge the functions they expected, and had been led to expect, from it.

In the first stage, the TPOC, officers concentrated very much on the obvious and physical representations of the equipment they had been given. Many of the comments they made with regard to the equipment related to the physical form, the usefulness and appropriateness of the interfaces, and the utility of the applications chosen. Criticisms, equally, were related to the interface, the ability to get information into and out of the machine, and speed with which the overall system operated. At this stage users were very clear about the interaction between the system and themselves as users. So much so that in the reporting of this stage in Chapter Four I developed a category entitled *Me factor*. Officers at this stage of implementation tended to

compare the equipment, and therefore the business processes, that they had been given with the ones they were used to. Many of their comments at this stage are related to the variance between what-was and, given the use of the new systems, what-is, and illustrated the power of the routine as a "carrier of organisational memory" (Hasu and Engestrom, 2000). Although the number of research participants was small, and the officers in very similar roles, there was a clear differentiation between the way that users reacted to, adopted, and use the equipment they had been given. Some took to it with a level of enthusiasm, others with manifest distrust.

In the second stage, the SPOC, the officers also provided significant levels of comment on the actual devices per se. At this stage of the analysis it was possible to determine a set of categories around the equipment into which both positive and negative quotations from officers could be placed. These were; the means of input to the device, battery life and power, the form factor of the device, the display, and the overall speed of reaction to user input and requests. Users provided a range of comment on these issues and it was noticeable at this stage that the emphasis had started to shift away from the intricacies of device and interface operation towards a more sophisticated appreciation of the nature of the system overall and its potential with regard to the activity of front-line policing. It was also noticeable that the users at this stage also failed to disaggregate "kit". In fact the users at this stage conceptualized the kit as being a larger artefact than the users in the TPOC. Whereas the users in the TPOC had conceptualized the kit as including the hardware, visible software and applications the users in this stage also tended to bring the carrier systems and associated security layers of the overall system into their conceptualisation of the kit as a whole. It was also noticeable at this stage that the officers had started to regard the provision of training and support as being integral to the overall system. In the particular case they regarded training as being poor, citing problems with timing content and delivery, but gave positive feedback on the provision of support. It should be noted that, at this stage, support was being provided on a daily basis with a dedicated member of the project team supporting the total population of twenty five users.

In the final, trial, stage a larger group of users was observed and interviewed. There were some significant differences between the earlier stages of implementation, as described above, and the reactions from officers in this stage. One of the most noticeable was a change in emphasis from the physical affordances of the devices as issued to the uses of it as a policing tool. The device, with its associated issues of battery life, input and output and quirks of interface had started to move into the background and its utility as a mediating artefact, providing a means for the achievement of work tasks, had started to move to the fore. This was a change from the perception of the device as a thing to being a tool which was accepted as an integral part of the policing landscape. This is not to say that users did not have comments on, praise for, and criticisms of the device and its associated software and systems. They did, but they did so from the perspective of people undertaking purposeful activity rather than the perspective of people who have been provided with a novelty. At this stage of implementation it was also interesting

to note that the training function which had attracted very little comment at the first stage of implementation and some criticism at the second, was subject to very significant criticism. This criticism elaborated on the themes already identified of failures in timing, content, and delivery. Equally the support function, which had attracted almost unreserved praise at the SPOC stage, now attracted significant levels of criticism. One of the reasons for this seemed to be that the officers had now moved on in terms of the level of aggregation of the overall artefact and now saw training and support as a part of the overall 'kit'; problems in the systems were therefore sometimes laid at the door of the larger system as they conceptualised it; "they should have covered this in the training". In the first stage, although officers did not disaggregate the "kit" the aggregate they dealt with was limited to equipment, interface and applications. In the second stage of development carrier and security systems were also brought in to the overall conceptualisation of "kit". In this stage officers also brought the concepts of training and support into their conceptualisation of the kit as a whole. Across the three stages of implementation there was a clear shift in the way that officers conceptualized the technology artefact and their conceptualisation grew broader as the organizational integration, and expectations, of the system grew.

#### *Officers' perceptions of the impact of MICT on their working practices*

In the TPOC, limited as it was in both scale and scope, officers saw very limited impacts on their working practices. The systems were relatively limited in the functionality they could provide to officers and as a result of this officer comments were mainly limited to the potentials of the system for change in the future as opposed to the actualities of change in the present. Three key points were raised at this stage; the first was a concern with issues of safety for officers using, and paying attention to, MICT rather than to the people or situations they were dealing with. The second was the level of inertia which officers expressed as being a barrier to the adoption and use of the technologies they had been provided with. They recognized that the potential of the technology was to provide them with a more efficient and effective way of working but felt, in some cases, that it was simply easier to stay with the simple routines and known structures they had been working with over time. Subjected, later, to an activity theoretical analysis this is reflected in the issue of the movement of stages in task accomplishment from operation (that is to say automaticity, such as using the radio) back to the level of action where a conscious goal was required, (such as using the PDA to undertake the same database check). The final issue which became apparent at this stage was the issue of a trajectory being perceived for the technology in the future. The officers I interviewed talked about the potential for the technologies over time and about the potential impact on other areas of the overall activity system. So they identified, as an example, the potential change in both the division of labour with the FCC and the rules and norms which governed the relationship between front-line operational officers and the FCC. This was not a uniform perception of the



future, or a fixed view but a recognition that change is inevitable and that the technology they had been provided with was, and would be, an integral part of this change. The role of human agency in this was implicit but was often vested in the 'they' who direct so many human endeavours.

At the SPOC officers started to identify slightly more abstract areas in which MICT would have an impact on their working practices. Given the slightly larger scale of implementation officers started to talk about the potential for efficiency and effectiveness. It was also noticeable at this stage that officers differentiated very clearly between the different roles of neighbourhood policing and response policing. While the building blocks of policing in the two situations are, in many respects, very similar there are also significant differences and these differences come, in the main, from context. This was not something which had been apparent during the TPOC as the officers there were all in similar roles and operated within a specific team environment. The issues of safety, and the potential trajectory of the technology were raised at this stage as they had been at the earlier one. One of the issues, that of officers reverting to routine and existing methods of operation as opposed to making use of the technology they had been provided with, had a specific interpretation by one of the supervisors who regarded this as being "laziness" on the part of the officers concerned.

During the final stage of implementation officers were noticeably more positive about the overall potential as well as current use of MICT on their working practices. As a group and individually they had started to accommodate the technology and move the use of the equipment from action with a conscious-goal to the level of operation carried out under given conditions. That is to say that the emphasis moved from the tool to the potential that it offered for use in a given situation, and the information which could be provided started to take primacy over the mechanisms by which it was provided.

#### *Officers' perceptions of the impact of MICT on their relationships*

The TPOC saw officers commenting that they did not expect to see, and did not see, any significant changes in the relationship with their immediate team. This was partly a reflection of the cohesive nature of this particular team but also reflected their recognition that policing is a social task and one which takes place in a collaborative environment. As was to be expected with a small scale and tentative implementation many of their comments were on the potentials of the technology as opposed to the realities. Nonetheless they did identify the potential for isolation from the wider team and, in particular, the FCC. They had noted a level of impact on their relationship with the public and, in particular, with the public as perpetrators (or potential perpetrators) of crime. Some of the people they came into regular contact with had started to be aware of the potential of the technology and officers felt that this had had a positive effect as far as the attitude of these people to the police was concerned. In observation on one patrol I

observed a member of the public, who had been stopped on suspicion of driving whilst not insured, protesting his innocence until seated in the police car where he could see the display for the mobile computer showing the response from the national database of insurance which showed his vehicle as "not insured". He deflated visibly. As already noted, officers did identify both the issue of safety and the issue of division of labour in the future with regard to the trajectory of the technology. There was, in particular, a suspicion that, in some way, the technology would be used to the prejudice of lower-level staff in the organisation by withdrawing support for tasks which officers would then be expected to do themselves.

At the second stage of implementation officer views, although quite similar in many respects, did have some significant differences from the TPOC stage. Officers recognized more explicitly the potential, with a pervasive implementation of technologies such as this in the future, for change in the relationship with their immediate team. They also noted the potential for the technology to be used either in a prejudicial manner (e.g., to reduce the level of staffing in the FCC) or in a manner which they regarded as more positive (e.g., to give staff in the FCC more time to support officers dealing with complex and urgent cases by taking routine and low-level transactions out of the system). As with the TPOC officers did not expect, and had not seen, significant impacts on the relationship between themselves and their supervisors. Officers at this stage also differentiated more between the impact of MICT on the relationship with the public. They felt that the public as victims of crime liked to see officers with what they regarded as up-to-date technology and the officers themselves commented that this presented an image of professionalism, as long as the technology performed as expected. With regard to the public as perpetrators of crime the comments at this stage of implementation were quite similar to those from the earlier stage. Officers at this stage also commented on the potential issues of safety. These issues were less pronounced than at the earlier stage of the process as the tool became internalised in practice and officers recognised the ways of working with it and developed norms of use within the broad guidance provided by training. They also noted the potential, while dealing with the public either as perpetrators or victims of crime, for the technology to structure the transaction, although they did also note that a paper form, whilst not as rigid, will also structure the transaction between the officer(s) and member(s) of the public they deal with.

At the Trial stage officer comments moved from a primary concern with self to a wider concern with regard to the impacts of the technology on the systems, and those within them, they dealt with. As with the earlier stages officers perceived the technology as having a trajectory and extrapolated the potential impacts of it out from the equipment and the situation they experienced. As before they did not see an immediate impact on the immediate team, but identified a potential. This potential had gone through a shift from the TPOC stage (enthusiasm for a bright technical future), to the SPOC (suspicion of the potentials with regard to the erosion

of support) and back again to a more measured appreciation of areas of gain as well as loss. As in the earlier two stages the impact on the wider team was expected to be relatively small, but the idea of a trajectory of the technology was firmly established in the users minds, and they saw one of the possible futures as being what one of them termed "*DIY Policing*"; being a future where tasks which used to be done for them moved to be tasks they could undertake themselves and from there to being tasks they have to do for themselves as the original support is removed. They also posited the alternative version of the trajectory that the technology could be used to routinise some transactions, leaving capacity in the FCC to deal with complex and demanding jobs. The relationship with supervisors was not seen as being adversely affected at this stage, with the officers (at all levels) suggesting that the technology, appropriately applied, could allow supervisors to be more active. This was something both PCs and Sergeants would welcome. With regard to the relationship with the public there was little change at this stage. Officers saw the technology (subject always to the caveat of, *if it works as it should when it should*) as being positively received by the public-as-victims, and they saw it reducing the room for manoeuvre of the public-as-perpetrators in attempting to deceive or obstruct officers.

#### ***Officers' perception of the impact of mobile ICT on organizational capability***

As noted in Chapter One a significant part of the drive towards mobile technologies in policing comes from what Goldfinch (2007, p.921) has termed "the idealisation of private sector management techniques" by public sector managers as well as by central government, as embodied in the rhetoric of new public management. The targets set by the police force in this particular case, or set of cases, (and indeed across police forces experimenting with mobile data as a whole) tended to concentrate on automating and informing rather than on the transformation of business processes and organisations through radical changes in organisational capability. It comes, therefore, as no surprise that officers across all of these three cases did not perceive any significant shift in organisational capability.

In the TPOC officers did not see any real change although they did clearly identify, as a part of their conceptualisation of the trajectory of technology as discussed above, that they saw technologies of this type as having a significant impact in the future. One area where organizational capability was developed, and which demonstrated that capability change does not have to be founded on technical features, was in the ability for officers to carry out checks into the PNC for volumes of car licence plates as opposed to single plates ( for example all the cars parked in a street near a club rather than a single car in the street). As noted in the individual findings chapters above this is, effectively, a new capability in that officers, particularly at busy times, had to be selective in their decisions as to which index plates were worth checking and which should probably be ignored. The advent of mobile data provided officers with the ability, time permitting, to carry out volumes of checks. Thus a shift in the

degree of information intermediary attention required to carry out a set of transactions effectively provided a new capability. This capability was not founded on a new technical feature (police officers have had access, via information intermediaries, to the PNC for over 10 years) but on the ability to make these checks independently.

In the SPOC, apart from the volume check on licence plates as noted above, again officers did not report any major changes in capability. However, at this stage camera use was something which officers remarked on and which, again, if it becomes pervasive would effectively be a new capability for both individual officers and for the force as a whole. At the moment police officers do have access to cameras as well as to specialist units, normally from scientific support, who can take images for them. But, these facilities are rarely to hand and so there is a level of decision as to whether the particular circumstances merit the time and effort required (from the individual officer and from others) to access these resources. It was also noticeable at this stage that officers, again as a part of the discussion of the potential futures for technologies such as this, conceptualized future change more around changes in rules and norms (as well as in the division of labour than) they did around the technical features of the actual hardware.

In the trial stage of implementation officers did not report that they saw any real change in organisational capability at the current time. They did, however, as with the earlier stages identify potential futures for the technology and for other technologies.

### *Officers' perception of the future development of MICT*

As already mentioned officers perceived a future trajectory for technology they had been given and for similar technologies in the future. In the TPOC comments around future development of technology were very much around technical development, battery life, input methods, screen quality were all issues where suggestions were made that improvement was both inevitable and, indeed, necessary for mobile data to provide an effective and useful tool for officers in front-line operational roles. During the SPOC and trial stages the emphasis was seen to shift slightly. At the system stage a wide range of points, some around hardware and some around systems and process were made by the officers involved. At the end of the trial stage it was noticeable that there were relatively few hardware related suggestions and relatively more suggestions about the future direction of technologies with regard to business process and the manner of operation of the organisation as a whole. The technology, as already mentioned, seemed to have moved to the background and the context had moved to the foreground with officers suggesting some shifts and developments in hardware but far more in the potential change in business process.

### *Summary findings from Force across the three stages*

This summary deals with the key findings from the officers perceptions in three categories which draw from all of the areas of analysis used above. The categories are; the kit and its use

as a tool, the context of use and motivations for use, and the developmental potential and trajectory of the system.

The *kit and its use as a tool* as a category encompasses a number of points which come from the analysis of the officers' reactions to the equipment per se and, increasingly, to a larger system conceptualised as a single artefact. One of the first, and key, points to come out of this set of studies with officers was to highlight the requirement that the MICT provided has to be fit for purpose. It is an enabling factor for an implementation and if it is not adequate for the tasks that it will be used for the implementation will fail. As a result of this it is clear that the concentration on technical challenges in the early stages of the development of a technology as an integral part of the way people work is quite sensible and necessary. Secondly, the stages of implementation studied illustrate that there is a progression in use from a pre-occupation with the technology to a concentration on delivering functionality and, finally to delivering value. It is interesting to see that this was replicated at various stages and levels of the process. So, within a stage of implementation this cycle was delivered over the implementation stage; it was replicated (with varying levels of speed of movement through it) at the individual officer level and it was replicated again, at the organisational level, with the organisation delivering, as a part of the activity system of introducing MICT to the Force, a set of stages which concentrated on these factors: TPOC, SPOC and Trial. Another key point which became apparent, both across the case studies as well as within the specific stages of implementation, was the fact that the technology, although a critically enabling facet in the activity system, is not a sufficient condition for acceptance, adoption and use. The technology has to be seen to deliver value for users in the activities they undertake rather than in the performance of tasks which are not central to their activity. This issue is important in that one of the success models for information systems concentrates on the fit of technology to task (TTF model), but can be accused of doing so from a technologically deterministic viewpoint. It should, however, also be noted that such resistance to the use of MICT in a context may only be a part of the overall resistance to change which is a common organisational phenomenon. In sum, therefore, the physical equipment has to work at least adequately to meet the needs of the users, but this, in itself, does not guarantee acceptance and use. The equipment, and the associated infrastructure which enables its use effectively, therefore become hygiene factors. It was also noticeable that the tolerance for problems reduced over time; as the technology moved more towards being an accepted tool for the performance of the work tasks so officers commented adversely on issues which, at earlier stages of the process had been tolerated. Another key issue is the level to which the officers did not disaggregate the kit. In fact, over the course of the three stages of implementation the officers conceptualisation of the equipment they had been issued with as a composite artefact grew more comprehensive. In the technical stage the kit was broadly perceived as the actual hardware taken together with the software and the carrier over which

information was transmitted and received. By the time the technology had moved into the systems stage the officers had started to include the infrastructure, in terms of training and support at least, within the overall conceptualisation of the equipment; so issues which caused problems with the use of the kit were not simply laid at the door of the hardware or software but were blamed on deficiencies in training which rendered the technology less effective as a piece of kit. This perception continued to grow in the trial stage with officers taking in to their overall perception in discussion of the technology some wider issues of the surround for the technology as a whole. This proved to be an increasing point of tension between the activity system of front-line policing and the activity system of introducing mobile technologies into the police force. In AT terms the tools have started to move towards background and, as a result of this, the action of their use (becoming operation under given conditions as opposed to action with conscious goals) becomes accommodated within the overall context.

*Context of, and motivation for, use* as a category emphasises some of the issues with regard to context of use as well as cultural and historical context which affect the technology and the manner of its use. Context is extremely important in differentiating between activity systems. Moving outside of the police context clearly the context of policing is not the same as the context of parcel logistics, even if similar technologies, with similar physical demands placed on them, are in use. Equally, as shown in the activity theory characterisations of the activity systems of neighbourhood policing and response policing (Appendix 4) policing contexts are very different. Whilst the same building blocks of action or operation are used within different policing contexts the contexts themselves show marked differences which, in turn, significantly change the character of given actions operations and activities within the overall activity system. This affects every element of the AT model; the choice of tools to carry out a particular task is affected by context, the division of labour will, as a result, be differentiated and both the motivation for and outcome of given actions are contextually determined. It should also be noted that context is also complex, dynamic and highly dependent on perspective. Key perspectives include the organisational, the user, the overall socio-political and the technical. These (differentiated as they need to be, Scheepers and Scheepers 2003) also need to be seen as a complex and, above all dynamic, whole (Engestrom 1999; Wilson 2006, 2008).

A key element in context, particularly for the larger activity system of introducing mobile technologies and mobile data into the police force, is the issue of process i.e. the manner of introduction and the manner of management of change. Without adequate user involvement, training, support, planning, and change management (among others) it will, at best, be harder to gain value. Process also implies that this is something which will unfold over time and that the organisation will see different effects and impacts over time; that they will not instantly achieve all of the 'projected benefits' of an implementation; that they will see areas of unexpected benefit and equally unexpected areas of negative impact.

With regard to the issue of motivations within the activity system it is clear that motivations are different between different groups and constituencies – even if the rhetoric is similar. The example of the rhetoric of NPM pushing for the efficient and effective MICT – as against the actual use of the technology in the activity of policing – has already been used.

There is a perceived *trajectory of development* of such technologies in the minds of users and it is a part of the way, particularly as its novelty value reduces and it moves to a level of automatic use, that they conceptualise the MICT artefact overall. The trajectory is not a fixed one, with unanimous agreement, rather it is a set of possibilities, continually adjusted, which stem from the affordance not just of the hardware but from the affordances of the conceptualisation of the system as a whole. So, it operates at a number of levels: officers see technical developments and predict that devices will become more *capable* with regard to factors such as battery life and displays. They are also aware of the developments in some of the features and layers which underlie the system and so some will talk of the development of improved bandwidth enabling new applications; they see development of the system to accommodate new services and deliver existing ones better as being an almost inevitable part of the order of things. They also see, however, the potential for the artefact as a whole to have an impact on the wider activity system in use; and they do this more as their conceptualisation of the artefact broadens from being a physical tool to being a truly mediating artefact – what they would term ‘a good piece of kit’. MICT has the potential to automate, to change (culturally determined as well as stated) work practices and business processes, to shift relationships and the way work is divided, and to change organisational capability. This is a concept expressed and discussed at some length by Zuboff (1984). Finally it should be noted that development of capability is not always a function of technical innovation or explicit process change, it can also come from user adaptation and adoption / colonisation of technologies.

### 8.3 AT-BASED AREAS OF ATTENTION

The aim of this section is to outline the key areas of attention I have developed from the data collected. This is based on a specific application of the areas of attention developed from the TPOC and refined as a result of the use of AT as a key tool for structuring both the collection of data and the understanding of it. In order to set these areas of attention in context I have first outlined the key issues with current models and structures which set out to evaluate system success or offer prescriptions for structuring understanding of the relationship between people and technology.

#### *Existing ways to understand and evaluate mobile working and MICT*

One of the key issues in the development and implementation of MICT and the associated mobile information systems into organisations of all sorts has been the ability to both understand the process and the outcome. This has led to a range of attempts to both classify the

areas which developers need to look at in the design of appropriate systems for mobile working and to understand the broad context of use. One of the earliest attempts to provide a coherent structure through which to understand mobile working and its associated technologies is the framework proposed by Lyytinen and Yoo in 2001. Lyytinen and Yoo set out to provide an initial agenda through which understanding of both the process of implementation and the effects of that implementation on people and organisations could be structured and understood. The framework they developed is based on their understanding of what they term ;

*“a nomadic information environment which is a heterogeneous assemblage of interconnected technological and organizational elements, which enables physical and social mobility of computing and communications services between organizational actors both within and across organisational borders” (p.1)*

and they propose analysis on two axes, these are, firstly, the user level ranging from individual to inter-organizational and, secondly, the thematic level broken down into services, infrastructure and fundamental drivers. They note in the conclusion to the article (p. 16) that;

*“What we lack in the traditions, both in terms of concepts and theories and at the level of research methodology, is a deeper understanding of how individuals behave in rich and nomadic information environments enabled and supported by multiple technologies, services and pervasive infrastructure.....New theoretical and methodological tools need to be developed to adequately address this challenge. While traditional analysis has been helpful in understanding the inter-relatedness among individuals it has ignored technical elements mediating enabling or constraining the social network.”*

This acknowledgement of the need to take a broader perspective on the development, implementation and eventual success of Information Systems was also being recognized by other writers at approximately the same time. Sorensen, Wang et al. (2002), in an evaluation which aimed to characterise mobile work, took a technology centred approach which highlighted the systems issues which needed to be addressed with the particular system under consideration and also noted that there was a pressing need to carry out further detailed work to understand the differences in implementation and the management of mobile systems as against fixed systems. This was a theme which Sorensen (2003) returned to in a paper in which he argued that in order to understand mobile work it was not sufficient to understand the nature of the use of mobile technologies alone but it was also necessary to understand both the nature of mobility and the wider interactions between the individual, the group and the organisation. He acknowledged that, at that stage, this should be viewed on a broad level and commented “when studying mobile Informatics we need to investigate how to address the fundamental issues without too narrowly defining the field, in terms of technology” (p. 8). This theme of the importance of people and their interrelationships has been recognised in the literature relating to the implementation and success of mobile systems and mobile computing. For example, Barnes (2004) comments that of the three dimensions he identifies in terms of support for mobile distributed work (being mobility, services, and value) people are central to two, and highly instrumental in the third and Venkataraman (2005) starts to add some granularity to this



concern with the interrelationship between people and technology being understood in the specific context of mobile computing and systems, when he notes that a key part of the infrastructure for such systems is highly dependent on the training for their use and the support for them in the working context, something which he describes as being "indispensable for the effective adoption and use of such systems" (p. 5). This is a viewpoint echoed by Lu and Xiao et al (2005) who, when reviewing the use of mobile computing and mobile technology in healthcare, noted that work to date had mostly concentrated on the technologies in use and that this, given the importance of these technologies (which they characterised as highly important within the context when they noted that "it is evident that handheld computing is becoming an indispensable tool in the sector" (p. 416) ) does not provide a full analysis of the system in its social context. As Venkataraman (2005) had done, they also noted the importance of training and support in the acceptance and use of technologies and highlighted the need for further work on both the usability of systems in the human computer interface sense and also on the broader use and adoption of systems within socio technical systems. Up to this point, although a number of writers, as noted above, had identified the need to place both the implementation process and the outcomes of it in a structure which recognized and acknowledged the broader context and particularly the human context, no particular frameworks had gained significant currency as a means of undertaking this task. Wakefield and Whitten (2006) evaluated the potential of the technology acceptance model (TAM) and variants of it, as a means of understanding and structuring evaluation of the success both of systems per se and of the implementation of them. They concluded that the models as currently constituted were too narrow to apply effectively to the specific context of mobile computing and mobile systems and commented that:

*" this study shows the complex nature of belief and attitude formation and that technology acceptance is a broad concept that transcends utilitarian models. Evaluating technology interactions requires a framework encompassing the whole nature of users as intrinsic variables influence both user beliefs and behaviours. Continued research in this area will enrich technology acceptance models and optimise the success of mobile systems." (p. 298)*

In a further attempt to structure the models by which mobile situations are illuminated and explored Scheepers and Scheepers et al. (2006) explored what they termed "extra contextual factors" (p. 261) in user satisfaction with mobile systems. They commented that evaluations and explorations of such systems to date have tended to centre either on the technical or on the users, with relatively little emphasis on the social and contextual framework within which such users exist and such technologies are used:

*"we argue that as mobile information technology becomes more ubiquitous, it will increasingly be necessary to take extra organizational contexts into account when assessing users' satisfaction, even in situations of mandatory use in the organisation." (p. 267).*

Up until this point the literature dealing with the success and appropriateness of mobile systems and mobile computing was, as noted above, relatively sparse and focused almost entirely on

either technical or user interpretations whilst acknowledging, in many cases, the need to take a broader perspective if a fuller understanding was to be gained.

As mobile computing and mobile information systems have expanded both in number and in the range of sectors which they have affected there has been something of an increase in interest in the process by which the understanding of such systems can be structured and illuminated. Sorensen and Al-Taitoon (2008) commented on what they saw as clear gaps in the current state of analysis of the effectiveness and use of mobile systems. In a paper which concentrated on the concept of usability they commented:

*"whereas much research in human computer interaction tends to forget anchoring the considerations in studies of working practices, much of Information Systems research is fairly open ended in the organizational enquiry and tends to forget proper characterisation of the information technology artefact at the centre of the analysis."* (p. 927)

and they noted that

*"it is important to note that seeking to bridge the concerns of individual usability with those related to the wider organizational context for mobility has just begun... would need to be explored from a broader empirical base than the one in this paper."* (p. 931).

This issue of the specificity of context is picked up in other work, such as that of Axtell and Hyslop (2008) who specifically examined the issues relating to the use of mobile technologies in mobile spaces and commented in their analysis that mobility is not restricted to mobility of individuals but incorporates mobility of context, something which echoes with the policing situation where the context of activities dramatically changes the nature and feasibility of those activities. Kietzmann (2008) also addresses the issue of needing to understand the process of implementation of technologies linked with mobility in a more fine-grained and detailed manner. In a paper focusing on the implementation of a particular and innovative mobile technology, radio frequency identification, she notes that the actual process of introduction of MICT is under researched and poorly understood, commenting that it is a process which is fraught with tensions and in which an effective understanding of context is key. She goes on to note that the structures by which this context can be understood are currently somewhat lacking. Kietzmann also notes a particular peril in not differentiating between the process of introduction of a technology and the manner of its use, although she is clear that the two cannot be completely divorced from one another, and comments that failing to understand the "duality of device-in-development with device-in-use can be dangerous to the understanding of both." (p. 17). One attempt to structure an understanding of this more detailed concept has been around the use of Actor Network Theory and Vainio and Oksman (2008) commented that attempts to date to evaluate and understand the implementation of mobile technologies have been extremely rigid and, in part as a result of this, have not been adequate to deal with what they term "the myriad complexities of mobility" (p. 29). They employ a system which they have termed MobiMap to describe the complex network of interactions in mobile work. They comment that, too often, single tasks have been the focus of analysis rather than a concentration on the overall

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aims and objectives for which the mobile work is being undertaken. Their perspective is firmly on the development of mobile services and they argue that:

*"an analytical tool for exploring work process and interaction is needed so that a cross-section of mobile work is achieved. There are many elements in mobile work that are dynamic in nature and therefore an analytical tool for long-term investigation of mobile work is important."* (p. 30)

and offer the process they have developed as a starting point. Cordoba and Robson (2003, p. 56) raise the issue of power, and suggest that "our analysis of power in evaluation is focused on participative approaches to evaluation. The notion of power in evaluation is a great unmentionable issue in evaluation theory." And, in their conclusion (p. 62) they suggest that evaluation approaches in IS could be improved by understanding of the wider context of the systems including the power relationship, analysis of the "layers of power" through which projects are furthered or denied and a reflective approach to evaluation. A theme which runs through the research noted above, and which is highlighted with a degree of force by Tarasewich and Gong et al. (2008), is the fact that understanding the implementation, development and success of mobile systems is harder than understanding fixed systems, and they comment that:

*"more empirical research is needed to develop an integrated theoretical foundation to guide organisations in the design and implementation of mobile systems, interfaces and technologies. As we progress towards a nomadic and ubiquitous working environment these issues become increasingly important overtime and organisations would benefit from the empirical findings and theoretical understandings generated from such research streams."* (p. 139).

This issue of the qualitative difference between fixed and mobile systems is also raised by McDowell (2008) who comments that organisations need to examine both the hard and the soft issues around the implementation of mobile technologies. She argues that the hard issues of technology are better dealt with than the soft issues around mobility and the integration of technologies into social spaces. She notes specifically that:

*"many organisations are currently addressing mobility opportunistically rather than strategically or holistically. Moving to a holistic approach will require members of the business mobility ecosystem to show real business value."* (p. 31).

An attempt to take an explicitly socio-technical perspective on mobile work incorporating a number of the issues from the literature surveyed briefly above is that of Chen and Nath (2008) who have attempted to structure and understanding of the interface between social and technical worlds and develop a number of areas in understanding and attention in the intersection between these two worlds. They argue that a more complete understanding of the processes by which the social and technical interact is vital if the true potential of mobility and mobile technologies is to be realised. They note that two of the currently used tools for understanding information technology and information systems impact, the technology acceptance model (TAM) and the concept of task technology fit (TTF), tend to divide their understanding between the user and the technology, without addressing the interface. This is a view echoed by Gebauer (2008) who surveyed the use of both TAM and TTF to understand mobile work and the systems used to support it. She commented that;

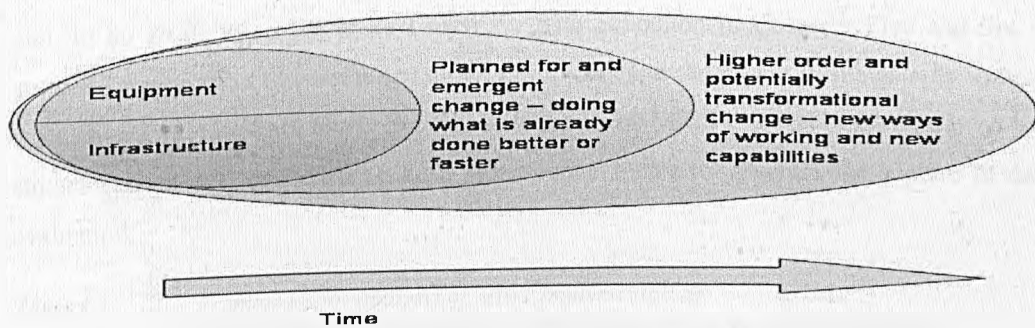
*“important research opportunities remain in order to develop a deeper understanding about the needs of the mobile workforce and in order to more fully realise the benefits that are expected from the use of mobile technologies. We see a need to assess in more detail the subtle changes which occur when users start to adapt their work-related tasks to mobile environments. Mobility appears to be a complex and multidimensional construct that needs to be explored in greater depth before a mobile workforce can be supported most effectively with novel technology.” (p. 117)*

In sum, the literature demonstrates that there is a gap with regard to an effective framework which can inform the understanding of the implementation of MICT.

### ***Antecedents***

The specific identification of these areas of attention has been developed based on the principles which underlie the use of AT. AT is, as has been pointed out by Rogers (2008) and Halverson (2002), a broad church and it is particularly good at illuminating the middle ground of use in a context as opposed to the minutiae of HCI design (Nardi 1996, Kaptelinin, 1999) although it has also been suggested that it “does not resolve well at the level of the individual” (Minnis, 2001, p. 308). This may be a valid criticism but it should be noted that it is, in large part, by the actions and interactions of individuals that the picture of an activity system is built up. AT was used in this work in the light of the basic principles which underlie it (Kaptelinin and Nardi, 1996) and was also used in line with the prescriptions of use as suggested by, among others, Rogers and Scaife (1997), Engestrom (1997) and Bannon (1994, 1997). The specific tool used was based, as discussed in Chapters Two and Three, on the Activity Process Model (Wilson, 2006). The areas identified owe a debt to the work of Mwanza and Engestrom (2002, 2005) and the eight step model they developed for use in e- learning environments.

In earlier work, Norman and Allen (2005) outlined the process over time by which MICT was introduced in a policing context as well as illustrating the areas of development which they observed, again against a timeline, in that research (outlined in Figure 8.1 below).



*Figure 8.1 Model of MICT introduction*

At the stage Norman and Allen's (2005) work was conducted, this was a useful representation of the process as they understood it but it was one which did not adequately capture the complexities of the context and the dynamic nature of the process. The Activity Process Model, and the use of AT as a set of principles guided both the data collection and analysis process, particularly for the SPOC and Trial stages and it is on that data that the figure set out below is based. This is an evolution of the Activity Process Model which re-conceptualises the active processes as shown below in Figure 8.2 below.

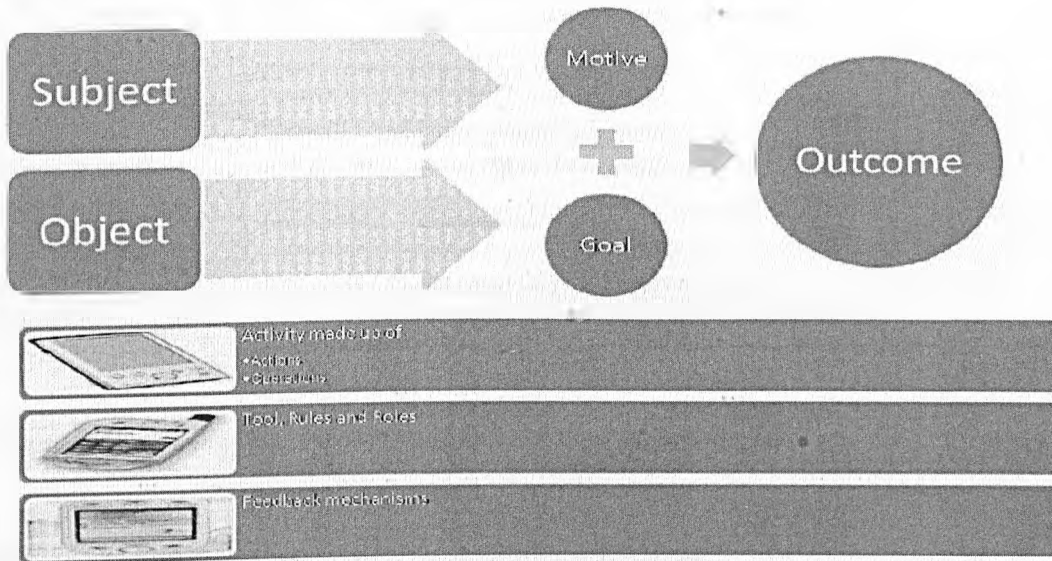


Figure 8.2 Revised Activity Process Model

In this presentation the activity components at the top of the model are underpinned by three layers of activity, tools and feedback. While being an over simplification this is intended to emphasise the pervasive nature of these processes.

**Areas of attention**

The areas of attention identified are designed to structure the investigation of an activity system and, to do so draw on the areas I used for data collection in Chapters Five and Six. This structure was used in those settings to help to understand the nature of the activity system and the changes to it brought about by the introduction of MICT. It has since also been used in studies carried out for the NPIA with other police forces to structure the capture of data for evaluation.

Table 8.1 Framework for analysis of MICT implementation

Focus	Questions
Activity	What is the overall activity system about? What is it trying to achieve? Is it a part of a larger system, or does it have component

	systems? How do they interrelate? Who is involved? How?
Equipment and infrastructure	What is the system in use? How well do the tools work? How well do the systems which support them work? Who uses it, and how? How does it relate to other tools?
Relationships	What are the relationships within the activity system? (Team, wider team, managers and supervisors, public) How / are they affected by MICT? How will / could they change over time?
Working practices	How are tasks carried out in the activity? How has MICT affected this? How could / should / will they change over time?
Capability	Are there any new capabilities in the system as is compared to the system as was? How were these developed?
Trajectory	In what ways can the system be expected to develop? (Hardware, software, business process, management process) What will determine and enable this?
Feedback mechanisms	How is the activity modified and developed?

Frameworks and models to judge success, to guide development and to understand the impacts and effects of technologies on people tend to deal with either the social, or the technical and fail to deal with the interplay between the two. This approach offers a number of benefits. It provides a set of areas of attention targeted at the collection of data specific to technology introduction ( thus building on the potential for accommodation within AT as noted by Nardi (1999). It provides a structuring device to systematically gather targeted and contextual information about the conditions and activities within activity systems, and use of this as a basis for informing design of both product and process. In so doing it blends the technical and the human with the contextual to provide a richer and more dynamic picture of an activity system in a given context and helps to identify areas of commonality as well as difference, thus allowing for the variability of context to be taken account of in design and implementation. It makes use of a common descriptive and analytic vocabulary which can be used for mapping and explicating the 'tools, rules and roles' that exist within extant or planned activities within larger activity systems. It provides a basis for formulating design and implementation practice on the basis of a fuller and wider understanding of the activity systems, their component and associated systems and the areas of commonality, difference and tension; this incorporates the use and developmental potential of Engestrom's concept of expansive learning cycles as well as the

concepts of areas of commonality and contextualisation of common activity, action and operation. The approach provides a process for analysis of phases of activity as well as activity as a whole. Hasu and Engestrom (2000), on this topic, comment that it is not enough to analyse developments in use and “to understand an innovation process the researcher should analyse the historical and development phases of activity” (p. 63). It also gives a basis for formulating the criteria for evaluating and validating the usability and usefulness of the MICT application, and, indeed, has been successfully applied in this manner in more recent work.

#### **8.4 PERCEPTION OF THE IT / MICT ARTEFACT .**

In the development of the understanding of the overall context, as outlined above, one of the areas which consistently came to my attention was the level to which the officers I was observing and interviewing failed to disaggregate what they termed ‘the kit’. This has been noted above and the findings chapters provide examples of the breadth of perceptions with users bringing diverse elements of the total system into their conceptualisation of the ‘kit’ as a whole. Officers were quite capable of disaggregating the kit when asked to do so and specific comments on a wide range of areas have formed a quite comprehensive view of the officers’ perceptions and experience of hardware, software, carrier systems and security. They did not, however, as a matter of routine, disaggregate the kit and this became more apparent as the TPOC moved to SPOC and then on to the trial. Deficiencies in training, in support, in charging arrangements for the PDAs and in the management of log on and security were all brought to bear on the overall user perception of the kit. As the officers grew more used to the equipment (and its use tended to move from action towards operation) so the tension between the activity system of front line policing and the activity system of introducing MICT became more apparent. The users expected the tool as a whole to deliver a level of functionality for them as an instrumental part of the activity system of policing – they therefore conceptualised the tool in terms of its functionality – a way of updating a log, or of accessing the PNC for example. When the tool, as a part of a process aimed at achieving a policing outcome, failed to provide the functionality targeted the officers were not prepared to look too far for the site of the problem – instead ascribing it to the system as a whole. The developers, on the other hand, were working on an activity system (introducing MICT into the Force) which had the technology and its delivery as the outcome and, therefore, disaggregated the kit routinely because it was at a higher level than in the front line policing activity system.

This was significant for two key reasons. Firstly, the perception of the overall system as ‘a piece of kit’ engendered tensions between the officers and the implementers of the systems in the Force. The implementations I have researched are, as discussed, activity systems and as such they are dynamic and context bound, and they incorporate, as key elements of the system, the mediating artefacts (tools, rules and roles). This level of aggregation of complex systems as

an holistic tool (kit) was one of the key factors in engendering tensions, both within the activity systems of front line policing in the different implementation stages and between the three stages of implementation and the larger process of implementation of MICT in to the force. So, users expressed frustration with the developers inability to get the system as a whole to work and, as the developers saw it, damning the whole for the faults of the part. The users, however, equally expressed frustration that the central team would insist on deconstructing the system in a manner which the officers felt was unproductive – placing the ‘blame’ for failures on component parts of the systems and insisting that the overall system was working well. A specific issue which flows from this is the need to discuss and examine tools on a number of levels – so as users aggregate complex systems it becomes harder, unless some level of analysis is applied, to see where tensions and contradictions arise and how this can be translated into development of the system as a whole. The aggregation of the kit as a whole also leads into issues of problems with adoptions and use (the province, as noted above of the TAM models). Users commented on the fact that the equipment needed to work well for them on a routine basis. Failures were not seen as challenges to be overcome but as reasons not to use the equipment.

### *The IT artefact in IS literature*

There has been considerable discussion in the Information Systems literature about the nature of the discipline and one of the key concepts in this discussion has been the centrality, or lack of it, of the information technology artefact. In this section I will briefly review some of the literature regarding the nature of information systems as a discipline and, specifically, some of the key discussions with regard to the centrality of the IT artefact. These are illustrative of the nature of debate as well as of the level to which the IT artefact is socially constructed. What I cannot do, given the paucity of literature taking this viewpoint, is provide significant illumination from existing literature as to the nature of the user perception of the IT artefact or, more specifically in this case, the MICT artefact. This issue is, clearly, intimately bound up with the issue of the equipment and infrastructure as discussed above when it comes to the actual implementation of systems on the ground.

Lyndon Wong, writing in 1988, draws a parallel between architecture and Information Systems, commenting that

*“The IS designer’s product and the architect’s product are intriguingly similar in intent and effect. First, both products are enduring. Like quality buildings, information systems are long term investments. Second, like buildings, information systems can significantly alter the way users (inhabitants) interact.....Finally, like the architect the IS designer can significantly influence the acceptance and utility of a new system. A poorly conceived information system, like an uninviting building, will be abandoned at the first opportunity.” (Wong, 1988 p1)*

Avison and Fitzgerald (2003) define information systems as a discipline as “The effective design, delivery, use and impact of information [and communication] technologies in



organizations and society". The idea that IS and IT or ICT are inseparably bound up is a persistent one and Cordoba and Robson (2003, p. 55) comment that "Our current information society is based on the premise that the use of electronic information will bring improvement in the quality of life of people." Ives et al (2002), in a similar vein, comment that "we believe that information technology is now the prime driver and enabler of business strategy for many, if not most, organizations". Lee (2001) adds a level of sophistication to this and argues that IS "examines more than just the technological system, or just the social system, or even the two side by side; in addition it investigates the phenomena that emerge when the two interact" (p iii). In a seminal and much quoted paper Benbasat and Zmud (2003), in an examination of the field of IS, suggested that the IT artefact should be the core and they suggested a set of areas of attention with the IT artefact as a central tenet – emphasising the need for IS practitioners to be knowledgeable and to work within a specific and set domain to avoid accusations of dilution. This debate has continued since their 2003 paper and a specific and well argued commentary came from Agrarwal and Lucas in 2005 who suggested that there were perils in what they saw as a potentially restrictive approach to the area. They suggest that it is healthy for a field to be flexible and to bring in tools from other areas to provide insight – while agreeing with Benbasat and Zmud (2003) about the need for an identity for the area of IS.

It appears that there is general agreement that the concept of the IT artefact is important in information systems and while the debate as to its exact role and status is not resolved there does seem to be a level of agreement that even if it is not a defining characteristic of the field of IS, it is an important one. However, as a concept it is examined mostly from the point of view of the developers and implementers of systems. Avison and Elliott (2005) state that IS is a "relatively new discipline" and comment that they see the genesis of the discipline in the move to make widespread use of computer processing in the 1950s. They make an important point that

*"Of course they existed well before the advent of computers. There can, today, be IS without computers. The grapevine is a powerful information system. Further, if technology is used it does not have to be sophisticated. But, in practice, information systems are now almost invariably computerised and can be very sophisticated in their use of technology." (p 4)*

Sidorova (2008) agrees with this – adding the caveat that the IT artefact should be ranked as ;

*"an equal partner interacting with humans and their collectivities in an organizational context. It is the interaction itself that that assumes the central place in IS research. This positioning highlights the distinctive nature of the IS field, separating it from other business disciplines that focus exclusively on the organization itself and from technology focused disciplines, which focus on different aspects of the IT artefact." (p. 477)*

The experience of working with the public safety community has shown that the conceptualisation of the IT artefact is an important construct; it delineates many of the areas of attention of both users and developers. However, as far as the analysis of mobile systems goes, it appears that the term is one which is not so much contested as neglected, and I believe it is worthy of further investigation.

## 8.5 USE OF ACTIVITY THEORY

The use of AT was a central methodological component of my research. The framework was adopted after the TPOC stage and was used to structure the data collection and the analysis of data for all of the stages of the research. Its use was predicated on my perception of the need to have a more comprehensive and coherent framework than the areas of attention with which I had gone into the process of researching the use of MICT with front line police officers. AT offered me a framework which has a rich heritage and which has shown that it is adaptable to a range of situations as well as being able to accommodate both theoretical progression and the use of a wide range of methods. The Activity Process Model, as discussed in the context of policing provided a theoretical base and added an emphasis on process to the other advantages of the approach. The main benefits I sought from the use of AT were the emphasis on process, the centrality of tasks and purposeful human activity, the recognition of the pervasive nature of the mediating artefacts in the process, the recognition of the significance of context (both immediate and historical) for the understanding of the activity system, the recognition of the role of tensions and contradictions and a standardised vocabulary within which understanding could be structured.

The use of AT provided a level of richness in the data collection process, and in its recognition of the dynamic nature of the development of activity systems, as well as the inter relationships between them it helped to expose and allowed me to examine issues with regard to the individual officers' perceptions of the systems and their use and development. It also provided a structure for the development of understanding of the nature of changes, tensions and contradictions between activity systems.

In using AT to help to understand the nature of the activity systems of front line policing I was able to use the data collected to help to build conceptual models of three of the activity systems which can be found within most police forces. These models describe the activity of front line policing and also identify the components of the roles of neighbourhood policing and response policing and allowed me to build, on the original conceptual model, a set of common activities made up of actions / operations. These common activities (made up of action/ operation groups) serve both to highlight the commonalities between activity systems and to provide a basis for also starting to understand points of difference. To take an illustrative example; all police officers in mainstream roles such as neighbourhood and response will need to access the PNC at some point, and they will usually do so on a regular basis. The process of doing so is common to the roles but can be, and often is, modified by context - a speculative check on a person by a neighbourhood officer may be a fairly amicable transaction, the same check process carried out by a response officer walking into a heated domestic situation may be very different.

AT has not been widely used in research into policing or public safety and has had relatively little use in the examination of MICT in policing and this research has illustrated that it can have value in these settings. I have also been able to use AT with a series of sequential case studies and found that the process of doing this provided some additional insights into the situation. It is recognised (for example, Engestrom, 1997, Nardi and Kaptelinin, 1996) that AT is best suited to a longitudinal investigation of a situation and the incorporation of this aspect of process into the model in an explicit fashion was one of the attractions of the activity process model as a structuring device for this research. However, its use in a set of cases as in this situation is certainly not common and I was unable to find other instances in the literature. I found that the process of using AT across the three stages of implementation in the Force offered some advantages and additional insights over using it in a single case.

On a practical level it offered me the opportunity to review the use of the tools by which I collected and analysed data at regular intervals and also ensured that I was able to generate formative feedback and findings to guide the next stage of research. Use in this manner also highlighted some tensions and issues which would not otherwise have come to the fore. A specific example is the issue of training identified within the three cases and within the overall analysis of the findings. There were repeated failures within the organisation to train effectively and these were demonstrated from case to case. This inability to learn demonstrated the importance of agency in the process of expansive learning cycles and the analysis of training as a part of the process of all of the three cases highlighted this in the Force. The sequential analysis also highlighted the transmission and build up of local context. As the overall process of introduction of MICT progressed so it was possible to observe the build up of contextual information in the community of police officers. By the time the trial stage was reached most officers had had some level of exposure to the technology – either via Force publicity, through having seen it in use or through knowing someone involved in one of the earlier stages. This progression was made very visible by analysis of sequential cases – certainly far more so than it would have been by analysis as a single case. Similarly the process of sequential analysis of cases allowed me to highlight and test the common components in the activity and also illuminated the issues of the growing levels of aggregation of the technology as ‘kit’, the perceived trajectory of the technologies moving from a technical to a process perspective and the cycle of attention from technology – system – utility being played out at individual levels, within stages and between them.

In sum, the ability to analyse cases sequentially provided an added opportunity to review tools and findings, as well as adding perspective which helped to understand and expose the processes of dynamic change across the overall progress towards introducing MICT to the Force as a whole.

## 8.6 DISSEMINATION

This work has informed some further activities since the research was carried out. The understanding developed has been the basis of work with other police forces to help them to evaluate the impacts of MICT on their officers and to manage the process of doing so. This work has, in turn, informed the overall evaluation model for mobile data sponsored by the National Policing Improvement Agency, helped to inform a paper presented at ISIC 2008 on the deployment of mobile data in UK policing, and was also presented at an AIMTech conference for public safety professionals in April of this year.

## Appendices

## Appendix One: Glossary of terms and acronyms

3G technologies	Third generation mobile phone technologies offering improved data rates over GPRS. Wide, but not universal, availability.
ACC	Assistant Chief Constable. Usually a Force will have two or three ACCs who rank after the DCC. The Metropolitan Police Service, have a different structure reflecting the size of the Force.
ACPO	Association of Chief Police Officers. Functions as an advisory body to both Government and Chief Officers.
ANPR	Automatic Number Plate Recognition. Camera based system providing alerts for vehicles of interest.
AT	Activity Theory.
Atlas.ti	Qualitative analysis software package.
Blackberry	Smartphone and push email device.
Bluetooth	Short range personal area network (PAN) technology. Available for some uses in policing but not fully approved by CESG.
BPR	Business Process Re-engineering.
CCTV	Closed Circuit Television.
Centrex	Central Police training resource. Subsumed within NPIA from April 2007.
CIS	Criminal Intelligence system – used to record details on people, places and vehicles of interest to the Force. Key to Intelligence led policing and the NIM.
CESG	Communications Equipment Special <sup>®</sup> Group. Responsible for the certification of devices used on secure Government networks or for secure communications over commercial networks.
Chief Officer	Chief Constable of a Police Force.
CMS	Crime Management System. Used to record targets, profiles and tasks for officers. Part of tasking and briefing.
COG	Chief Officers Group. All of the senior staff of a Police Force, including ACC and DCC ranks.
COP	Community Oriented Policing. Also known as Community – led policing and Community policing. Sometimes allied with policing by consent. Basic philosophy underlying Neighbourhood Policing in the UK
CRS	Crime Recording System. Used to log details of a crime. Also known as a Crime Management System in some Forces.
DCC	Deputy Chief Constable. Second to the Chief Constable.
DVLA	Driver and Vehicle Licensing Authority.
DVLC	Driver and Vehicle Licensing Centre.
FCC	Force Control Centre. Used to receive, dispatch, resource and manage incidents as well as handling communications from officers. Often also referred to as ‘Comms’, ‘Dispatch’ or ‘Radio Room’.
Force	Police Force – usually here referring to a territorial as opposed to a special police force or miscellaneous police force.
GPRS	General Packet Radio Systems. Connectivity system provided by commercial carriers as a replacement for GSM. Provides improved bandwidth and data handling.
GSM	Global System for Mobiles.
HATO	Highways Agency Traffic Officer.
HCI	Human Computer Interface

HORTI	Form requiring drivers to produce documents at a police station. Referred to as 'a producer' or 'a horti'.
ICAD	Incident Command and Dispatch System. Also Incident Control and Dispatch system. Software and process used to record, resource and manage incidents via the FCC.
ICT	Information and communication technology.
ILP	Intelligence Led Policing. Underlying doctrine for the NIM.
ISD	Information systems development.
MDT	Mobile Data Terminal. Vehicle mounted computer.
Mobile data	Police community term for the provision of information to officers while out of the station without the use of an information intermediary.
MICT	Mobile information and communications technology..
Mobile technology	Broad term for mobile computing and telecommunication equipment. Significant overlap, and often confusion with, MICT
NIM	National Intelligence Model. Prescriptive model setting out the management of intelligence in Forces and between Forces. Fundamental to ILP.
NPIA	National Policing Improvement Agency. Formed to replace PITO from April 2007, and also taking in other police related central bodies including PSDB and Centrex.
NPT	Neighbourhood Patrol Team. Group of officers, usually PCs and PCSOs in the main, assigned to provide neighbourhood policing (aka COP) in a geographic area.
O2	Provider of the PFI-funded Airwave system (originally commissioned with British Telecom and then passed to their subsidiary company, Cellnet, which in due course became O2) up to 2006 when the system was sold, along with the main commercial operations of O2, to Telefonica. It was then acquired by McQuarrie Pty who operate it as Airwave, leasing the network to the Government.
PACE	Police and Criminal Evidence Act
PC	Personal Computer and Police Constable.
PCSO	Police Community Support Officer.
PDA	Personal Digital Assistant .
PI	Performance Indicator.
PITO	Police Information Technology Organisation. Formed in 1998 to provide central direction for Police ICT and IS development. Subsumed within NPIA from April 2007.
PNC	Police National Computer. Central record of criminal convictions relating to individuals ( nominals) and details of vehicle ownership and status.
PNLD	Police National Legal Database. Online reference tool for Police officers setting out powers and points to prove.
POC	Proof Of Concept. Exercise designed to prove the feasibility of a development although not necessarily using the full technical deployment required for a larger scale, or permanent deployment of a technology.
POP	Problem-Oriented Policing.
PSDB	Police Scientific Development Branch. Research branch of the Home Office. Subsumed within NPIA from April 2007.
QAS	Quick Address System. Linked to the Voter's Roll, QAS will provide details of the registered address against a name, or given an address will provide names of those registered there.
SOCO	Scenes Of Crime Officer.

Smartphone	Combined PDA and mobile phone: Distinct from a PDA with a phone capability in that the Smartphone will have the phone function at the forefront of design whereas the PDA will have that as a background function.
SMS	Short Message Service. Text messages.
SSTA	Structural Systemic Theory of Activity. A theoretical development of the original AT models associated primarily with Bedny and integrated by Wilson as a part of the Activity process Model in his 2006 paper.
TAM	Technology Acceptance Model.
TTF	Task-technology Fit.
TETRA	Terrestrial Trunked Radio. Basic technology behind the Airwave radio system – providing communication which is advertised as being secure, resilient and cost effective. Also handles data, albeit more slowly than commercial phone networks.
UbiComp	Ubiquitous Computing.
UMPC	Ultra Mobile PC. Now usually seen as 'Netbook' PCs.
WAP	Wireless Application Protocol
WiFi	Wireless Fidelity connectivity.
WiMax	Potential successor to WiFi offering improved reach, speed and mobility support protocols. The standard is in the process of being agreed and pilots have already proved the concept.
Windows CE / Mobile	Mobile versions of the Windows OS designed for mobile devices. Windows CE was replaced by Windows Mobile during the TPOS / SPOC stages.
XDA2	Model of PDA used in the SPOC and Trial. Two XDAs, the predecessor of the XDA2, were used in the TPOC. The XDA is manufactured by HTC and retailed exclusively in the UK by O2. It operates on GPRS and GSM as both a mobile phone and portable computer.



## Appendix Two: Researcher Background

I am a lawyer by original training and have worked in further and higher education for most of my working life. Initially a Lecturer in Law, I developed an interest in the wider social context within which law is developed and applied and moved over a period of some ten years to being a Principal Lecturer in Management. During this time I gained both a postgraduate teaching qualification and an MSc in Management Science. In the process of working in educational organisations I undertook administrative roles including course management and associated quality management roles. This led me to a position as Head of Faculty of Business and Management in an FEI with associated HEI work to undergraduate level. Some 11 years ago I left the organisation to run a consultancy company with two Gulf based educational organisations as key clients. This was mainly concerned with developing the management and project management capacity within these organisations to deliver franchised UK HE and FE courses. It also involved me in some of the uses of innovative technologies for teaching and learning including e-learning, and the then almost non-existent area of mobile technologies for teaching and learning. As a result, in part at least, of this exposure I have had a keen interest in MICT for many years. Initially my interest was of a personal nature, using technologies in a personal context in the main, with a peripheral involvement in the use of mobile technologies in learning and management. My interest in the potentials of such technology grew and I was involved in the deployment of learning technologies and, latterly, the use of mobile technologies for learning and development in educational, medical and tourism settings.

As a part of the process of gaining an MSc in Information Systems, I undertook a study which looked at the introduction of mobile data and mobile working within a specific UK Police Force. This study drew on the content of the MSc programme, my existing work experience in service management, and on an existing interest in the application of handheld and mobile devices to work settings. My dissertation provided an overview of the role of mobile data in the Police context in the UK and also an overview of some of the detail level changes and effects of mobile data and mobile working on the Police in the case of a specific Force and specific groups of officers – both uniformed front line officers and non uniformed and specialist officers. Through undertaking my dissertation my interest in the topic of mobile technologies and the police grew, and I realised that there was still much to learn about the impact of mobile technologies in this context. Having completed my MSc, I was fortunate to gain employment researching into mobile information management with the associated opportunity to undertake a PhD in the area. As well as significant exposure to the field of public safety and mobile technologies I have built on previous research experience and also further developed the knowledge and skills needed to undertake my PhD research, through engaging in continuous professional development activities. Through these activities I gained additional skills in research design, in the practicalities of conducting interviews, focus groups and observations, became a competent user of the MICT that the police officers were to use, and became familiar with Atlas.ti, which is the software package I used when analysing the data. I have also had the opportunity to add to my knowledge of the police as a service in the UK, as well as the issues raised by the implementation of MICT in this setting.

### Research skills development:

I began my research with expertise and skills gained from my previous employment and academic study and have updated and furthered them whilst undertaking the research. I have been trained in teaching techniques including questionnaire design, presentations, the running of focus groups and one to one interviews and have, over fifteen years of full time employment in situations across both further and higher education made extensive use of those skills. As professional development I have undertaken two masters degrees with dissertation components – one at UMIST (MSc Management Sciences) and the other at the University of Salford (MSc Information Systems) - and each of these has been supported by research methods programmes. The most recent was completed in 2002 with a Distinction grade overall. Both that dissertation – examining the experience of police officers with regard to mobile data - and the previous one - examining the use of soft systems methodologies in the curriculum development process in further education - involved the use of a range of techniques including interviews, observation, discussions and focus groups. In both cases extensive use was made of information technology to analyse and present the work, including the use of a qualitative analysis package (Atlas ti) in the more recent dissertation. I have approximately ten years experience in quality assurance for UK educational organisations, including Edexcel, ending in 2000. During this involvement I was a Moderator for programmes up to HND and Professional development level, a Verifier for NVQ programmes up to and including level five, and a specialist adviser on quality assurance systems for both the UK and International divisions of Edexcel. These roles included the management of data collection and the evaluation of that data and also required the running of workshops, discussions and one to one interviews. Initial training was provided for this role and regular refreshers were undertaken. As a project the PhD requires management and systematic tracking of tasks and progress. I undertook Project Management

training as a part of an MSc. in Management Sciences and later taught this as a topic at HND level and as professional development up to 1996. I have experience in the management of large and small scale projects in both the UK and international educational settings, including European funded projects. I am a PRINCE2 Practitioner. I worked in Consultancy for six years on a substantial part time or full time basis. The role included the development of quality assurance systems in educational organisations both in the UK and the Middle East. This work required a range of skills in data collection, interviewing and analysis; providing an opportunity to both acquire new skills and to practise existing skills in new settings. On commencing study at LUBS I completed the research skills module required on entry to PhD study. Updating has been undertaken whilst at LUBS through three key routes; the programmes run by the University, attendance at external (mainly supplier and industry) events, and staff development as a part of the AIMTech group which provides regular sessions run by members of the group. I have acted as a deliverer of training as well as attending development sessions run by other group members. A representative selection of these are noted below.

• Avoiding misconduct in research	University event	4/03
• Starting your research degree	University event	4/03
• Time Management	University event	5/03
• Ownership, confidence and secrecy in research	University event	5/03
• BAPCO 03	Conference	5/03
• End Note	University event	6/03
• IIRMT 03	Conference	6/03
• BAPCO NW Mobile Technologies	Industry event	2/04
• NVivo	LUBS internal event	4/04
• Vodafone: Mobility Workshop	Industry event	5/04
• Activity Theory	AIMTech event	5/04
• BAPCO 04	Conference	6/04
• BAPCO NE	Industry event	6/04
• IIRMT 04	Conference – delegate and presenter	6/04
• BAPCO NE ‘Control Rooms. Why are we different?’	Industry event	9/04
• Running Workshops	AIMTech event	9/04
• Designing Interview Schedules	AIMTech event	10/04
• Interviewing	AIMTech event	10/04
• IST 04	Conference	12/04
• FP6 Framework Event	Workshop	01/05
• BAPCO Resilience Workshop	Workshop	01/05
• E Government and FP6	Seminar	01/05
• BAPCO 05	Conference	04/05
• IIRMT 05	Conference – delegate and presenter	06/05
• MOBIS 05	Conference – delegate and presenter	12/05
• AMBEX 06	Exhibition	3/06
• Internet IP 06	Exhibition	4/06
• BAPCO 06	Conference	4/06
• Field Service Mobility and Power Distribution 06	Conference - delegate and presenter	6/06
• FP 7 Briefing	University event	7/06
• FP 7 Writing Workshop	University event	7/06
• PRINCE 2 Practitioner	Commercial course	9/06
• BAPCO 07	Conference	4/07
• NPIA Mobile Data Symposium 07	User Group	6/07
• BAPCO 08	Conference	4/08
• ISIC 08	Conference – delegate and presenter	10/08
• BAPCO 09	Conference	4/09

### Appendix Three: Sample briefing sheet for participants

This conversation is to help me to get a picture of what the mobile data project in the Force is achieving and where any problems and issues are. I am especially interested in how the kit you have been given affects the work you do, and how you have got to grips with it. All of the conversation is subject to a set of ethical guidelines which are endorsed and promoted by the University, and which apply to all the work I do here. In brief they are that:

- Participation is voluntary.
- If at any time there is anything you don't want to answer then just say so and we'll move on.
- You can withdraw from the interview or observation at any time.
- The interview and observation will only be used for the purpose of research into mobile data in policing.
- The data will be anonymised as far as possible; I do not record names or identifiers such as collar numbers. But if you hold views which may identify you and that might be a problem, then make me aware of it and I will make sure nothing is used in a form which could cause offence or embarrassment.
- With your permission I will record the interview or observation so that I can transcribe it more easily. If you would like a copy of any recording / transcript, as applicable, then let me know and I'll arrange it.
- The audio files will be deleted once accurate transcripts have been made and will, in the interim, be stored on a secure system in the University

The contact in the Force for this work is NAME

I may want to publish from this work in the future but if I do so all participants will be anonymous and this would, in any case, be subject to agreement by the Force.

If you want to discuss any aspect of this research, and don't want to do that with me, then you should contact CONTACT NAME / PHONE / EMAIL (SUPERVISOR)

## **Appendix Four: Activity systems**

**Front Line Operational Policing**

**Neighbourhood Policing**

**Response Policing**

## Front Line Operational Policing

Activity System	Front line operational policing.		
Subject	Object	Outcome	Motivation
Police Officer(s)	Member(s) of the public as actual or potential victims or perpetrators of crime.	Appropriate policing outcome met (e.g. arrest made, details of missing person obtained, visible presence)	Maintain law and order.  Assist people in distress.  Progress personal and Force policing objectives.
Tools typically used			
Physical	Representational	Informational	Internal
Car, boots, radio(s), mobile phone, notebook and pen, handcuffs, uniform, maps, torch, computers, cells. Reference manuals and materials.	Forms( paper and ICT based), incident log	Police National Computer, control centre staff via radio as information intermediaries, Force intelligence system, Voters' Roll, crime management system, email	Knowledge of: law, police powers and limits, key individuals and networks, local area, internal procedures and routines of the Force
Communities potentially involved			
Immediate		Longer Term	
Police officers and police staff. Control centre staff. Public.		Back office staff, wider criminal justice system (e.g. CPS / Courts) , allied agencies (e.g. social work, youth offending team), specialist police staff (e.g. crime prevention officer, scientific support)	
Rules and Norms affecting the activity system			
Laws	Rules	Codes	Norms
National laws governing the public (e.g. Theft Act, Road Traffic Acts)  Local Bye laws (e.g. No Alcohol areas)  National laws governing police actions (e.g. Police and Criminal Evidence Act)	Externally set rules governing processes and procedures such as recording of incidents, or safety procedures. (e.g. investigation of complaints by the Independent Police Complaints Commission, rules governing Tactical Pursuit And Containment of vehicles)  Internal police Force rules governing processes and procedures such as recording of incidents, or internally set safety procedures.	Externally and internally provided good practice codes covering areas such as relations with communities, dealing with vulnerable people.  Current Force priorities and procedures – such as the degree of latitude given with regard to speeding stops by Motorway Patrol	Norms operating at the level of the immediate team, the wider team and the Force as a whole, as a minimum.  Norms with regard to specific groups of people such as uninsured drivers or paedophiles.
Division of Labour			
Immediate		Longer Term	
Public raise concern. Usually by phone call, less frequently by visit or personal approach, even less		Other elements of the wider criminal justice system – for example a case passed to the CPS,	

<p>frequently by letter, text message, web form or email.</p> <p>Police manager acting directly or via police staff tasks officer(s). In the case of a clear urgent need (burglary in progress) this will be immediate via the control centre. In the case of minor issues (e.g. repeated littering outside a school by pupils) it may be some time before the issue is passed on, via a briefing to neighbourhood patrol officers for example.</p> <p>Officer(s) deal with the incident or concern and record action, requesting information and completing records as required. This may be a matter of minutes or a matter of months.</p>	<p>sent for trial at Court and attendant requirements made for reports from police prior to sentencing.</p> <p>Allied agencies – for example Social Services involvement with a family where a child has run away from home.</p> <p>Specialist police services – such as counselling for officers involved in especially traumatic events or investigation by the IPCC following a fatal shooting</p>
<p>Feedback mechanisms</p>	<p>The activity process model identifies that feedback is a continuing and iterative process. The elements of this activity system, where feedback mechanisms can be identified, include some elements of nearly all aspects of the model and also include both formal and evaluative mechanisms and less formal changes to ways of working which may take place almost unconsciously at the level of the individual officer. Much of the level of formality applied depends on the outcome. So a situation which is handled correctly and effectively and where the appropriate policing outcome is met may receive relatively little formal attention. The same situation which, although handled in exactly the same way by the officer concerned as the subject of the activity system, does not result in the appropriate policing outcome being met may receive rather more formal attention. So, for example, in the case of a child missing from home who has a record of such absence and of being found within a relatively short period of time in a relatively predictable set of places an officer may set a fairly well worn train of activity in motion with relatively low urgency. If the child is in fact found, as has usually been the case, in one of the local cinemas after a few hours then the situation will receive little formal attention. If the child, in fact, turns out to have been abducted then rather more formal attention will be given to the case and may result in changes to procedures in order to try to ensure the safety of other children.</p> <p>Informal feedback mechanisms may well concern certain aspects of the activity system and an example could be the use of a new piece of equipment. If officers are, for example, issued with a handheld computer providing access to some of the Force information systems an informal feedback between officers may suggest changes to working practices as a result of this. Whilst such changes may well, in due course, be picked up by formal systems, codified and presented as either rules or good practice codes it is likely that, in the first instance, they will have been picked up and disseminated informally. Obviously, it is possible for poor practice to be disseminated in this informal manner just as easily as good practice and in that case the formal reaction to the change in practice may well be to put rules in place to prevent the change taking root.</p>
<p>Notes</p>	<p>This is a higher level characterisation of an activity system and, as such, it lacks both precision and an exhaustive account of all of the potential elements which may, in an actual case, form a part of the activity system as it is deployed. The intention is to provide, in a relatively brief and accessible format, an overview of the activity system and to identify the key components in context.</p> <p>Headings used in the table above indicate that the discussion is typical rather than exhaustive and examples have been used which are representative rather than comprehensive.</p> <p>At this stage and this level the potential impact of mobile technologies on the activity system has not been identified.</p>

## Neighbourhood Patrol

Activity System	Neighbourhood Patrol		
Subject	Object	Outcome	Motivation
<p>Neighbourhood Patrol Team officer(s).</p> <p>Consisting of a Community Beat Manager, Police Constables and Police Community Support Officers.</p>	<p>Community policed and the members of the public within it.</p> <p>Includes actual and potential victims of crime and the actual and potential perpetrators of crime or anti social behaviour.</p>	<p>Appropriate policing outcomes met in response to specific situations and incidents.</p> <p>Visible presence maintained in the area.</p> <p>Knowledge of the local community(ies) built up in terms of connection with residents and input to Force and officers' own local knowledge.</p> <p>Priorities set with the local community delivered.</p>	<p>Maintain law and order.</p> <p>Support the local community(ies) in maintaining the area as they want to have it.</p> <p>Support local, Force and National priorities with regard to policing</p>
Tools			
Physical	Representational	Informational	Internal
<p>Boots, radio, mobile phone, notebook and pen, handcuffs, uniform, handheld and fixed computers.</p>	<p>Forms (paper and ICT based), incident log.</p>	<p>Police National Computer, control centre staff via radio as information intermediaries, Force intelligence system, Voters' Roll, crime management system, email.</p> <p>Information systems in allied agencies such as schools, housing associations, and social work departments or education departments in local authorities. Usually accessed via information intermediaries in the agencies and often by email or phone call, depending on urgency.</p>	<p>Knowledge of: law, police powers and limits, key individuals and networks, local area, internal procedures and routines of the Force.</p> <p>Personal qualities of organisation, negotiation and persuasion.</p>
Communities		Longer Term	
<p>Immediate</p> <p>Public.</p> <p>Local community organisations.</p> <p>Police officers and police staff.</p>		<p>Back office staff, wider criminal justice system (e.g. CPS / Courts), allied agencies (e.g. social work, youth offending team, local housing associations), specialist police staff (e.g. crime prevention officer).</p> <p>Formal consultative mechanisms with local community groups and organisations – typically Police And Communities Together (PACT) groups</p>	

and meetings forming a key part of such consultation.

**Rules and Norms**

Laws	Rules	Codes	Norms
<p>National laws governing the public (e.g. Theft Act, Road Traffic Acts)</p> <p>Local Bye laws (e.g. No Alcohol areas)</p> <p>National laws governing police actions (e.g. Police and Criminal Evidence Act)</p>	<p>Externally set rules governing processes and procedures such as recording of incidents, or safety procedures. (e.g. investigation of complaints by the Independent Police Complaints Commission, rules governing community involvement initiatives)</p> <p>Internal police Force rules governing processes and procedures such as recording of incidents, or internally set safety procedures.</p>	<p>Externally and internally provided good practice codes covering areas such as relations with communities, dealing with vulnerable people.</p> <p>Current Force priorities and procedures – such as the degree of latitude given with regard to littering offences.</p>	<p>Norms operating at the level of the immediate team and the wider team.</p> <p>Norms with regard to specific groups of people such as uninsured drivers or paedophiles.</p> <p>Norms developed with regard to particular sections of the local community and specific actions (e.g. a particular area has a 'green transport policy', so officers tend to allow significant latitude to cyclists and pedestrians and less to drivers)</p>

**Division of Labour**

Immediate	Longer Term
<p>Public raise concern. Often by personal approach or via community forums. Less frequently by phone call, visit to a police station or shop. Even less frequently by letter, text message, web form or email.</p> <p>Police manager acting directly, or via police staff, tasks officer(s). In the case of many issues (e.g. repeated littering outside a school by pupils) it may be some time before the issue is passed on, often via a briefing and inclusion on the targets in the crime management system, to neighbourhood patrol officers. There may also be situations where an urgent incident arises on a geographic area and NPT officers are despatched via radio message – an example could be a fight in a town centre pub when response officers have also been despatched but NPT could be there first and, in any case, the more officers the better.</p> <p>Officer(s) deal with the incident or concern and record action, requesting information and completing records as required. This may be a matter of minutes or a matter of months.</p>	<p>Other elements of the wider criminal justice system – for example a case passed to the CPS, sent for trial at Court and attendant requirements made for reports from police prior to sentencing.</p> <p>Allied agencies – for example Local Authority cleanup staff to remove graffiti before it can lead to further nuisance behaviour</p> <p>Community organisations which may take up longer term action with regard to issues which have been resolved in the short term. So, for example a local community group may campaign for more youth activities after a rise in youth antisocial behaviour has been reduced by targeted patrols</p>

Notes	<p>Typical activities within the activity system of NPT policing include:</p> <p>Routine issues:</p> <ul style="list-style-type: none"> <li>Visible patrol, often on foot</li> <li>Stationary vehicle violations</li> <li>Deterring anti social behaviour</li> </ul>
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Community liaison – individuals and organisations  
Links and liaison with wider agencies  
Follow up on response officer interventions in cases of burglary, missing persons etc.

Responding (albeit relatively rarely) to incidents:

Domestic disputes  
Burglaries  
Missing Persons  
Shoplifters  
Traffic accidents  
Anti social behaviour (drunkenness, fighting, graffiti, disorder)

In carrying out these tasks officers will have a series of actions and operations which they carry out as component parts of the tasks:

- Identify vehicle or person of interest or potential interest
- Carry out checks on PNC, Force Intelligence system, voters roll
- Liaise with Force Control Centre for information required or access information directly
- Stop person
- Search person or vehicle
- Ascertain whether an arrestable offence has been committed
- Arrest person
- Issue fixed penalty notice for disorder
- Issue stop encounter form
- Issue stop search form
- Issue youth stop form
- Arrange prisoner transport
- Deal sensitively with people under stress
- Record appropriate incident details
- Call for backup as required
- Read and update incident logs
- Submit information into the intelligence system
- Inform supervisors or managers as required
- Access crime management system
- Arrange and participate in community liaison meetings
- Identify and develop relationships with key individuals and networks

Most situations will be made up of a number of these actions / operations in combination. They will, of course, differ in character according to the situation. So, for example, the process of stop and search can be quite placid and low key with one person and can be quite different with another person who objects to the process and is perhaps under the influence of drink or drugs at the time. Nonetheless, the stages of the activity will be similar even if the skills and tools needed to achieve them are different.

## Response policing

Activity System		Response policing	
Subject	Object	Outcome	Motivation
Police Officer(s)  Usually as a double or single crew in a vehicle.	Member(s) of the public as actual or potential victims or perpetrators of crime.	Appropriate policing outcome met. (e.g. arrest made, details of missing person obtained, visible presence provided)	Maintain law and order.  Assist people in distress.  Progress Force policing objectives.
Tools			
Physical	Representational	Informational	Internal
Car, radio, mobile phone, notebook and pen, handcuffs, uniform, maps, torch, handheld and fixed computers.  Detention facilities.	Forms (paper and ICT based), incident log	Police National Computer, control centre staff via radio as information intermediaries, Force intelligence system, Voters' Roll, crime management system, email.	Knowledge of: law, police powers and limits, key individuals and networks, local area, internal procedures and routines of the Force.  Personal skills of organisation, persuasion and negotiation.
Communities			
Immediate		Longer Term	
Public.  Police officers and police staff.  Control centre staff.		Back office staff, wider criminal justice system (e.g. CPS / Courts), allied agencies (e.g. social work, youth offending team), specialist police staff (e.g. crime prevention officer, scientific support)	
Rules and Norms			
Laws	Rules	Codes	Norms
National laws governing the public (e.g. Theft Act, Road Traffic Acts)  Local Bye laws (e.g. No Alcohol areas)  National laws governing police actions (e.g. Police and Criminal Evidence Act)	Externally set rules governing processes and procedures such as recording of incidents, or safety procedures. (e.g. investigation of complaints by the Independent Police Complaints Commission, rules governing response driving in traffic)  Internal police Force rules governing processes and procedures such as recording of incidents, or internally set safety procedures.	Externally and internally provided good practice codes covering areas such as dealing with missing children, and rights of juveniles who have been arrested, for shoplifting for example.  Current Force priorities and procedures – such as the degree of emphasis placed on prosecutions for domestic violence.	Norms operating at the level of the immediate team, the wider team and the Force as a whole.  Norms with regard to specific groups of people such as drug dealers or to specific social groups such as a particular family with a heavy involvement in crime or antisocial behaviour.

Division of Labour	
Immediate	Longer Term
<p>Public or police raise concern. Usually, for the public, by phone call, less frequently by visit or personal approach.</p> <p>Police manager acting directly or via police staff tasks officer(s). In the case of a clear urgent need (burglary in progress) this will be immediate via the control centre. In the case of less immediate issues (e.g. a series of burglaries on an industrial estate being brought to the attention of the management by crime analysts) it may be some time before the issue is passed on, via a briefing and inclusion as a crime management task in many cases, to response officers.</p> <p>Officer(s) deal with the incident or concern and record action, requesting information and completing records as required. This may be a matter of minutes or a matter of months.</p>	<p>Other elements of the wider criminal justice system – for example a case passed to the CPS, sent for trial at Court and attendant requirements made for reports from police prior to sentencing.</p> <p>Allied agencies – for example Social Services involvement with a family where a child has run away from home.</p> <p>Specialist police services – such as crime scene investigation after a burglary.</p> <p>Specialist other services - such as a referral to Relate after a call to an incident of domestic violence.</p>
Notes	<p>Typical activities within the activity system of response policing for an officer / crew include:</p> <p>Routine issues:</p> <ul style="list-style-type: none"> <li>Visible patrol</li> <li>Carrying out bail address checks</li> <li>Moving and stationary vehicle violations</li> </ul> <p>Responding to (main priority):</p> <ul style="list-style-type: none"> <li>Domestic disputes</li> <li>Burglaries</li> <li>Missing Persons</li> <li>Shoplifters</li> <li>Traffic accidents</li> <li>Anti social behaviour (drunkenness, fighting, graffiti, disorder)</li> </ul> <p>In carrying out these tasks officers will have a series of actions and operations which they carry out as component parts of the tasks:</p> <ul style="list-style-type: none"> <li>• Identify vehicle or person of interest or potential interest</li> <li>• Carry out checks on PNC, Force Intelligence system, voters roll</li> <li>• Liaise with Force Control Centre for information required</li> <li>• Stop person or vehicle</li> <li>• Search person or vehicle</li> <li>• Ascertain if an arrestable offence has been committed</li> <li>• Arrest person</li> <li>• Impound vehicle</li> <li>• Issue fixed penalty notice for disorder</li> <li>• Issue conditional fixed penalty notice</li> <li>• Complete missing from homes report</li> <li>• Issue stop encounter form</li> <li>• Issue stop search form</li> <li>• Issue youth stop form</li> <li>• Arrange prisoner transport</li> <li>• Deal sensitively with people under stress</li> <li>• Respond rapidly and safely to get to the location of an incident</li> <li>• Record appropriate incident details</li> </ul>

- Call for backup as required
- Read and update incident logs
- Submit information into the intelligence system
- Inform supervisors or managers as required
- Access crime management system

Most situations will be made up of a number of these actions / operations in combination. They will, of course, differ in character according to the situation. So, for example, the process of stop and search can be quite placid and low key with one person and can be quite different with another person who objects to the process and is perhaps under the influence of drink or drugs at the time. Nonetheless, the stages of the activity will be similar even if the skills and tools needed to achieve them are different.

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