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THE ROLE OF AUTOMATIC NUMBER PLATE RECOGNITION SURVEILLANCE WITHIN POLICING AND PUBLIC REASSURANCE

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A thesis submitted to the University of Huddersfield in partial fulfilment of the requirements
for the degree of Doctor of Philosophy

The University of Huddersfield in collaboration with West Yorkshire Police

December 2009

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Abstract

This Thesis examines the role that Automatic Number Plate Recognition surveillance plays within policing and public reassurance. The Thesis is improvement orientated, exploring how ANPR could become a more effective policing tool and highlights implications for future policies and practice.

The first two chapters set the context for the research, explaining what ANPR is, its place within criminology and gaps in research addressed in the Thesis. The literature review calls for a better understanding of ANPR's potential and role as an investigative tool and an examination of the public's views about ANPR surveillance. In the third chapter, reference is made to available methods used to address such objectives.

Chapters Four, Five and Six present the results emerging from the empirical work in this Thesis. Chapter Four is concerned with police perceptions regarding current ANPR practice. The thesis highlights the complexity of translating policy into practice in the current political and economic climate, where objectives and priorities dictated by the government are constantly shifting. Continuing its improvement orientation, Chapter Five covers public perceptions about ANPR and outlines ways to address the balance between privacy and security without endangering both. The potential impact of ANPR on crime and ways to measure it is the topic of Chapter Six, which argues that establishing a causal link between ANPR and crime is not a straightforward process. The concluding chapter talks about the implications of the study and any interesting future avenues for research.

The emerging findings from this research sit uncomfortably with the opinions and predictions of both supporters and opponents of ANPR alike and shed light not only on the management and use of ANPR by the police in Britain, but also on many of the ethical issues raised by the emergence of new surveillance technologies.

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Acknowledgments

I would like to thank my supervisors, Professor Alex Hirschfield and Dr Aidan Wilcox at the University of Huddersfield who have been of a great intellectual support, sharing with me a lot of their expertise and research insight. I am deeply grateful to their valuable supervision, advice, and guidance throughout the entire PhD, especially for their careful reading and commenting of my thesis. I admire their wisdom and distinguished character and, although their approach has made it challenging for me at times, I believe it has made me a stronger and more mature academic. I would also like to thank Dr Jason Roach at the University of Huddersfield for his advice and supervision in the early years of the PhD.

I would like to show my gratitude to West Yorkshire Police who have been extremely helpful in facilitating the research throughout the entire PhD. I especially thank Chief Superintendent Mark Milsom, for his continuous support and guidance with the research. I am ever indebted to his believing in me at times when I needed it most. I am heartily thankful to everybody at Corporate Review, West Yorkshire Police, for their relentless help and support in the last four years, in particular David Fitzgerald, Jane Sykes, Malachi Rangecroft and Sarah Carter. I would also like to thank those at Special Operations Division, for having me work with them in the field in the early years of my PhD. Special thanks go to Robert Furness for sharing his knowledge and expertise about ANPR and for facilitating access to ANPR data; to Chief Superintendent Geoff Dodd for his valuable input in the research project, and to my 'liaison officer', Chief Inspector David Knopwood for his help in facilitating meetings and access in the early stages of the PhD.

I am indebted to Leeds City Council, Q&A Research, Safer Leeds, West Yorkshire Police and the West Yorkshire Youth Association and for their help with the additional funding and research facilitation for the public opinion study.

I owe my deepest gratitude to all police forces who have participated in this research, whose name I cannot mention here for confidentiality purposes. I would also like to thank the Association of Chief Police Officers (ACPO) and the National Policing Improvement Agency (NPIA) for their support with the practical aspects of the research. Special thanks go to Ian Bond at the Practice Improvement Unit at NPIA, who supported my research throughout the years and facilitated access to people, documents and meetings with all police forces in the UK and stakeholders in the ANPR arena.

I would also like to show my genuine appreciation to the other members of the Applied Criminology Centre who took effort in reading and providing me with valuable comments on bits and pieces of this thesis. Many thanks go in particular to Michelle Rogerson for her advice throughout the years and her help with those 'complicated statistical tests'.

I also thank all my postgraduate colleagues for sharing some of their knowledge and literature, as well as the PhD 'burden'. Special thanks to Vicky whose cheerful attitude gave me lots of encouragement throughout the years and to Monish for his funny way of helping in keeping the fire 'glowing'.

Special thanks to my family, in particular my grandparents ('Multumesc') and Eric ('Merci beaucoup') for their understanding and compassion throughout the PhD. I am also heartily thankful to my friend, Ian, who had the patience to read the thesis, provide me with very

useful comments and encourage me to keep going. This work should serve as a small token for their (continued) belief in my potential.

I am tempted to individually thank everybody, but as that list might be long and for fear I might omit someone, I will simply and genuinely say: ‘thank you to you all for your support and trust’.

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‘Those who would give up essential Liberty, to purchase a little temporary Safety, deserve neither Liberty nor Safety.’¹

Chapter One

ANPR in the Spotlight

‘Britain is to become the first country in the world where movements of all vehicles on the roads are recorded. [...] Using a network of cameras that can automatically read every passing number plate, the plan is to build a huge database of vehicle movements so that the police and security services can analyse any journey a driver has made over several years’².

1.1. Introduction

This statement brings to mind almost inevitably images of a society under total surveillance, of ‘Orwellian nightmares’ and fears about a ‘Big Brother’ state³. While the government uses the language of safety and security, claiming that ANPR targets the wrongdoers and reduces crime, critics argue that the police use of ANPR surveillance may breach privacy and human rights laws⁴. Although it is easy to be carried away by the ‘apocalyptic vision’ of critics of new policing technologies or by the publicity of their effectiveness in reducing crime⁵, the truth is, however, that technologies like this are both a ‘burden and a blessing’⁶. Indeed surveillance has two ‘faces’⁷: it not only has the potential to be ‘protective and enabling’, but it can also be intrusive and deeply implicated in the structure of the ‘totalitarian rule’⁸.

Automatic Number Plate Recognition (ANPR) is certainly one of the emerging enhanced technologies which enable the rapid recovery, matching, identification and real time tracking of vehicles and people through public space. Mass ‘dataveillance’ is now a reality, with large groups of people being monitored in the name of security to identify particular sub-

¹ Quote first used by Benjamin Franklin in a letter written on 11th November 1755, ‘Pennsylvania Assembly: Reply to the Governor’, printed in *Votes and Proceedings of the House of Representatives, 1755-1756 (Philadelphia, 1756)*, pp. 19-21. Quote taken from Labaree and Ketcham (Eds.) (1963: 242).

² Connor (*The Independent*, 22nd December 2005).

³ Goold (2004: 5).

⁴ Macdonell (2006). See also the annual reports of the Chief Surveillance Commissioner (2006, 2007).

⁵ Chan (2003: 656).

⁶ Postman (1992: 4-5).

⁷ Lyon (1994: 201).

⁸ Norris and Armstrong (1999: 5).

populations of interest to the police and allied security organisations. Anonymous travel is quickly becoming a thing of the past, with an increased risk of losing any rights to ‘locational privacy’⁹. This raises questions like: Can we have privacy and security at the same time or is one sacrificed for the other? If we have to give up privacy for the sake of security, how effective are such surveillance technologies in providing this security? In other words, is ANPR worth the public money and the restrictions to one’s civil liberties? Indeed the potential, direction and the policy intent (deliberate or otherwise) appear to be pushing us towards a ‘Big Brother’ state.

Automatic Number Plate Recognition was implemented by police forces in their efforts to control crime and maintain public order. ANPR is typically used in the hope that it will help to detect and deter document offences¹⁰ and acquisitive crime, as well as more serious incidents such as kidnapping, murder and terrorist attacks. It is also hoped that public confidence and reassurance will be improved. However, despite the wide use of ANPR technology in the UK, little is known about its effectiveness in addressing these aims or the extent to which it provides value for money. It is important that we become more aware of the full implications of these crime fighting tools, of the impact they can have on policing and crime, as well as their wider socio-political and ethical implications.

Firstly, what exactly is ANPR and what does it do? Before looking in more detail at the background, scope and objectives of this Thesis, it might be useful at this stage to familiarise the reader with the topic of research. This introductory chapter commences by defining what is understood in this research by the term ANPR. This is followed by a discussion of the rationale for the study, including a brief account of the current state of research on ANPR and the research objectives of the Thesis. The chapter concludes with an overview of the Thesis’ structure.

⁹ Blumberg and Eckersley (2009). See also Clarke and Wigan (2008) on the ‘deep’ privacy impact of ‘location technologies’.

¹⁰ Driving without valid insurance, MOT, licence are typically referred as ‘document’ offences.

1.2. What is ANPR?

Before explaining the motivations and scope of this research, it is important to introduce the reader to the main concepts used throughout the thesis. ‘ANPR’ stands for Automatic Number Plate Recognition. Automatic number plate recognition is defined as a *‘surveillance capability that uses mobile and fixed road-side sensors to read vehicle number plates and instantaneously cross-match them with information and intelligence held on the Police National Computer and linked systems’*¹¹. The purpose is to identify stolen vehicles used in crime or which are in violation of some other law.

Simply explained, ANPR ‘reads’ **vehicle registration marks** (VRM), commonly known as number plates, from digital images captured by ANPR cameras. Depending on the specifications of readers and cameras, ANPR can read up to 3,600 number plates per hour. The images captured include a ‘plate patch’ (the photograph of the number plate) and an overview image (which includes a photograph of the vehicle). The plate image is converted to text using optical character recognition (OCR) technology. Once the number plate is converted into text, the ANPR system stores it in a database. An electronic log of vehicle movements with date, time and location is created. While the system is only designed to read the plate, the software enables a search to be made for the plate in a variety of databases, providing feedback to the operator in seconds, if required¹².

1.2.1. The ANPR process: cameras, hotlists and hits

ANPR systems can use existing CCTV cameras¹³, traffic cameras or cameras specifically designed for the task. While the police have focused on applications of ANPR based on these three platforms, less common types of systems are also used, such as portable, hand held and helicopter based ANPR. An illustration of common types of cameras used in conjunction with ANPR systems is presented in Figures 1.1 and 1.2 below:

¹¹ NPIA (2009: 10).

¹² ANPR is a tool with a multitude of applications, including operational policing, vehicle road tolling and traffic control, monitoring of shopping centres and private estates, control of parking and petrol stations forecourts, defence installations and high security applications.

¹³ CCTV (Closed Circuit Television) is a system in which a number of video cameras are connected in a closed circuit or loop, with images produced being sent to a central television monitor or recorder (Goold, 2004: 12).

Figure 1.1 ‘Fixed’ ANPR*

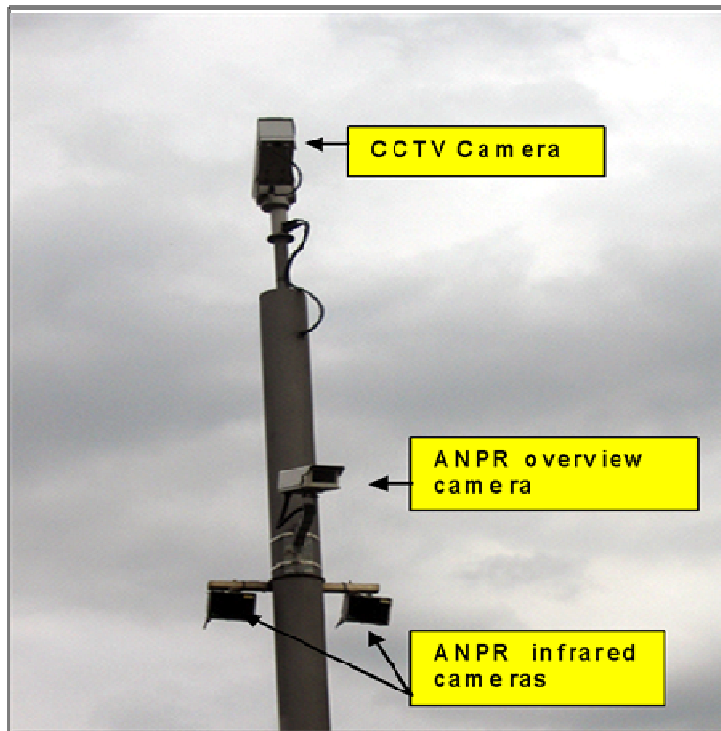


Figure 1.2 ‘Mobile’ ANPR: Spectrum van*



*These pictures were released to the public domain or to the researcher who was given permission to use them for the purpose of the study

Although ANPR systems use CCTV cameras, this is not to say that CCTV is analogous to ANPR. The CCTV system usually captures and records moving images of pedestrians, bikes, cars etc, while ANPR captures only still images of the vehicle and its number plate and records the number plate data in the form of a text. Typical limitations encountered by the ANPR systems, which will be briefly explained next, suggest that ANPR works best with CCTV when different but complementary sets of cameras are used.

Databases typically used by the police in connection with ANPR systems are also known as '*ANPR hotlists*'. The most common ANPR hotlist is the *Police National Computer (PNC)*. This includes vehicles that have been stolen or those linked to crime. However, other databases are also used to create ANPR hotlists including:

- *The Local Police Force Intelligence Systems hotlist* which comprises vehicles of interest based on the local intelligence within a force;
- *The Counter Terrorism hotlist*, which is compiled by the National Joint Unit (NJU) and consists of vehicles that are of interest to Force Special Branch and other government agencies in relation to terrorism;
- *The Driver and Vehicle Licensing Agency (DVLA) hotlist* which includes all vehicles without a valid excise licence or registered keeper and the *Motor Insurance Database Application System (MIDAS)* hotlist comprising all vehicles without a valid insurance policy.
- Other *In-force hotlists* which are developed at force level and used more on an ad hoc basis to support targeted operations or to address specific crime problems in an area.

ANPR systems produce two types of data, 'read' data and 'hit' data. 'Read' data contain all number plates identified and recorded by the system; 'hit' data contain number plates that have a hit against one of these databases (*ANPR hits*).

Within policing, ANPR systems link to a central server called the *Back Office Facility (BOF)*. The time, date, location and direction of travel of the vehicle, the image of the number plate ('patch plate') and in some cases the image of the vehicle and the driver are stored within the Back Office. The Back Office enables hit and read data to be searched for analysis. Systems are equipped to produce instantaneous warnings for 'hit' data/vehicles, which in turn assist the operators in their decisions and actions to take forward.

1.2.2. Technological limitations

Although the ideas behind ANPR are simple, putting them into practice is more challenging. The main difficulty is to enable the capture of a clear image of the number plate, irrespective of light conditions, speed of the vehicle or the conditions of the number plate. It would be wrong to assume that all ANPR systems can be used in the same way or generate the same results. Some systems work with lower specs cameras producing lower quality images and less accurate reads. Newer ANPR cameras have enhanced specifications, with infrared capabilities to enable reading number plates and taking photographs in poor light conditions or at night. It is believed that the overall read rates for ANPR are 90% to 94%, in ideal conditions and supported by high quality modern systems. However, additional factors such as tow-bars, increased reflective properties of the number plate's lettering, dirt, cloned or fake number plates could lead to significant levels of misreads. The older ANPR systems have been notably unreliable (with performance rates between 60% and 80%), being heavily criticised for misreading number plates and generating 'hits' on innocent drivers. Although ANPR technology has developed considerably over the last few years, concerns about the accuracy and reliability of ANPR systems remain¹⁴. Media reports of misidentification coupled with fears of the loss of 'locational privacy'¹⁵ have raised concerns amongst the public and this Thesis seeks to explore these issues.

¹⁴ Parking Trend International (June 2008), available from: <http://www.parkingandtraffic.co.uk/Measuring%20ANPR%20System%20Performance.pdf>. For information about the congestion charging system in London, go to <http://www.thisislondon.com/news>. Last checked October 2009.

¹⁵ Blumberg and Eckersley (2009) define 'locational privacy' as the ability of an individual to move in public space with the expectation that under normal circumstances their location will not be systematically and secretly recorded for later use.

1.3. Why ANPR? Motivations and scope of the research

This research is based on a collaborative studentship between the University of Huddersfield and West Yorkshire Police, which part-funded the study. West Yorkshire Police recognised a need for a more systematic examination of the use of ANPR technology particularly with regards to crime investigations and intelligence development, in order to tackle crime and disorder more efficiently. West Yorkshire Police facilitated the researcher with access to a number of data sources and key stakeholders in the ANPR arena both at local and national level.

The research also stems from a general interest in criminology and a more specific concern for activities which come under the umbrella of surveillance technologies. While there is an abundance of literature on CCTV, there has been little academic attention afforded to the implications of advanced CCTV systems such as ANPR on policing, crime prevention, public reassurance and civil liberties. Research on ANPR identified at the time when this Thesis was started (April 2006) was limited to just few studies commissioned by the Home Office Police Studies Unit (PSU) with support from the Association of Chief Police Officers (ACPO) and Her Majesty's Inspectorate of Constabulary (HMIC)¹⁶. These were informally called the 'Laser' evaluations (Laser 1-4), with only Laser 2 being released into the public domain (published by PA Consulting Group in 2002). More specifically, this body of literature looked primarily at the police use of ANPR technologies across England and Wales in the context of operational policing and ANPR-enabled intercept teams.

While these studies provide valuable information on ANPR and add to our understanding of how ANPR works, they are limited in scope and quality. There is a paucity of research examining how the police have embraced this new surveillance technology, or whether ANPR is effective in reducing crime and fear of crime. According to the ANPR Strategy for the Police Service 2007/2010¹⁷, one of the justifications for the use of ANPR is to increase public confidence, which is an area that has been completely overlooked by current research and academic papers. Given the extensive developments in surveillance technologies in the UK and fears about an emerging 'Big Brother' state on the one hand and extensive investment from the government in crime prevention measures such as ANPR on the other,

¹⁶ For future reference, the acronyms ACPO, NPJA and Home Office PSU will be used.

¹⁷ ACPO (2007).

there is a clear need to investigate the effectiveness of ANPR as a policing tool, but also to explore the wider socio-ethical implications of using ANPR. The use of ANPR brings with it responsibility and accountability, as well as expectations of effectiveness and value for money.

This is even more the case given that the investigative and intelligence use of ANPR are becoming increasingly important in the current political and national security context. The thinking behind policing strategies at a national level is to find more comprehensive ways to effectively address issues such as terrorism and serious and organised crime. This involves embedding ANPR into mainstream policing and using ANPR more as an aid to crime investigations and a means to developing intelligence, which – as will be argued throughout the Thesis – is ANPR's 'Achilles' heel'.

1.4. Research objectives

This Thesis seeks to redress some of these gaps in research and knowledge with regards to ANPR. Drawing on three years of field research with the police and the public (that included the capture of primary data through participant observation, interviews, electronic and postal surveys, focus groups), crime data analysis and secondary analysis of police records, this Thesis presents the findings of an extensive study of ANPR and its role within policing and public reassurance.

The primary objective of this Thesis is to explore the advantages and limitations to ANPR as perceived by the police and the public with a view to inform future development and policies and improve ANPR's effectiveness in reducing crime and reassuring the public. The Thesis is not an impact evaluation of ANPR. More specifically, this Thesis' objectives are to:

- Explore the criminological theory behind the use of ANPR;
- Examine common practice in the police use of ANPR in the UK;
- Explore ANPR's potential as an investigative and intelligence policing tool;
- Investigate the extent to which opportunities presented by ANPR are fully exploited;
- Explore ANPR's impact on crime;
- Explore the public's view with regards to ANPR surveillance;
- Suggest recommendations regarding the police use of ANPR and implications for future policy and practice;
- Identify future avenues of research.

Research of this nature is important in the context of police effectiveness and accountability. A better understanding of how ANPR works and how it is perceived would be of obvious interest to the police and other agencies with policy remit involved in the development and future funding of ANPR. This research is important for not only will it explore how police practice could be improved, but it will also flag up some of the issues surrounding the measurement of ANPR's impact on crime.

1.5. Structure of the Thesis

In this concluding section, a brief outline of the remaining chapters is provided. The first major question that this Thesis addresses is how ANPR fits within broader crime theories. ANPR, like CCTV, is a surveillance technology with a rationale based, on the one hand, on a situational approach to crime and contemporary opportunity theories, and on the other hand on principles of the 'Panopticon' and modern control theories. Thus Chapter Two places ANPR within a wider surveillance and crime prevention context and explores the criminological theories which might explain how ANPR can reduce crime, issues largely overlooked by the academic literature. The chapter moves on to highlight the deficiencies of the literature and concludes with a list of research questions, some of which this Thesis seeks to address.

Chapter Three describes the research methodology and justifies the selection of certain methods over others. It also describes the stages involved in the research and highlights a number of issues relating to the research process, research facilitation and field-based research in a police environment.

Chapters Four, Five and Six include the empirical results of the research. Chapter Four presents police perceptions, knowledge and experience about ANPR, exploring the balance between ANPR's potential and use as an investigative and intelligence tool. The main impediments to ANPR's effectiveness are highlighted here with the view to identify areas where further work or guidance might be required to optimise the benefits of ANPR in all areas of policing.

Chapter Five turns its attention to how the public respond to the introduction of ANPR in the UK and how they perceive its role as a crime prevention tool. This chapter examines in detail the public's view on the police use of ANPR surveillance, a process which was both literature-led and informed by field research (public opinion survey and focus groups).

Chapter Six explores the extent to which traditional ways of measuring an intervention's impact on crime could be applicable to new surveillance technologies such as ANPR. The chapter presents the findings of a study exploring changes in police recorded crime following

the introduction of ANPR and highlights the main challenges to the process of measuring ANPR's impact on crime.

The final chapter of the thesis, Chapter Seven, draws together the lessons from the earlier chapters and describes the theoretical, methodological and practical contribution of the study. The chapter also outlines the implications of the study, research limitations and any interesting future avenues for research.

Chapter Two

Literature Review

2.1. Introduction

In order to fully understand ANPR and its impact on policing, the theoretical background to ANPR and its development as a policing tool are first discussed. Where does ANPR fit into the world of surveillance and the area of policing and of crime detection? Why might we think that ANPR works? To answer such questions we need to explore the theoretical justifications for surveillance technologies, tracing for example their roots in opportunity or crime theories. The rise of surveillance technologies has implications both for criminology and wider society and these are discussed in this chapter. This chapter places ANPR within the wider sociological and criminological context and reviews the literature on this subject. The chapter concludes with a list of important questions for further investigation, some of which this thesis seeks to address.

2.2. Surveillance: from Sun Tzu's spies to CCTV and beyond

In a broad sense, surveillance means 'watching over' someone or something¹⁸. Surveillance is an old phenomenon, an intrinsic part of human interaction. When Sun Tzu wrote 'The Art of War' 2500 years ago, he discussed the role of spies in the battle against enemies. Since then, surveillance has evolved to the point where it involves the systematic monitoring and recording of behaviour, movement or affairs of people for security or social control purposes. Surveillance nowadays is so pervasive, it has almost become routine:

*'We live in a surveillance society. It is pointless to talk about surveillance society in the future tense. In all rich countries of the world everyday life is suffused with surveillance encounters, not merely from dawn to dusk but 24/7. It is not just that CCTV may capture our image several hundred times a day or that check-out clerks want to see our loyalty cards in the supermarket. It is that these systems represent a basic, complex infrastructure which assumes that gathering and processing personal data is vital to contemporary living.'*¹⁹

While some forms of surveillance have always existed, the development of information technologies and advanced electronics has brought surveillance to a completely new and extended level of operation. This new surveillance assisted by information and computer technology ('surveillance technology') is fast, varied, controlled, coordinated and in some cases automated. Examples of everyday surveillance include visual (e.g. CCTV) and aural surveillance (e.g. audio bugs, microphones, telephone taps), electronic surveillance of people and their goods (offender tagging, in-car satellite tracking devices, radio frequency identification in clothes) or the surveillance of individuals through the 'traces' they leave behind on a daily basis, also called 'data trail' or 'dataveillance'²⁰ (e.g. identity cards and passports, credit and debit cards, loyalty cards, cell phones, e-mail and the internet).

The increase in the use of surveillance technologies over the last fifty years has been phenomenal²¹. Amongst these, the most striking example is the development of CCTV in the

¹⁸ Definition provided by Merriam-Webster's Online Dictionary, available from: <http://www.merriam-webster.com/dictionary/surveillance>. The word 'surveillance', of French origin, comes from 'surveiller' which means 'to watch over'.

¹⁹ Ball and Wood (ed.) (2006: 1).

²⁰ Clarke (1988).

²¹ Chan (2003). See also Graham (1998); Lyon (2001), Marx (2001, 2002) and Nunn (2001).

United Kingdom, where the spread of this surveillance technology has surpassed any other country in the world. The history and development of CCTV falls beyond the remit of this thesis, however, the underlying theoretical concepts and evidence of effectiveness will be highlighted in this chapter, as ANPR, like CCTV, is a surveillance technology with a rationale based, on the one hand, on a situational approach to crime and contemporary rational actor theories, and on the other hand on principles of the ‘Panopticon’ and modern control theories. It is, however, important to highlight that it is the increase in the use of CCTV that influenced the development and rise of more sophisticated and advanced surveillance systems such as ANPR and facial recognition for example²².

As surveillance is an implicit characteristic of modernity²³, surveillance methodologies adapt, spread and develop accordingly. Technologies which were originally developed and used by the military have extended into the private sector and the law enforcement arena. Modern surveillance technologies are highly sophisticated, globally widespread and under constant scientific development. A wide range of surveillance technologies has evolved, including digitised, algorithmic surveillance (e.g. ‘smart CCTV’ enabled with facial, movement or number plate recognition technologies), monitoring and tracking using detection sensors (e.g. heat, light, motion, sound and smell) and the increased use of biometrics and advanced computer techniques (e.g. finger and hand print recognition, iris scanning, DNA tests)²⁴.

‘Algorithmic surveillance’ involves the use of automatic step-by-step instructions, also known as algorithms²⁵. Algorithms link together to create software which is used to exploit raw data, generating systems that can basically *classify and store* simple data, or more complex systems that *compare and match* the data, even *predicting and reacting* to events²⁶. Surveillance technologies are indeed becoming more sophisticated and complex, with more digital and algorithmic features. One such example is the development of ***Automatic Number Plate Recognition Systems (ANPR)***. The introductory chapter explained that ANPR systems are equipped to read vehicle number plates, match them against a variety of databases and

²² Goold (2004: 18-19).

²³ Ball and Wood (ed.) (2006: 1).

²⁴ Marx (2001: 1).

²⁵ The term ‘algorithmic surveillance’ was first used by Norris and Armstrong (1999), but the origins of the word ‘algorithm’ can be traced back to the 9th Century Muslim mathematician Muhammed ibn Musa al-Khwarizmi (Graham and Wood, 2003: 253).

²⁶ Graham and Wood (2003); Introna and Wood (2004).

produce automatic warnings for vehicles of interest to the police. ANPR is a form of algorithmic surveillance as it can classify and store, compare and match, predict and react.

2.3. Sociological perspectives: ANPR in a wider surveillance context

Sociological explanations for video surveillance (particularly CCTV) often invoke the metaphor of the ‘Panopticon’, the image of a ‘maximum surveillance society’ or of a ‘Big Brother’ state²⁷. The Panopticon was an architectural design of a prison developed by Jeremy Bentham in the late eighteenth century (1791) in which prisoners were to be held in cells around the edge of a circular building for the purpose of being observed from a centrally elevated watch-tower. The scenario implied that all prisoners were subject to surveillance by an observer, while the observer remained unseen by those being observed. The purpose of the panopticon was not only to facilitate the supervision of prisoners from a centralised location, but also to create obedience and conformity through the fear and uncertainty of being watched; an ‘expression of power’ which aimed to cultivate self-discipline and self-control²⁸. Bentham argued that his design of the Panopticon could be applied beyond prisons, to any place where people are kept under supervision (e.g. work, hospitals).

Over one hundred and fifty years later, the French philosopher Michel Foucault drew on Bentham’s ideas, including his own design of the Panopticon. In his book *‘Surveiller et punir: Naissance de la prison’* (1977), Foucault used the Panopticon as a symbol of all new surveillance techniques introduced in the early nineteenth century which enabled a small number of people to control and observe (‘surveillance’) a large mass of people. According to Foucault, the power generated by this architecture had influenced not only the prison, but other social institutions, such as hospitals, schools, military barracks and factories²⁹. He predicted that in the future the principles of the Panopticon will expand to non-institutional spaces and populations³⁰.

2.3.1. Does ANPR bring us closer to a total surveillance society?

Although the rise of surveillance technologies invoke images of a ‘Big Brother’ state³¹, we should be cautious before automatically applying Foucault’s concepts to CCTV and ANPR. The spread of such systems does not in itself mean that a totalitarian state is about to appear.

²⁷ The ‘Panopticon’ is a concept developed by Jeremy Bentham. See his ‘Writings’ in Bozovic (ed.) (1995).

²⁸ Hier et al. (2006: 231).

²⁹ Norris and Armstrong (1999: 6).

³⁰ Smart (1985).

³¹ As Goold (2004: 5) argues, ‘it is rare to find a critical discussion of policing and electronic surveillance that does not at some point either invoke the image of “Big Brother” or rely on metaphors drawn directly from the world of *Nineteen Eighty-Four*.

Some will argue that the disciplinary potential of Foucault's Panopticon or Orwell's 'Big Brother' is at its peak only when combined with 'techniques of behaviour modification, indoctrination and socialisation'³². Others stress that for CCTV surveillance to be 'total', it has to have the power to observe (anybody, anywhere, anytime) and classify individuals; people need to be aware of being watched and there has to be a certainty of response from authorities to acts of non-conformity³³.

ANPR is certainly an enhanced technology enabling the rapid recovery, matching, identification and real time tracking of vehicles through public space. However, whilst the Orwellian nightmare of a 'maximum surveillance society' remains, we should not yet be resigned to technological determinism. This thesis will argue that at present there are significant technical, operational, governance and institutional problems which hamper its realisation. The potential, however, is ever-present in the technology. Being digital and automated, ANPR systems have an increased capacity to store and analyse data; an increased ability to identify suspects without having to watch for behavioural patterns. In most cases, the population subject to CCTV surveillance (open street systems) is unknown to the observers so they cannot systematically identify and classify people in public space³⁴. Most CCTV systems cannot (yet) routinely link a person's image to a database. CCTV cameras can be linked to facial recognition software and match facial features against a database of known suspects or offenders, but these systems are still in their infancy³⁵. While the population subject to typical CCTV surveillance is largely anonymous, non-documented, non-classified (and thus less likely to induce anticipatory conformity)³⁶, most of those watched by ANPR cameras are already known to those who are watching. ANPR cameras are linked to databases comprising information on the entire registered driving population. However, stand alone ANPR systems have their disadvantages over CCTV. Firstly, they are limited to the driving population; they cannot 'watch' everything and everybody. Not only is ANPR limited to cars, but the information on the known driver of the car of interest can be inaccurate, as the driver may not be the registered keeper of the vehicle or the databases used in connection with ANPR may not be up to date at the time when the system cross-checks the information regarding the vehicle registration number.

³² Norris and Armstrong (1999: 6).

³³ Norris and McCahill (2006: 115).

³⁴ Norris and Armstrong (1999: 91-2).

³⁵ In the UK, The London Borough of Newham has a facial recognition system built into their CCTV systems. The system is piloted in two other British cities, Birmingham and Manchester (Meek, 2002).

³⁶ Norris and Armstrong (1999: 94).

ANPR systems can match, analyse and disseminate personal data at high speeds. As will be argued throughout the thesis, the development of a national ANPR centre, where all ANPR related intelligence are to be stored, is the proof that the information gathered by ANPR could be networked and shared and there is the potential for any driver in the UK to be under surveillance at some point in time. These are some of the reasons why ANPR could bring us closer to a ‘maximum surveillance society’³⁷.

One of the main limitations, however, both with regards to CCTV and ANPR systems, is the extent to which these surveillance systems generate an ‘authoritative reaction to non-conformity’³⁸. Studies about CCTV surveillance indicate that this is affected by poor integration, which generally means that the majority of systems are not monitored on a regular basis and that CCTV staff have other responsibilities or do not watch all the cameras all the time³⁹. This thesis will argue that this is the case with ANPR surveillance. An uneven balance between resources available and the amount of hits generated by the systems can result in low response rates, hence affecting the response to ‘non conformity’. For an illustration of differences between CCTV and ANPR, see Table 2.1 below:

³⁷ New sophisticated technologies close this gap even further. The face recognition technology developed by NEC enables cameras to identify drivers and passengers in their cars by taking a picture of the driver and compare with photos from the driver licence database to find a match. These cameras can be linked to ANPR systems which conduct further checks on the person and their driver licence. The system has been already used by border police in places like Hong Kong. The British Police are currently at the testing stage of this technology. Story available from: <http://www.autoexpress.co.uk/news/autoexpressnews>.

³⁸ Dandeker (1990: 40-1).

³⁹ Norris and Armstrong (1999).

Table 2.1 Characteristics of ANPR and CCTV

ANPR	CCTV
Digital	Mostly analogue*
Algorithmic and automated	Manual*
Increased capacity of storage & analysis	Limited storage of data*
One moment in time	Continuous recording
Fast	Slow*
Automatic recognition and tracking	Manual tracking*
Identities**	Images of people, cars, places
Known population**	Anonymous
Tracking of vehicles	Tracking of vehicles and people
Low coverage, limited to roads	Extensive coverage, incl. pedestrian areas
Driving population	Everybody
No need to monitor behaviour	Constant need to monitor behaviour
Reduced number of operators; reduced 'operator' bias (automatic detection of suspects)	High number of operators; highly skilled; danger of 'operator' bias (operator decides on suspicious behaviour)

* However, more digital CCTV systems are currently installed. Digital CCTV is more effective and more reliable. The data are digitally recorded and stored instead of being recorded onto video tapes, hence there is scope for increased storage, speed in processing and analysing the data.

** Certainty about identities is highly dependent on the accuracy of the read and the information stored on databases used in connection with ANPR systems.

2.4. Criminological perspectives: ANPR in a wider crime prevention context

From a criminological point of view, surveillance technologies are concerned with the prevention, detection and, ultimately the reduction of crime. This section will review different forms of crime reduction and appropriate criminological theories in an attempt to explain the rationale for the police use of ANPR.

While crime reduction refers to ‘any activity to decrease the frequency and/or seriousness of criminal and related events’, crime prevention refers to the methods used to intervene in the ‘causes of crime and disorder events to reduce the risk of their occurrence and the potential seriousness of their consequences’⁴⁰. Some criminologists talk about ‘primary’, ‘secondary’ and ‘tertiary’ crime prevention, where ‘primary’ refers to the prevention of the crime event, ‘secondary’ to the prevention of criminality amongst those at risk of becoming offenders and ‘tertiary’ refers to the prevention of continued criminal behaviour amongst those already offending⁴¹. Others distinguish between ‘situational’, ‘community’ and ‘developmental’ crime prevention⁴². Some criminologists have gone even further, identifying eleven types of preventative intervention, each of which addressing more immediate or more remote causes of crime⁴³.

‘The potential scope of prevention is vast and the means of capturing it highly various. This presents a challenge for the practitioner attempting to reduce crime, for the crime scientist trying to develop effective means of reducing crime and for the criminologist attempting critically to make sense of policies and practices defining crime problems and responding to them.’⁴⁴

At the broadest level, however, there are two main approaches to explaining criminal behaviour – the dispositional and situational approaches - each with different implications for crime prevention⁴⁵.

⁴⁰ Ekblom (2005: 204).

⁴¹ Brantingham and Faust (1976).

⁴² Tonry and Farrington (1995).

⁴³ Ekblom’s (2005). For a good description of different types of crime prevention and theories supporting these approaches, see also Tilley (ed.) (2005) and Maguire, Morgan and Reiner (ed.) (2002).

⁴⁴ Tilley (2005b: 4-5).

⁴⁵ Sutherland (1947).

Dispositional prevention, which is sometimes referred to as ‘social prevention’, seeks to change offenders’ fundamental criminality by eliminating or ameliorating the ‘root’ causes of crime which are believed to be the reason for ‘criminal dispositions’. Crime is a result of inherited personality traits and upbringing or deprivation resulting from socio-economic and cultural disparities such as unemployment, poverty and social disorganisation. For advocates of dispositional prevention, the only way to affect crime is to address these causes, rather than the situations in which crime occurs⁴⁶. However, dispositional theories have been criticised for focusing solely on the offender without considering differences in motivation for committing different types of crimes⁴⁷ or for mistaking correlations between various factors with the causes of crime and criminal behaviour. The effectiveness of dispositional crime prevention interventions has been questioned mainly because of the difficulty in evaluating such a broad range of inputs in terms of a long-term outcome and the poor quality of evaluations of community prevention strategies⁴⁸.

2.4.1. Principles of situational prevention

An increasing awareness of the limitations of strategies based only on dispositional factors encouraged academics to consider other explanations for crime. While proponents of ‘social crime prevention’ focussed on the dispositional determinants of crime (‘why?’) and measures designed to reduce criminal motivation, in the last three to four decades criminologists have turned their attention to the situational determinants of crime (‘where?’, ‘when?’, ‘who?’, ‘what?’ and ‘how?’) and proposed preventive measures to reduce the opportunities for crime. Crime and the current dynamics/situations of crime became the object of interest. Situational crime prevention thus focuses on reducing the opportunities for crime - rather than changing the characteristics of offenders - and modifying the environment or situation in which a crime usually occurs⁴⁹.

Support for a situational approach to crime prevention was provided by a study investigating rates of suicide in England and Wales during the 1960’s and early 1970’s⁵⁰. It found that

⁴⁶ Clarke (1980: 137-146); Clarke and Mayhew (1988: 82).

⁴⁷ Clarke (1980: 137).

⁴⁸ Tonry and Farrington (1995). It is argued that programmes to provide ‘treatment’ for offenders and reform their behaviour have not been particularly successful. Criminologists such as David Matza (1964) have argued that offenders may even be encouraged by a society which appears to appreciate, if not actually condone, their actions.

⁴⁹ Poyner (1983: 5).

⁵⁰ Clarke and Mayhew (1988).

suicide rates declined significantly following the change from coal gas (toxic) to North Sea gas (less toxic). This change in the opportunity to commit suicide led to an immediate and lasting reduction in the number of suicides. It was argued that if such a situational change could affect the acts of desperate people considering suicide, then the role of opportunity must be much more powerful for less deeply-motivated deviance, such as theft and violence. However, the development of this approach needs to be understood in the context of the political programmes with which it is aligned and in particular the work of Ron Clarke and the Home Office Research and Planning Unit in the late 1970s and early 1980s⁵¹. Situational crime prevention became a popular approach as it used economic language such as rewards, risks, demand and supply which fitted well with the ideology of the Conservative government at the time. Not only were the ‘situational’ interventions typically short-term and relatively inexpensive compared to ‘social’ programmes, but it was strongly believed that they provided practical solutions, rather than simply postulating as to why crime is committed. This was attractive to practitioners who had to implement such theories on the ground⁵².

2.4.2. Techniques of situational crime prevention

As situational crime prevention has evolved over the last decades, the number of techniques has increased as well – from the original twelve proposed by Clarke in 1993, to Clarke and Homel’s sixteen in 1997⁵³ and the twenty-five proposed by Cornish and Clarke ten years later (2003)⁵⁴. ‘Opportunity reduction’ is now about:

- *Increasing the effort* involved in crime (‘target-hardening’);
- *Increasing the risks* of detection (screening and surveillance);
- *Reducing the rewards* of crime (devaluing or removing the target);
- *Reducing provocations* and
- *Removing excuses* for committing crimes⁵⁵.

These interventions work on the premise that offenders make calculated decisions about the most suitable targets to select. Therefore, altering the target (installing a burglar alarm or CCTV), or portraying the message that the target may have been altered (installing a dummy

⁵¹ Crawford (1998).

⁵² Garland (2000).

⁵³ Clarke and Homel (1997) added the category ‘removing the excuses of crime’.

⁵⁴ Cornish and Clarke (2003) included the category ‘reducing provocations’. See also Ekblom’s (2001) conjunction of criminal opportunity, which has 231 categories.

⁵⁵ Cornish and Clarke (2003).

burglar alarm or installing CCTV in some shops and not others) should render that target less suitable, as perceived by the potential offender. For a classification of the latest collection of crime reduction techniques, see Table 2.2 below. This classification was devised by Cornish and Clarke in 2003, but for the purpose of this Thesis, the table has been adapted to include, where appropriate, where ANPR might act as a situational crime prevention technique.

Table 2.2 ANPR, amongst other situational crime prevention strategies*

Increase the effort	Increase the risks	Reduce the rewards	Reduce provocations	Remove excuses
1. Harden Targets <ul style="list-style-type: none"> immobilisers in cars anti-robbery screens steering column locks tamper-proof packaging 	6. Extend guardianship <ul style="list-style-type: none"> cocooning neighbourhood watch go out in group at night leave signs of occupancy carry cell phone 	11. Conceal targets <ul style="list-style-type: none"> gender-neutral phone directories off-street parking unmarked armoured trucks 	16. Reduce frustration and stress <ul style="list-style-type: none"> efficient queuing soothing lighting/music expanded seating polite service 	21. Set rules <ul style="list-style-type: none"> rental agreements hotel registration harassment codes
2. Control access to facilities <ul style="list-style-type: none"> alley-gating entry phones electronic card access baggage screening ANPR 	7. Assist natural surveillance <ul style="list-style-type: none"> improved street lighting defensible space design neighbourhood watch hotlines 	12. Remove targets <ul style="list-style-type: none"> removable car radios pre-paid public phone cards women's shelters 	17. Avoid disputes <ul style="list-style-type: none"> fixed cab fares reduce crowding in pubs separate seating for rival soccer fans 	22. Post instructions <ul style="list-style-type: none"> 'No parking' 'Private property' extinguish camp fires
3. Screen exits <ul style="list-style-type: none"> tickets needed for exit electronic merchandise tags export documents 	8. Reduce anonymity <ul style="list-style-type: none"> taxi driver ID's 'how's my driving?' signs School uniforms ANPR 	13. Identify property <ul style="list-style-type: none"> property marking vehicle licensing and parts marking cattle branding ANPR 	18. Reduce emotional arousal <ul style="list-style-type: none"> controls on violent porn prohibit paedophiles working with children enforce good behaviour on soccer field prohibit racial slurs 	23. Alert conscience <ul style="list-style-type: none"> roadside speed display signs 'shoplifting is stealing' signature for customs declarations ANPR signs
4. Deflect offenders <ul style="list-style-type: none"> street closures in red light district separate toilets for women disperse pubs 	9. Utilise place managers <ul style="list-style-type: none"> train employees to prevent crime support whistle blowers CCTV for double-deck buses reward vigilance 2 clerks for convenience stores 	14. Disrupt markets <ul style="list-style-type: none"> checks on pawn brokers licensed street vendors controls on classified ads 	19. Neutralise peer pressure <ul style="list-style-type: none"> 'idiots drink and drive' 'it's ok to say no' Disperse troublemakers at school 	24. Assist compliance <ul style="list-style-type: none"> litter bins public lavatories easy library checkout
5. Control tools/weapons 'smart guns' <ul style="list-style-type: none"> toughened beer glasses photos on credit cards 	10. Strengthen formal surveillance <ul style="list-style-type: none"> speed cameras red-light cameras burglar alarms CCTV in town centres security guards ANPR cameras and police response/presence 	15. Deny benefits <ul style="list-style-type: none"> ink merchandise tags graffiti cleaning disabling stolen cell phones disabling engine power stolen vehicles 	20. Discourage imitation <ul style="list-style-type: none"> rapid vandalism repair V-chips in TV's ensor details of modus operandi 	25. Control drugs /alcohol <ul style="list-style-type: none"> breathalysers in pubs alcohol-free events server intervention programmes

*Adapted from Cornish and Clarke (2003: 90); Clarke and Eck (2003).

2.4.3. ANPR: a situational crime prevention measure and beyond

Among these inter-related and sometimes overlapping ‘opportunity reduction’ strategies⁵⁶, ANPR is a formal surveillance system which fits well within those situational measures focusing on increasing the risk of detection or the perceived risk of detection. Within this framework, ANPR has the potential to increase the perceived effort by controlling access to facilities (e.g. ANPR private systems which automatically check vehicles entering a facility); increase the risks of detection by increasing the risk of offender identification (ANPR can reduce anonymity) and enhanced formal surveillance (through the presence of ANPR cameras and visible police presence on the road); although ANPR can also ‘alert the conscience’ of offenders through visible ANPR signs such as ‘This area/petrol station is covered by ANPR cameras which will record your number plate’.

Although situational prevention is the most common measure aiming to reduce opportunities for crime, it is important to recognise that there are other ‘opportunity reducing’ approaches to crime such as crime prevention through environmental design (CPTED) and problem-oriented policing (POP) - most recently known as intelligence-led policing. CPTED is concerned with the relationship between people and the environment they inhabit. The concept was developed by C. Ray Jeffrey in 1971⁵⁷, influenced by the work of Jane Jacobs (1962) and Oscar Newman (1972) on defensible space, natural surveillance, territoriality and the role of the environment in crime prevention. CPTED focuses on designing (or altering post-design) the features of the environment (i.e. housing estates, shopping centres etc) in an attempt to physically increase the difficulty in committing a crime and create an environment in which a potential offender’s perception of the risk of committing a crime is high. Problem oriented policing (developed by Herman Goldstein in 1979⁵⁸) and intelligence-led policing (mentioned for the first time by Smith in 1994⁵⁹) are concepts describing a proactive approach to policing and crime prevention, in which the police find ‘ways of removing the opportunities giving rise to crime problems that they repeatedly have to deal with, rather than responding in a reactive fashion to each individual incident’⁶⁰.

⁵⁶ Clarke (1992).

⁵⁷ Jeffrey (1971).

⁵⁸ Goldstein (1979).

⁵⁹ Smith (1994).

⁶⁰ Clarke (1995: 2).

ANPR is a surveillance technology falling within the remit of situational prevention, hence this thesis focuses on the situational crime prevention approach and how opportunity theories supporting this approach can be used to provide a rationale for the use of ANPR as a crime prevention tool. However, ANPR's potential to track suspects' movements and create offender profiles - where the aim is not to protect a physical location/target against a particular crime, but to collect information on possibly dangerous populations – takes ANPR beyond typical situational prevention, covering aspects of the intelligence-led policing approach. ANPR has the potential to generate useful intelligence to create profiles of offenders and their movement which could be used by the police in a proactive way to deploy their resources, detect and prevent crime in a more efficient way.

2.5. Why might we think ANPR works? Theoretical justifications

How do theories help us understand crime prevention measures such as CCTV and ANPR? It is often argued that many situational crime prevention measures have been driven by practical considerations rather than with reference to the theoretical framework within which they are set⁶¹. If one takes the example of CCTV, there is arguably a general theoretical weakness in both its development and its evaluation. Possibly because CCTV has been primarily politically driven, relatively little attention has been paid to the theoretical basis on which CCTV is premised. Rather it has been viewed as a technical solution to an empirical problem. Crime prevention measures, *inter alia*, are never, however, implemented or evaluated in a theoretical vacuum – although theory is sometimes hidden beneath ‘common sense’ knowledge or underlying assumptions about why they would work.

The theoretical basis for situational prevention was developed retrospectively to provide a framework for research and future developments and to counter some of these critics, particularly with regards to displacement⁶². The development of the rational choice perspective⁶³, supplemented by routine activity theory⁶⁴ and crime pattern theory⁶⁵ provided situational prevention with a stronger theoretical base. These theories are usually called ‘*opportunity*’ theories because they give an important role to situational factors in crime and opportunity. They are also called ‘crime’ theories because they seek to explain the occurrence of crime, not the development of criminality⁶⁶. David Garland⁶⁷ has also called them ‘criminologies of everyday life’ because they treat the occurrence of crime as theoretically unproblematic, resulting from normal human impulses of greed and selfishness. Although different in scope and focus, these theories share the belief that opportunity generates crime and that crime is a normal phenomenon, as opposed to something unusual which has to be explained:

⁶¹ Crawford (1998: 68).

⁶² Reppetto (1976).

⁶³ Cornish and Clarke (1986); Clarke and Cornish (1985, 2000).

⁶⁴ Cohen and Felson (1979); Felson (2002).

⁶⁵ Brantingham and Brantingham (1993).

⁶⁶ Clarke (2005: 41).

⁶⁷ Garland (2000).

*'Crime becomes a risk to be calculated (by the offender and the potential victim) or as an accident to be avoided, rather than a moral aberration which needs to be specifically explained.'*⁶⁸

This chapter does not discuss these theories in detail, but rather highlights some of the assumptions that are particularly relevant in explaining the relationship between ANPR and crime.

2.5.1. Rational choice theory and ANPR: perceived risk of offending and decision making

The rational choice perspective is the main theoretical foundation on which situational crime prevention stands. Rational choice theory is influenced by economic thinking; specifically the notion that the potential offender is perceived as a self-maximising decision maker who carefully calculates the advantages and disadvantages of offending⁶⁹. The costs of committing a crime are weighed up against the benefits of committing a crime, therefore crime is viewed in terms of supply and demand and being a criminal is viewed as an occupational option. Unsurprisingly, because of its association with economics, the rational choice model was criticised for failing to contextualise offending and not paying enough attention to the development and importance of criminal behaviour⁷⁰. Not all offenders act rationally and not all crimes are rational⁷¹ – the rational choice would focus too much on predatory property crime, organised crime or white collar crime (i.e. economically motivated crimes) and not take into account passionate, violent or reckless crimes, for example. Some critics point to the fact that the rational choice perspective is too policy orientated, in other words too concerned with preventing crime. These critiques have influenced the ongoing development and refinement of the rational choice perspective and the application of situational crime prevention, extending its remit from property crime into impulsive or 'expressive' crime, for example drug addiction⁷², serial murder⁷³ and child sexual abuse⁷⁴.

⁶⁸ Garland (1996: 450-451).

⁶⁹ Cornish and Clarke (1986).

⁷⁰ Cornish and Clarke (2008). Offenders are thus abstracted from their psychologies and social and structural context (O'Malley, 1992).

⁷¹ Wright et al. (2006).

⁷² Bennett (1986).

⁷³ Rossmo (2000).

⁷⁴ Wortley and Smallbone (2006). More recently, situational prevention was applied to internet frauds (Newman and Clarke, 2003) and terrorism (Clarke and Newman, 2006).

The rational choice perspective should be viewed as a theory for practice, reactive rather than proactive, influenced by the present developments of situational crime prevention, changing in order to overcome its limitations, particularly the critiques of its minimalist view of the offender⁷⁵.

Rational choice theory potentially helps to explain the impact that ANPR might have on crime in terms of the extent to which ANPR is able to affect the rational decisions and motivation of potential offenders to choose to commit a crime through increasing what they perceive to be the risk involved in committing that crime. On the basis of this theory, one can hypothesise that the introduction of ANPR may have two 'positive' effects and two 'negative' effects:

- (+) A reduction in certain types of crime along routes/areas covered by ANPR cameras;
- (+) A reduction in certain types of crime in the vicinity of areas/routes covered by ANPR cameras (diffusion of benefits);
- (-) An increase in certain types of crime committed to avoid detection by ANPR ('counter-measures')
- (-) Displacement of crime (change of location or time of crime, target, method or type of crime or a combination of these).

Firstly, ANPR can reduce crime by increasing the chances of offender detection or offenders' perception of risk of detection. The use of the media to highlight successful cases could give a false but raised perception of risk, even if real detection rates are not changing. This may deter potential offenders from committing the crime, at least in the area covered by ANPR. That is why situational prevention is sometimes referred to as 'perceptual' crime prevention, because of the power of perceptions and anticipatory effects⁷⁶. However, for ANPR to be an effective deterrent, the offender obviously has to be aware of it in the first place. At present, the extent to which offenders are aware of ANPR and its potential is largely unknown; so too, therefore, is the extent to which it acts as a deterrent.

⁷⁵ Wortley (2001); Cornish and Clarke (2003); Ekblom (2007).

⁷⁶ Smith, Clarke and Pease (2002). Previous research indicates that some crime prevention initiatives work better when there is more publicity about the initiative in the areas where they are supposed to work even before they are implemented. See also Bowers and Johnson (2005).

Secondly, ANPR can generate crime, as the rational offender will use other illegal means in order to decrease the risks of being caught. This is usually referred to as '*counter-measures*'. As ANPR increases the risk of offending, criminals adapt and find ways of evading the system. Once again, this is highly dependent on offenders' knowledge of ANPR and its capabilities. For example, knowing that ANPR can read number plates and identify vehicles' owners, criminals might steal a car to commit a crime instead of using their own; use 'pool' cars⁷⁷; make use of false identities to register cars; utilise measures to render the number plate unreadable (e.g. specialist paint, sprays and other blocks) or steal, falsify and clone number plates. 'Offender adaptability' is often cited as a limitation to situational crime prevention and environmental criminology in general. Reliance upon 'physical' barriers (e.g. a camera, a lock, an alarm etc) fails to acknowledge that criminals are able to adapt their methods to overcome the barriers which face them⁷⁸.

Thirdly, if criminals perceive the avoidance techniques to be too demanding (in terms of risk and effort), they might decide to avoid the cameras altogether, by committing the crimes somewhere else or at a different time, or just by changing the target, method and type of offence. This phenomenon is also known as '*displacement*'. Displacement is probably the main criticism with regards to situational crime prevention and the rational choice perspective. It is argued that the '*more professional the crime and the criminal, the greater the probability of displacement*', therefore '*those most likely to conform to a rational choice model of behaviour – the self-maximising professional criminals – are exactly the group of offenders most likely to be displaced*'⁷⁹. Felson and Clarke⁸⁰ identified five main types of displacement:

- 'Geographical' (change of crime location);
- 'Temporal' (change of time);
- 'Target' (crime directed away from one target/victim to another);
- 'Tactical' (change of method of committing crime or '*modus operandi*') and
- 'Crime type' (one type of crime substituted for another).

⁷⁷ Pool cars are typically shared within a group of offenders. These vehicles are usually registered with previous keeper details.

⁷⁸ Ekblom (2002).

⁷⁹ Crawford (1998: 82).

⁸⁰ Felson and Clarke (1998: 25).

It is argued that a sixth type of displacement might occur, a ‘perpetrator’ displacement. As the offenders who typically commit certain offences are either arrested or decide to desist from it, other offenders take their place⁸¹.

Conversely, a ‘*diffusion of benefits*’⁸² beyond the targeted location and time or the targeted individuals and crimes might occur. In this case, the crime reduction effects may be felt outside the area covered by ANPR or beyond offences targeted by ANPR. Although it has proven difficult to accurately assess displacement or diffusion of benefits, this does not mean that they do not exist. Evidence of displacement and/or diffusion of benefits, in particular spatial displacement, was found in a number of studies looking at changes in crime rates for example in areas targeted by burglary initiatives or CCTV. For example, Chaiken et al. (1974) found a reduction in robberies on buses at the same time as an increase of robberies in the subway. Allat (1984) identified a decrease in burglaries on a ‘target hardened’ housing estate at the same time as an increase in burglaries on a nearby estate. Barr and Pease (1990) found spatial displacement of approximately one quarter of the burglaries prevented. Brown (1995) and Tilley (1993) found evidence of displacement after the introduction of CCTV. Assessing the impact of burglary schemes, Bowers et al. (2003) found evidence of some geographical displacement and diffusion of benefits of burglary into surrounding areas⁸³.

It is important that the possibility of both ‘malign’ and ‘benign’ displacement is taken into account when evaluating ANPR so that the wider implications can be assessed. This is closely related to the construct validity of such an evaluation⁸⁴ and the extent to which ANPR would be considered successful in changing what it was intended to change. The level or type of displacement generated by ANPR is unknown and this thesis will highlight the difficulties of measuring the potential displacement effects of ANPR.

2.5.2. Routine activity theory and ANPR: the presence of a capable guardian

Similar to the rational choice perspective, routine activity approach⁸⁵ seeks to explain the supply of criminal opportunities, focusing on criminal events rather than inclinations. The

⁸¹ Barnes (1995: 96).

⁸² Term proposed by Clarke and Weisburd (1994). See also Poyner (1992); Barr and Pease (1990, 1992); Clarke (1992); Brown (1995).

⁸³ See also Hesseling (1994); Chenery et al (1997); Farrell, Chenery and Pease (1998); Ratcliffe and Makkai (2004); Gill and Spriggs (2005).

⁸⁴ Farrington (2003: 54).

⁸⁵ Cohen and Felson (1979); Felson (1998); Felson and Clarke (1998).

spatial dimension of crime is very important and crime tends to be explained without reference to criminal motivation. The theory of human ecology⁸⁶ was the basis for routine activity theory, with crime been viewed as part of the broad ecology of everyday life.

The theory was developed as a ‘micro’ and ‘macro’ theory of how crime rates emerge. On a ‘micro’ level, the routine activity theory states that crimes occur when a motivated offender converges with a suitable target (e.g. person, object, place) in the absence of a capable guardian to control the conduct of the offender or protect the target (e.g. police patrols, neighbours or friends, CCTV)⁸⁷. On a broader/‘macro’ level, this theory considers how certain features of the larger society and the routine activities of everyday life create more opportunities for criminal activities⁸⁸ and can make such convergences possible. For example, more vehicles on the road could be seen as an opportunity for potential offenders to commit more vehicle crime and an increased mobility and flexibility when it comes to crime locations and targets (taken in account that transportation in modern societies is increasingly dependent on the use of vehicles).

It could be argued that ANPR may reduce crime by impinging on any of the elements identified by routine activities theory. However, there is no clear empirical evidence showing which of these elements (if any) is affected by ANPR and it is difficult to see how ANPR could affect the motivation to offend or the existence of suitable targets/victims. ANPR could however perform part of the function of ‘increased guardianship’. Thus ANPR could reduce crime along *guarded* routes, and - as discussed above - possibly produce some kind of displacement effect (to non guarded areas/routes) and either result in higher detection, arrest and conviction rates or in the deterrence of potential offenders enough to negate this. However, ANPR’s potential to impact on crime in a particular area is not clear. Thus measuring ANPR’s impact on crime in an area is implicitly difficult. ANPR does not protect an area in the same way as CCTV does. By monitoring vehicles moving through an area, it has the potential to identify vehicles which are believed to have been involved in crime, but not to stop criminals committing these crimes. Its potential is in the disruption of criminal activity only where a vehicle is involved.

⁸⁶ As stated by Amos Hawley in 1950 in ‘Human Ecology, a theory of community structure’ (after Felson and Cohen, 1980). Hawley discussed how time was an essential element when examining spatial change, as spatial patterns vary from moment to moment and hour to hour, for where people are, what they are doing, and the consequences of doing this (the foundations of routine activity theory).

⁸⁷ Felson and Clarke (1998: 4).

⁸⁸ Cohen and Felson (1979) and Clarke (1999).

As with the rational choice theory, the original routine activity model was criticised for the lack of 'generalisability', especially as it applied only to 'direct-contact' predatory offences (involving direct physical contact). The initial routine activity approach implied a decisional offender without making clear the decision process and only the micro and macro levels were considered and nothing in between. To strengthen the theory and make it more 'general', elements of the routine activity approach were combined with the geography of crime, situational prevention and models of offender choices. Routine activity thinking today is used to explain other non-predatory/property crimes, such as serial murders and sexual abuses⁸⁹ and helps, for example, towards understanding the 'geography' of co-offending⁹⁰. The initial routine activity approach failed to acknowledge the dual role of control in the 'chemistry' of crime. In an attempt to incorporate aspects of Hirschi's control theory, the concept of 'handler' was included as a fourth element in the routine activity model⁹¹. The handler component involves a two-step process. The guardian is responsible for supervising the likely target and the 'intimate handler' is responsible for supervising the likely offender. The individual is susceptible to informal social control at these two levels by virtue of his/her bonds to society. First, social bonds are developed in society. Second, someone with a relationship to the potential offender exercises control over that person to adhere to the social bonds (e.g. parent, friend, colleague). Thus the offender would have to escape the (intimate) handler, then would have to find a target with no capable guardian. Another change was that the term 'motivated offender' was swapped for 'likely offender', reflecting the rational choice concept within the framework of the routine activity theory⁹².

The ongoing development of rational choice and routine activity theories led to a growing recognition that they were not isolated approaches and that combining elements of the two theories would provide useful explanations for certain crime events. This culminated with the development of a third 'opportunity' theory, the crime pattern theory.

⁸⁹ Rossmo (1995).

⁹⁰ Felson (2003).

⁹¹ Felson (1998).

⁹² Brunet (2002).

2.5.3. Crime pattern theory and ANPR: ‘non-random’ criminality

Crime pattern theory is another *opportunity theory* which suggests that not only is crime a normal phenomenon, but also that it does not occur randomly in time or space or society⁹³. It fits well with the routine activity approach:

*‘Offenders do not inhabit a world in which offending and non offending are straightforwardly dichotomised. Offending, therefore, fits in with other routines as opportunities, needs or temptations present themselves and routines themselves can include both deviant and non-deviant behaviour’*⁹⁴

According to pattern theory, crimes are complex and patterned. Crimes do not occur randomly or uniformly over time or space. Places are linked with desirable targets and the situation or environment in which they are found. There are three main components to crime pattern theory: nodes, paths and edges⁹⁵. Nodes describe where offenders and victims travel to and from and the idea of personal activity nodes is closely linked to the routine activities theory. The nodes are linked to paths and crime events may occur within and around these nodes. Nodes and paths are important on the road network, as routes where ANPR cameras are installed may correspond to the paths between nodes. The ‘edges’ are the boundaries around nodes where people live, work and/or routinely active in.

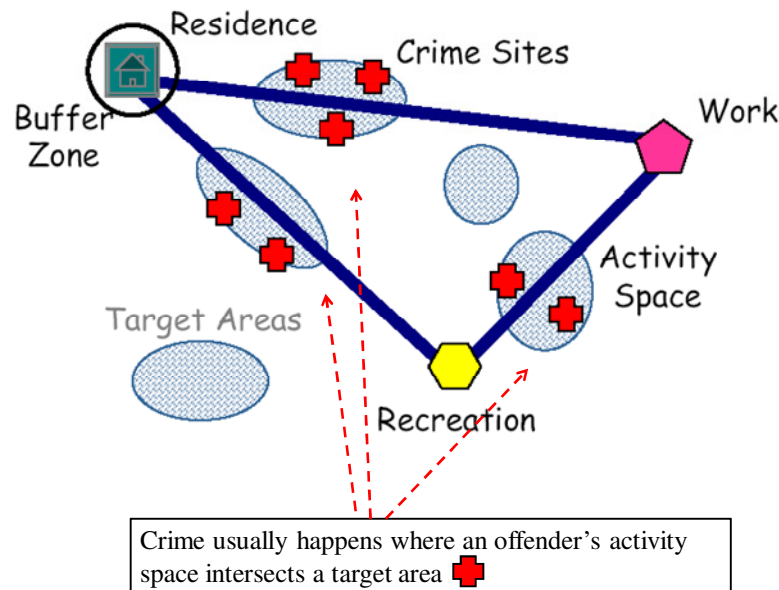
Thus, pattern theory suggests that crimes are likely to cluster around offenders’ activity and awareness spaces. Offenders are just like everybody else (not ‘abnormal’), spending much of their time travelling between their ‘living’ places (home) and ‘attending’ places (for leisure, school, work), choosing their targets from within their activity and awareness space. For an illustration of this theory, see Figure 2.1 below.

⁹³ Brantingham and Brantingham (1993: 264).

⁹⁴ Wiles and Costello (2000: 40).

⁹⁵ Felson and Clarke (1998).

Figure 2.1 Brantingham's Crime Pattern Theory (1984, 1993)



Adapted from Rossmo (2000)

Several research studies support the assumption that crimes cluster around offenders' activity and awareness spaces. Research on burglary concluded that offenders generally select a target because they are passing it or have passed it in the past, as part of their everyday activities:

'... much travel associated with crime is not primarily driven by plans to offend but appears to be much more dependent upon opportunities presenting themselves during normal routines'⁹⁶.

Other research indicates that offenders' selection of an area is based upon cognitive images of particular neighbourhoods that they acquire over time⁹⁷. Another study where burglars were interviewed in order to see how they select their targets from all available properties concluded that offenders selected their targets within their travel path to work or leisure activities⁹⁸. A similar study where interviews with burglars were conducted indicated that drug dealing locations might draw offenders to an area to purchase drugs, area which then becomes target to other predatory crimes⁹⁹. Although limited, this evidence supports the hypothesis that places attract offenders for one purpose, offenders who then participate in

⁹⁶ Wiles and Costello (2000:V). See also Eck and Weisburg (1995).

⁹⁷ Taylor and Gottfredson (1987).

⁹⁸ Rengert and Wasilchick (2000).

⁹⁹ Rengert and Wasilchick (1990). See also Weisburg and Ross (1994).

other crimes. However, offenders do not always provide accurate accounts of their own decision making¹⁰⁰. It is important to acknowledge the limitations to these studies, as most of them involved interviewing either a sample of subjects in custody or persistent adult offenders, so the results are only indicative.

So why is crime pattern theory relevant to ANPR? Motor vehicles are not only a target for acquisitive property crime (e.g. when they are stolen or have property stolen from them) and a means for offenders to travel to and escape from scenes of crime (transportation to/from crime), but most commonly are just their means of transportation in everyday life ('non-crime' transportation). The fact that criminals are mobile reinforces the importance of place and movement for criminologists. Following explanations of pattern theory and routine activity theory, we can argue that ANPR has the potential to 'work' because most offenders, like most people, are mobile and use cars as part of their everyday life. They go shopping, they park their cars, they fuel their cars, they stop at petrol stations. Every time they use the roads the risk of their journey being recorded increases considerably. Number plates provide a means of linking vehicles with the personal details of their owners (and to a certain extent, of their drivers) and can be used to identify potential offenders and crimes. ANPR can link these criminals to these vehicles, as well as linking vehicles to crime scenes.

ANPR therefore has the potential to make offenders vulnerable to police interventions through the identification of their vehicles when travelling on public roads. As will be argued next, this vulnerability can also be increased because (serious) offenders are more likely to drive untaxed and uninsured vehicles – actions which are easily detectable by ANPR. In the UK, the level of vehicle documentation offences is significant. Approximately 5.5% of cars on the road do not have a valid vehicle excise licence¹⁰¹; approximately 1.9 million cars do not have a registered keeper with the Driver and Vehicle Licensing Agency (DVLA), and there is anecdotal evidence from the police that the information on registered keepers is inaccurate for at least 10% of cases. About 5% of British drivers do not have valid insurance for their vehicle and accidents involving uninsured motorists cost up to £500 million a year, which ultimately adds approximately £30 a year to each motorist's premium¹⁰².

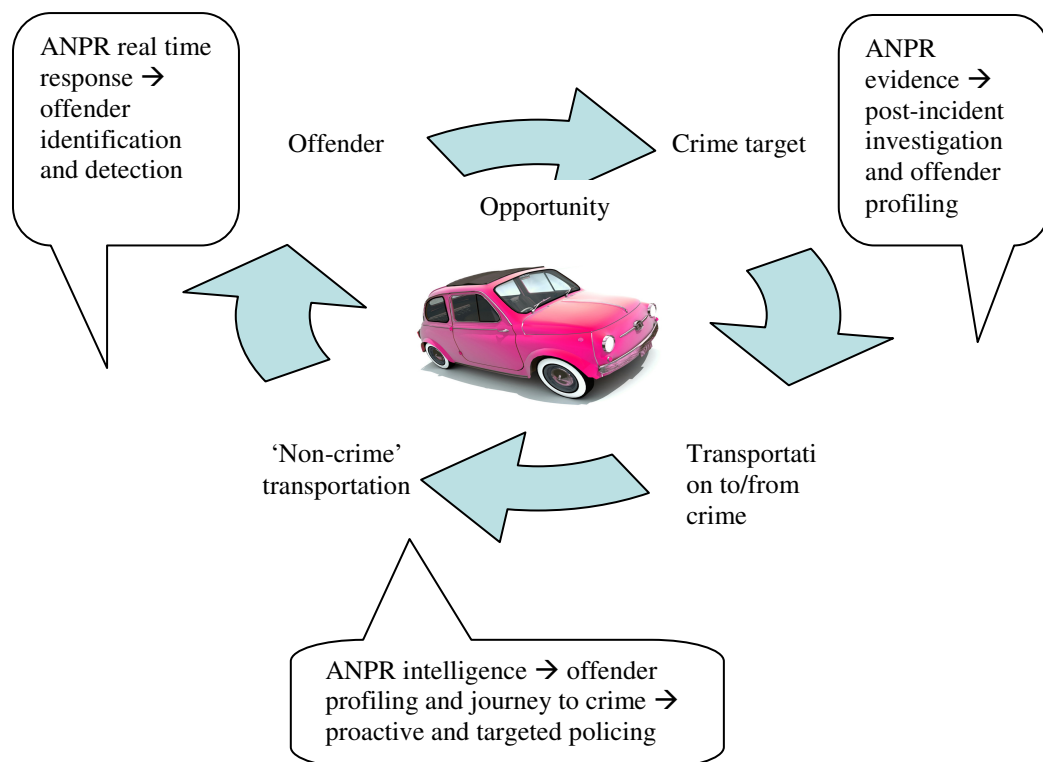
¹⁰⁰ Carroll and Weaver (1986); Cromwell et al. (1991).

¹⁰¹ DfT (2002).

¹⁰² Association of British Insurers (2004).

ANPR's potential extends so that, even if offenders are not caught immediately, the systems will continue to detect their presence, gather information and increase offenders' risk every time they use their cars on the road. Pattern theory argues that crimes cluster around places where people travel to and from. ANPR has the potential to map and profile offenders' activities and assist police forces in their intelligence gathering and predictions, deployment and offender detection. For an illustration of the link between vehicles, offenders and ANPR, see Figure 2.2 below.

Figure 2.2 Motor vehicles and ANPR



This section of the literature review indicated how opportunity theories might provide some support for the implementation of ANPR as a crime prevention tool and the hypothesis that ANPR could impact on crime by deterring/de-motivating potential offenders (through offenders' knowledge of and perceptions about ANPR and its capabilities), or more likely by increasing the risks of potential offenders of being identified and detected (through the monitoring and response to ANPR hits in real time, targeted policing using ANPR intelligence proactively and through post-incident and offender profiling analysis).

2.5.4. Offender self-selection and ANPR: from motor offences to serious crime

Another theoretical approach which merits consideration here is the offender-self selection approach, or self selection policing¹⁰³. While opportunity based theories are concerned with preventing crime¹⁰⁴, self-selection policing take the idea of opportunity further, using opportunity against serious offenders in order to identify them, rather than trying to prevent them from offending in the first place. Thus the main idea behind self-selection is detection rather than prevention; more specifically, detection of serious offenders through targeting of minor offences¹⁰⁵; the argument that ‘people who do big bad things also do little bad things’¹⁰⁶.

The ‘offender self-selection’ concept is based on a Home Office study¹⁰⁷ on illegal parking in disabled bays, which indicated a link between traffic offending and general criminality. The authors found that one in five vehicles parking illegally warranted immediate police attention for serious criminality. The findings were reinforced by those of another Home Office study¹⁰⁸ which established a link between drink driving, disqualified and dangerous driving and wider criminality. Further evidence suggests that, by scrutinising people for committing minor offences such as traffic offences, serious offenders can be detected. For example, the ‘Yorkshire Ripper’, the American serial rapist ‘Son of Sam’ and the ‘Washington Sniper’ were all caught by the police for minor traffic offences¹⁰⁹. So the principle of self-selection could be relevant to the police use of ANPR because of the evidence pointing to a correlation between driving offences and wider criminality, ANPR’s extended ability to identify motor offences could arguably lead to the identification of more serious offences, although this hypothesis would need to be further tested.

The limitation to this approach is the probability of significant numbers of false positives cases (i.e. the number of people who are not of interest to the police), also the fact that the probability of a serious offender also being a minor offender is not necessarily higher than an

¹⁰³ Roach (2007).

¹⁰⁴ Clarke (1997).

¹⁰⁵ Self-selection is not about predicting future serious criminals, rather identifying current ones (Roach , 2007).

¹⁰⁶ Roach (2007: 66).

¹⁰⁷ Chenery et al. (1999).

¹⁰⁸ Rose (2000).

¹⁰⁹ Roach (2007). See also Wellsmith and Guille (2005) and Roach and Pease (forthcoming).

average citizen¹¹⁰. The number of potential minor offences which could act as markers for serious offender identification is still unknown and more research is needed to discover the most reliable ones. Thus the principle of self-selection should be employed with caution. Regardless of these limitations, it should be acknowledged, however, that this approach brings useful information to both criminological theory and practice. With particular use to police practice, the approach provides some evidence that offences are heterogeneous - despite the police's tendency to over-estimate offence homogeneity; and is a relatively ethical and productive way to target offenders. In light of this, more consideration should be given by both criminological theorists and researchers to acknowledge and further explore the self-selection perspective¹¹¹.

While the self-selection approach is about the 'here and now' of criminality and identifying current offences, new approaches in criminology are moving towards a focus on preventing crime by identifying 'risk', which is the subject of the next section.

¹¹⁰ Roach (2007); Ratcliffe (2008).

¹¹¹ Roach (2007).

2.6. Wider implications of ANPR surveillance: new penology, social control and ‘risk society’

It could be argued that the development of opportunity theories contributed, to a certain extent, to a general pattern of movement towards ‘new penology’¹¹² and risk management. Surveillance discourse has become increasingly bound up with the mediation of ‘risk’; a trend towards ‘risk management’ where surveillance technologies, data collection and the prediction of future threats are seen as the solution to insecurity¹¹³. It is argued that the emergence of ‘new surveillance technologies’ goes beyond the disciplinary power associated with the Panopticon, and gives rise to new forms of social control:

‘Surveillance is no longer about the observation of particular individuals whose identity is known beforehand; rather, it is about the surveillance of geographical places, time periods and categories of person’¹¹⁴.

New surveillance technologies like ANPR can be seen as part of a trend towards a new penology based on actuarialism¹¹⁵. Actuarialism is defined as *‘an approach to crime control and management which dispenses with concerns about the meaning or motives behind offending and replaces these with an emphasis on technologies of risk minimisation and the elimination of potential threats to social order’¹¹⁶*. According to the proponents of new penology, actuarial control policies focus on the effective control of selected risk groups and system management, rather than the rehabilitation or punishment of individual offenders.

The implications for criminology are significant: while the old penology is about identifying the *individual* offender to assign blame and guilt and impose punishment and treatment, the new penology is about ‘identifying, classifying and managing *groups* assorted by levels of dangerousness’¹¹⁷. The new technologically driven (crime) control strategies are not only reacting to past criminal events, but are rather future oriented and driven by the logic of risk minimisation. A shift towards the management of risk (through enhanced surveillance,

¹¹² Feeley and Simon (1992).

¹¹³ Gray (2003: 319).

¹¹⁴ Norris and McCahill (2006: 98). See also Marx (2002: 10); Poster (1990); Lyon (2002).

¹¹⁵ Feeley and Simon (1994); Norris, McCahill and Wood (2004); Cheliotis (2006).

¹¹⁶ Smith (2006: 92).

¹¹⁷ Feeley and Simon (1994: 180).

intelligence gathering, data collection and dissemination) has become an important function of the modern police:

*'In risk society, policing is not just a matter of repressive, punitive, deterrent measures to control those who are morally wrong. It is also a matter of surveillance, of producing knowledge of populations that is useful for administering them. The focus is on knowledge that allows selection of thresholds that define acceptable risks and on forms of inclusion and exclusion based on this knowledge.'*¹¹⁸

In light of preventative crime reduction strategies focussing on 'opportunity reduction', 'situational prevention' and the new approach to 'risk management', ANPR can be placed somewhere between the old and new penology perspectives. From the new penology point of view, technologies like CCTV and ANPR have an appeal because it is believed that, on the one hand, they can increase the likelihood of the 'rational' offender being caught and therefore increase the 'cost' to the offender; on the other hand, their display demonstrates that 'something is being done about crime'. From the perspective of the 'old penology', CCTV and ANPR can be 'disciplinary' because not only do they enable the 'capture, censure and normalization of particular offenders', but they can promote 'habituated anticipatory conformity' by a population that thinks it is permanently under surveillance¹¹⁹.

The theoretical assumptions highlighted in this chapter indicate that ANPR has the potential to 'capture' and 'censure' offenders and, to a certain extent, these claims are backed up by existing research. ANPR's impact on criminal behaviour and its potential to induce 'conformity' is less clear, however, and there is still much to be done to test such assumptions. As highlighted earlier in this chapter, there have been claims that ANPR could bring us closer to a 'maximum surveillance society'. However, the current potential of these technologies cannot justify these claims. CCTV and ANPR do not yet have the disciplinary potential of the panopticon or the power to cultivate such anticipatory conformity. Although they might have the power to observe, this is limited in space and time. Their 'power' is dependent on the reliability of technology and systems data used in conjunction with these technologies, the availability of resources and, most importantly, the level of knowledge and awareness of those under surveillance.

¹¹⁸ Ericson and Haggerty (1997: 41).

¹¹⁹ Norris and McCahill (2006: 113-115).

The potential danger lies, however, in the expansion of blameworthiness to the entire population. One of the main shifts from the old to the new penology is the change in focus from individualisation to generalised suspicion. According to the new penology, populations are seen as particular bearers of risks and surveillance systems gather information on the whole population rather than on suspects or known offenders. Everybody is a suspect or assumed guilty until proven otherwise. And this is the case with ANPR surveillance, as it collects and stores information on the entire driving population without any evidence of offending. Furthermore, ANPR systems can collect information on individuals on the basis of possible association with known offenders or suspects; hence interest and suspicion are attached to individuals without them even being aware of it or without having done anything wrong¹²⁰.

The generalisation of suspicion to the entire population is to a certain extent a consequence of the latest major terrorist attacks on the Western World (e.g. New York and Washington 11/09/2001, Madrid 11/03/2004; London 07/07/2005). In the wake of these events, the use of surveillance for the purpose of monitoring of populations and public spaces has considerably increased¹²¹. Consequently, significant changes in surveillance regulations have occurred and anti-terrorist legislation has been enacted, expanding the authority of law enforcement agencies and giving them unprecedented access to information about the populace through the use of surveillance tools¹²². In the aftermath of these events, there has been an increased interest in strengthening security and developing technologies to identify potential terrorists, particularly at ports and airports and ANPR has been embedded in the policies and strategies aimed to deal with such events.

¹²⁰ This debate is similar to that about the legitimacy of an emerging national DNA database.

¹²¹ Lyon (2001).

¹²² Lyon (2003: 168). Examples of such legislation include the USA Patriot Act (2001), the UK Terrorism Act 2001 and the amended Terrorism Act 2006 which extends the power of the police to stop and search (including suspect vehicles) and the period of detention of terrorist suspects. For more information on this subject, see also Carroll-Mayer (2006) and the EU report (2005) on Anti-terrorism 'Liberty and Security: Striking the Right Balance'.

2.7. The development of ANPR in the UK: from risk management and terrorism to crime prevention and back

2.7.1. The ‘Ring of Steel’

Unsurprisingly, terrorism was the drive behind the initial development of ANPR in the UK. ANPR was first used by the British Police in the 1990s, as part of the so called ‘Ring of Steel’. The ring of steel is the popular name for the security and surveillance cordon surrounding the City of London, which was installed in order to combat terrorism, in particular as a response to attacks linked to the Irish Republican cause¹²³. The system consists of over 1,500 surveillance cameras and ANPR systems have been linked to many of these cameras fitted at the eight official entrances to the Square Mile, transforming London into ‘the most surveilled space in the UK and perhaps the world’¹²⁴. In the first three years of operation as part of the Ring of Steel, ANPR systems scanned seventy five million vehicles as they passed through the Entry Points to the City of London. As a result, twelve hundred people were arrested, some of them in connection to crimes as serious as murder, sexual assault and armed robbery¹²⁵.

2.7.2. Police reform and ANPR

The development of ANPR must also be viewed in the context of increasing expectations and pressure for reform within the police service itself. The government’s call for reforms to the police was set against a background of ongoing changes¹²⁶ within the Police Service in Britain and a number of reports aiming at increasing the criminal justice system’s effectiveness in dealing with crime.

In the White paper, ‘*Building Communities, Beating Crime: A better police service for the 21st century*’¹²⁷, the government stressed the need for continued improvements in policing to

¹²³ ANPR was installed after the ‘Bishopsgate Bombings’ in the City of London in April 1993, when IRA were successful in detonating a huge truck bomb, killing two and injuring more than forty people and causing approximately £350 million of damage.

¹²⁴ Coaffee (2004: 205).

¹²⁵ Information from the City of London Police, available from: <http://www.cityoflondon.police.uk/crime-prevention/anr.html>.

¹²⁶ The changes include ‘the expansion of private security’, the increased weight placed on ‘transnational’ policing, changes in the ‘organisation and management of public police forces, the increased use and impact of new technologies on policing and crime control and the emergence of new ‘risk-based’ policing strategies (Jones and Newburn, 2002: 129).

¹²⁷ Home Office (2004a).

help build safer, secure and stable communities. The aim was not only to prevent and reduce crime, but also to increase public confidence in the criminal justice system. In ‘*Cutting Crime, Delivering Justice: A Strategic Plan for Criminal Justice 2004-08*’¹²⁸, the government called for more offences to be brought to justice, as well as the need to share information within the Criminal Justice System in order to increase its effectiveness in dealing with crime. A significant role was attributed to ANPR as a new technological policing tool, in particular in relation to detection and conviction targets and the issue of illegal motorists in Britain. The government’s response to the publication of the ‘Greenaway Report’ was to highlight the need to tackle vehicle crime more effectively and in particular to address the problem of uninsured driving¹²⁹.

New legislation enacted in July 2005¹³⁰ formally allowed the Police to seize and destroy vehicles driven illegally, to link the Driver and Vehicle Licensing Agency (DVLA) and the Motor Insurance Databases in order to identify uninsured vehicles on the road, and to issue fixed penalties for people who ignore reminders about their insurance. In brief, the police were given extended powers to use new technologies in order to enhance their effectiveness in dealing with crime.

2.7.3. Project ‘Laser’

Although installed first and foremost as part of the police’s anti-terrorist strategy, ANPR has since expanded its use to daily policing operations and a much wider category of crime. As a result of ANPR technological advances and a reduction in costs, the police have started to use ANPR to target a wider area of criminality, in particular volume crime such as vehicle theft, burglary and drug offences.

Recognising ANPR’s potential to impact on criminality, the Home Office released funding in 2002 which provided each police force in England and Wales with an ANPR mobile unit (the ‘Spectrum’ Van) and supporting infrastructure (the Back Office Facility). A sample of nine police forces were selected to deploy their mobile ANPR equipment as part of an integrated pilot scheme, known as ‘Project Laser’, which was initially funded for a period of six months. These forces increased their use of ANPR in conjunction with *Dedicated Intercept Teams* –

¹²⁸ Home Office (2004b).

¹²⁹ Greenaway (2004).

¹³⁰ The Serious and Organised Crime Police Act 2005 gives the police service the power to seize uninsured vehicles and those being driven by people without the correct driving licence.

including police officers deployed specifically to respond to hits generated by ANPR systems. The dedicated teams aimed to intercept and stop vehicles identified by ANPR and take appropriate measures.

The aim of the pilot ‘Laser’ was to collect evidence to evaluate the effectiveness of ANPR intercept teams with a view to inform a potential national roll-out. As the results from the initial pilot (‘Laser 1’) exceeded expectations, the Home Office decided to commission a second stage of the project, ‘Laser 2’. Following a submission to HM Treasury, conditional approval was given to the Home Office to test a cost recovery system for dedicated ANPR-enabled intercept teams. This process allowed police to target vehicle documentation offences and crime in general with the activity part-funded through receipts from the fixed penalties issued by these teams¹³¹. In 2003, the project extended to twenty three forces, allowing ANPR activity to be partly funded by hypothecated fixed penalty revenue.

The evaluation of projects ‘Laser 1’ and ‘Laser 2’¹³² indicated that, compared to conventional policing, police forces using ANPR technology produced higher arrest rates and more offences brought to justice (OBTJ)¹³³. Based on this success, in 2004 the HM Treasury allocated extended funding for a full roll-out of the ANPR technology to all forces across England and Wales, what was seen as the last phase of the project (‘Laser 3’). At the same time, the Home Office decided to invest more capital funding (£32.5m) for further ANPR development and integration at local, regional and national level, including the roll out of the Back Office Facility (BOF) and the development of the National ANPR Data Centre (NADC).

2.7.4. The rationale for a national ANPR data centre (NADC)

The development of the NADC was influenced by the Bichard Inquiry recommendations which highlighted the need for better information sharing between agencies within the Criminal Justice System¹³⁴ and more specifically by the recommendations from the ‘Laser’ evaluations indicating the need to develop a mechanism enabling ANPR information sharing between forces at a national level. It was expected that this data warehouse, later called the

¹³¹ The start of the Laser 2 project coincided with the introduction of three new fixed penalties with relevance to the use of ANPR, e.g. driving without insurance, MOT or a Vehicle Excise Licence.

¹³² Home Office (2002, 2004d).

¹³³ OBTJ include cautions, TIC PRs (Taken into Consideration Previously Recorded), fixed penalty notices for recorded crime (FPN), street warnings (for possession of Cannabis) and convictions.

¹³⁴ The Bichard Inquiry Report (Home Office, 2004c).

National ANPR Data Centre or NADC, would hold all vehicle intelligence and enable all ANPR hits to be read in real time by all users nationally. The benefit was seen in the extended ability to store ANPR reads and hits for future reference helpful in major crime investigations and terrorism enquiries.

Given these considerations, the Association of Chief Police Officers (ACPO) used part of the funding provided by the Police Studies Unit (PSU) to progress the development of an ANPR national infrastructure comprising the NADC and a matching force Back Office Facility (otherwise known as the BOF II). This was supposed to enable forces in England and Wales to store and analyse all ANPR reads within their force and link with other forces' back office and the NADC. The PSU funding was also allocated to individual forces to develop or expand their local ANPR infrastructure, including the installation of ANPR cameras at strategic sites¹³⁵.

2.7.5. ANPR strategy for the police service

Notwithstanding its difficulties, ANPR has come a long way since the development of Project 'Spectrum' in 2002. 'Denying criminals the use of the road' was the slogan used by the ANPR Strategy for the Police Service which was launched in 2005 by ACPO. The 2005 ANPR Strategy provided a framework for the development and use of ANPR in the years to come. According to this strategy, the primary justifications for using ANPR were:

- **To reduce crime**
- To increase number of offences brought to justice
- To gather information regarding 'suspicious' activity and
- To enhance intelligence in accordance with NIM principles

Secondary aims were:

- To promote public reassurance
- To increase police visibility
- To deter terrorism
- Increase road safety by removing unsafe vehicles and drivers from the road
- To increase the percentage of stop/searches that lead to an arrest and
- To increase the likelihood of positive criminal justice outcomes (charges/guilty pleas/convictions).

¹³⁵ Home Office PSU (2007).

The latest ANPR Strategy for the Police Service 2007/2010 brings more emphasis on serious crime and 'terrorism', an increase in public safety and confidence in the police and more efficient use of police resources, which were not previously included as primary aims in relation to the police use of ANPR. These changes could be a result of shifting priorities at government level and trying to ensure ANPR's sustainability in terms of future investments.

2.8. Why might we think ANPR works? ‘Evidence-based’ justifications

However, is ANPR effective in achieving these aims? The primary objective of ANPR is to reduce crime, but is this supported by research evidence as to its effectiveness? As with CCTV, a great deal of money and faith has been invested in ANPR technology, but how far has this faith been justified by the results? Is ANPR being implemented on the assumption that CCTV ‘works’? This section explores what is known about the effectiveness of ANPR in terms of research literature. By identifying limitations within the existing literature, research implications and further questions will be addressed. An outline of research on evidence of CCTV’s effectiveness in reducing crime is presented first.

2.8.1. Because CCTV works?

Proponents of the effectiveness of camera surveillance technologies, particularly CCTV, argue that potential offenders will be deterred by the threat of being seen and caught, thus contributing to a reduction in crime. Indeed, CCTV has become one of the most important crime reduction strategies and ‘the most heavily funded non-criminal justice crime prevention measure’¹³⁶. But how effective is CCTV in deterring and ultimately reducing crime? The effectiveness of CCTV is a contested subject. Some argue that there is little evidence to suggest that CCTV is ‘anything more than an expensive placebo for the public fear of crime’¹³⁷. Although the number of studies looking at CCTV’s effectiveness has increased during the last decade, reliable evidence that CCTV reduces crime continues to be thin on the ground.

Evaluations of CCTV schemes¹³⁸ seem to indicate that CCTV has a crime reduction effect, but the evidence is still limited and inconclusive. There is however consensus regarding CCTV’s ability to reduce premeditative/property crime and its lack of impact on crimes of passion, public order problems or violent crimes, results which fit, to a certain extent, with the rational actor model presented above.

Welsh and Farrington’s review (2002) of twenty two British and American studies of CCTV indicated that cameras can be effective if used in specific environments (e.g. car parks), for

¹³⁶ Welsh and Farrington (2002: 44).

¹³⁷ Goold (2004: 27).

¹³⁸ See for example Poyner (1992), Tilley (1993), Brown (1995), Sarno (1996), Short and Ditton (1996), Squires and Measor (1997), Skinns (1998), Squires (1998a, 1998b, 1998c, 1998d), Armitage et al. (1999), Ditton and Short (1999) and Gill and Spriggs (2005).

specific types of crime (e.g. theft of motor vehicle) and when combined with other preventative measures (e.g. improved lighting, fencing, publicity/notices about CCTV, increased security personnel etc).

The most comprehensive evaluation of CCTV undertaken by Martin Gill and Angela Spriggs for the Home Office in 2005 reinforces these arguments, pointing out that certain types of offences are more affected than others. Their meta-analysis of fourteen individual CCTV sites in the UK found that the cameras had ‘no overall effect on all relevant crime viewed collectively’¹³⁹, although there was evidence of better outcomes for vehicle crime in seven out of the fourteen sites. Even where there was evidence of ‘success’, there were still questions whether the effect was 100% down to CCTV and not to other intervening variables. For example, the decrease in vehicle crime in one site could have influenced by changes to parking regulations, or the reduction in burglary rates in one site could have been a result of displacement in an area adjacent to the target area¹⁴⁰.

Evidence of offender deterrence is even more limited. Exploring offenders’ perceptions of CCTV and their perceived risk, Short and Ditton (1998) found some positive results indicating that some crimes might have been stopped because of offenders being deterred from committing offences. More recent evidence¹⁴¹ suggests that generally offenders do not perceive CCTV as a threat, unless if they have been caught on camera. But more research is needed in this area to draw more valid conclusions about CCTV’s deterrent effect.

2.8.2. What do we know about the impact of ANPR?

What about ANPR? Police officers and ministers alike believe in ANPR’s potential and benefits in the fight against crime and terrorism:

‘Although it is only one policing tool, ANPR has uses in a range of areas, including tackling volume crime, serious & organised crime, counterterrorism, and in intelligence gathering. It has also proven a great asset in tackling the ‘underclass’ of vehicles that are incorrectly registered, untaxed and uninsured’¹⁴².

¹³⁹ Gill and Spriggs (2005: 33).

¹⁴⁰ Gill and Spriggs (2005: 42).

¹⁴¹ Gill and Loveday (2003).

¹⁴² David Blunkett, October 2004, quoted in the ‘Laser 2’ evaluation (Home Office, 2004d).

But are these beliefs well founded? Is there valid evidence supporting the effectiveness of ANPR in preventing, responding to, and reducing crime? Following the theoretical framework for ANPR discussed earlier in this chapter, we have seen that ANPR has the potential to reduce crime by increasing the risks of identification and detection of potential offenders or by deterring/de-motivating potential offenders from committing crime, at least in areas covered by ANPR.

2.8.3. The impact on the Criminal Justice System: ANPR-enabled intercept teams

Evidence about the effects of ANPR in the Criminal Justice System, including evidence of its impact on response times, rates of detection apprehension is more comprehensive than the evidence about ANPR's impact on crime. The question of the effectiveness of ANPR has been addressed in four independent evaluations ('Laser')¹⁴³. These studies looked primarily at ANPR's effectiveness in the context of operational policing and ANPR-enabled intercept teams.

The most significant emerging finding was that ANPR had a positive effect on the police's ability to identify offenders and disrupt their activities. ANPR outcomes were impressive in terms of the arrest capabilities of intercept teams and their ability to increase the number of Offences Brought to Justice (OBTJ). OBTJ represents a measure of effectiveness of the Criminal Justice System, in particular the police and the courts' effectiveness in dealing with crime. It was concluded that ANPR teams produced an average of six to seven times the national average arrest rate per officer and two to three times the number of OBTJ compared to conventional policing - which was believed to have improved the cost effectiveness of ANPR as well¹⁴⁴. ANPR's potential to speed up the Criminal Justice Process was also highlighted, for example it was estimated that the time taken for ANPR arrests to reach conclusion was on average lower than for arrests resulting from normal policing methods. Anecdotal evidence suggested that the time taken to clear up an offence was also reduced, as ANPR was believed to increase the likelihood of offenders pleading guilty once they have been told they've been caught on camera¹⁴⁵.

¹⁴³ These were conducted by PA Consulting Group (Laser 1, 2 and 4) and Hartley McMaster (Laser 3) and commissioned by the Home Office PSU, ACPO and HMIC. See Home Office (2004d).

¹⁴⁴ Home Office PSU (2002).

¹⁴⁵ However, more research is needed to draw this type of conclusions. In the case of CCTV for example, it has been shown that those who were caught on cameras were more likely to enter a guilty plea. A study in

The ‘Laser 4’ evaluation indicated that the use of dedicated ANPR vehicle intercept teams by all forces in England and Wales and of ANPR fixed site infrastructure has resulted in a considerable number of arrests (20,592 individuals), some of which included Prolific or Priority Offenders (PPO). The study found that ANPR helped towards the reduction of vehicle theft (through the identification and recovery of 2,021 stolen vehicles) and of motor offences (through the identification of 52,037 vehicle related document/motor offences and the seizure of vehicles as a result of the detection of these offences, i.e. 41,268). For a summary of results emerging from the four ‘Laser’ evaluations, see Table 2.3 below:

Table 2.3 A summary of results of Project ‘Laser’ (2002-2007)*

Project/Year/Number of forces	Arrests	Document Offences	Vehicle Seizures	Offences brought to justice per FTE**
Laser 1/2002/9 forces	3,071	n/a	n/a	n/a***
Laser 2/2003-04/27 forces	13,499	30,620	n/a	21
Laser 3/ 2005-06/43 forces	18,643	40,704	20,744	29
Laser 4/2006/07/44 forces	20,592	52,037	41,263	21

*Source: PA Consulting Group (2007: 13)

**FTE stands for full time equivalent

***The ANPR arrests were followed through the criminal justice system in Laser 2-4

2.8.4. ANPR’s benefits beyond intercept capability: intelligence and crime investigations

The existing evaluations tend to show that ANPR is most useful in tackling volume crime and when used to respond to criminality in real time through intercept capability. However, ANPR’s potential is much greater than this. The massive recording and storing of data means that analysis helpful to a variety of situations can be facilitated, from proactive intelligence-led operations to post-incident investigations. Analysis of ANPR data can identify past, present and possibly future patterns of behaviour or possible threats. If properly linked to a force intelligence system, ANPR data can be analysed to provide vehicle patterns and geographical profiling, which would bring valuable information into an investigation and

Newcastle reported that since the introduction of a 16 camera system in 1992, there has been 100% guilty pleas (Brown, 1995).

helping towards the identification and arrest of suspects. By conducting location time analysis, sequential pattern analysis, convoy analysis and post-incident analysis, investigating officers could research and identify the movements of a vehicle, potential suspect(s) and accomplices, victims and witnesses¹⁴⁶.

ANPR is believed to improve the quality of investigations and save time, a crucial element in an inquiry, particularly when investigating serious crimes. ANPR systems have already led to significant breakthroughs in major investigations, for example the investigation into the fatal shooting of British Police Constable Sharon Beshenivski, who was shot dead in 2005 during a robbery in Bradford, Northern England. The CCTV network was linked in to the West Yorkshire Police's ANPR system in Bradford North (also known as the 'Big Fish'), which was a crucial element in the identification of suspects.

As indicated above, the 'Laser' evaluations (particularly Laser 1-3) focused on ANPR's effectiveness as an intercept tool. However, new developments in the national infrastructure increased the scope and range of ANPR use beyond roads policing. The investigative and intelligence use of ANPR are becoming increasingly important in the current political and national security context. The thinking behind policing strategies at a national level is to find more comprehensive ways to effectively address terrorism and serious and organised crime. This involves embedding ANPR into mainstream policing and using it more as an aid to crime investigations and as a means of developing intelligence. The latest evaluation (Laser 4) aimed to identify some of these benefits in terms of intelligence and investigation. By including the results of a 'Thematic Review of the use of ANPR within Police Forces', the study concluded that ANPR has the potential to provide significant benefits to the intelligence and investigative police functions by:

- Increasing the efficiency of surveillance;
- Improving intelligence products;
- Providing information on witnesses and suspects linked to major investigations and
- Providing intelligence for proactive operations to disrupt organised criminal activity.

However, the study was limited by the small number of respondent forces (N=8) and the lack of evidence supporting these claims.

¹⁴⁶ Investigator's Guide to ANPR (ACPO, 2006a).

2.9. Research limitations and implications: some useful questions for further investigations

Existing research highlights the multiple ANPR benefits to the police service, but it is, to a certain extent, limited in both scope and quality. The ‘Laser’ studies have demonstrated a number of ANPR benefits, although at times conclusions have been too easily drawn from anecdotal evidence. The potential benefits were not always evaluated, rather they were suggested as possible outcomes. There has been too much focus on results generated from the use of ANPR with dedicated intercept teams - and most quantified benefits relate to such use. Thus the intelligence and investigation benefits of ANPR are not proven to the same extent as the intercept benefits. There are also issues regarding the validity of the results, in particular the correctness of inferences about cause and effect, i.e. whether ANPR really did cause a change in the outcome¹⁴⁷. The use of control groups appears inadequate and most results are inappropriately presented (e.g. number of offences, detections, rather than percentages), which sometimes are misleading or confusing when it comes to force size, population, crime type etc. These limitations call into question the validity of these studies.

Moreover, the investigative use of ANPR data has been largely overlooked and under-researched. ANPR systems can produce enormous amounts of data which can be difficult to process and analyse and there is a gap in research and knowledge about how can this data be utilised to enhance intelligence policing and overall police effectiveness.

Although existing evaluations add to our understanding of how ANPR works, there is limited evidence regarding ANPR’s impact on crime, fear of crime and public reassurance. Not only are the evaluations looking at ANPR’s effectiveness limited, but also there is no other academic study examining these aspects. The ‘Laser’ studies indicate that ANPR is useful with regards to motor offences or some aspects of volume crime, but they fail to indicate how ANPR works in a wider area of criminality. According to the latest ANPR Strategy for the Police Service¹⁴⁸, the primary justification for the use of ANPR is to reduce crime, yet there is no clear evidence as to whether it does so. Another important ANPR objective is to increase public confidence, which is an area that has been completely overlooked by current research.

¹⁴⁷ Shadish, Cook and Campbell (2002).

¹⁴⁸ ACPO (2007).

Given the extensive developments in surveillance technologies in the UK, there is a clear need in future evaluations of ANPR to investigate its wider socio-political and ethical implications, in particular what the public considers to be legitimate levels of surveillance and any concerns they hold about the potential impact on civil liberties.

In light of these considerations, it is possible to identify three issues which need further investigation:

1. Better awareness and an increased understanding of ANPR's role as an investigative policing tool;
2. A better understanding of the public's perceptions about ANPR and the wider social and ethical implications;
3. A robust evaluation of ANPR's impact on crime.

While it is quite straightforward to identify gaps in research and knowledge about ANPR, it does not necessarily mean these could easily be addressed. The thesis mainly sought to explore the advantages and limitations to ANPR as perceived by the police and the public with a view to inform practice and policies with regards to ANPR (key areas 1 and 2). However, as will be argued later, numerous issues limited the extent to which an impact evaluation could be conducted (key area 3). There are currently no clear or consistent mechanisms in place to monitor ANPR's outcomes through the criminal justice system or to quantify and investigate the use of ANPR as an intelligence and investigative tool; nor to assess the impact and effectiveness of the newly expanded infrastructure. Although some analysis will be conducted to explore ANPR's impact on crime rates, the difficulty of measuring and controlling for all other relevant variables will limit the validity of the results.

Thus this thesis does not seek to address all the gaps in research or to undertake an impact evaluation of ANPR. It rather seeks to explore the advantages and limitations to ANPR as perceived by the police and the public with a view to inform future developments and policies. Table 2.4 below highlights key research questions covering these issues. The table includes research questions which have been addressed in previous research, as well as questions which need further exploration.

Table 2.4 Key ANPR Research Questions*

Question	Existing Evidence	Thesis objective
1. How does ANPR fit within broader crime theories?	No	Yes
2. What is common practice in the police use of ANPR?	Yes**	Yes
3. (How) does ANPR contribute to criminal investigations and intelligence development?	Yes**	Yes
4. What are the perceived advantages and limitations of ANPR within policing (the practitioners' views)?	Yes**	Yes
5. What are the public's views regarding the police use of ANPR surveillance?	No	Yes
6. What policies/practices should be put in place to improve ANPR's effectiveness within policing and public reassurance?	Yes**	Yes
7. How far is it possible to measure ANPR's impact on crime?	No	Yes
8. Does ANPR reduce crime and the fear of crime?	No	No
9. Does ANPR displace crime?	No	No
10. To what extent does ANPR act as a deterrent to crime?	No	No
11. How do offenders respond to ANPR?	No	No

*Questions in **bold** font are addressed in current thesis. The remaining questions are in need of further research, but are not addressed in current thesis

** Partially addressed by previous research

2.10. Conclusion

This literature review has placed ANPR within a wider surveillance and crime prevention context and has explored the criminological theories which might explain how ANPR can ‘work’ – issues previously ignored by the academic literature. The review also outlined issues related to previous research and knowledge about ANPR’s effectiveness as a policing tool. It has revealed gaps in our understanding of the role that ANPR plays and could play in the fight against crime, and set out which of these this thesis seeks to address. The following chapter highlights the methods used to answer these research questions and talks about the rationale behind the research approach used in this study.

Chapter Three

Methodology

3.1. Introduction

This chapter describes the methods adopted in this research and explains why certain methods were preferred over others. It also highlights a number of issues relating to the research process, research facilitation and field-based research in a police environment. Where appropriate, more details about the use of these methods are presented in the ‘results’ chapters (Chapters Four, Five and Six).

The following methods were found to be most appropriate for this research:

- *Participant observation*
- *Face to face interviews, self-completion questionnaires and focus groups* with the police and agencies with national policy remit
- *Quasi-experiments* using police recorded crime data
- *Postal Survey and Focus Groups* with the public
- *Triangulation* of research findings.

Table 3.1 below outlines the research objectives and methods used in the current study:

Table 3.1 ANPR's role within policing and public reassurance: a multi-method research strategy

Research phase	Timeline	Research Objective	Method
Phase 1	Apr '06 - Feb '07	<ul style="list-style-type: none"> • Explore the theoretical justifications for the use of ANPR as a crime prevention tool • Identify the opportunities presented by ANPR 	<ul style="list-style-type: none"> • Literature review • Participant observation
Phase 2	Mar '07 - Nov '07	<ul style="list-style-type: none"> • Examine common practice in the police use of ANPR in the UK • Explore ANPR's potential to contribute to criminal investigations and intelligence development • Investigate the extent to which opportunities presented by ANPR data are fully exploited 	<ul style="list-style-type: none"> • Review of police literature • Participant observation • Interviews • Electronic survey
Phase 3	Dec '07 - Apr '08	<ul style="list-style-type: none"> • Explore the public's view with regards to ANPR surveillance • Explore the wider social and ethical implications of ANPR 	<ul style="list-style-type: none"> • Literature review • Public opinion survey • Public focus groups
Phase 4	Jun '08 – Apr '09	<ul style="list-style-type: none"> • Further examine ANPR's advantages and limitations within policing (in line with objectives from Phase 2) • Provide (interim) recommendations about how ANPR can be used more effectively 	<ul style="list-style-type: none"> • Research synthesis of findings from Phases 2 and 3 (triangulation) • Follow up Interviews • Thematic focus groups • Follow up electronic survey
Phase 5	May '09	<ul style="list-style-type: none"> • Explore ANPR's impact on crime • Identify the main limitations in measuring ANPR's effectiveness in reducing crime 	<ul style="list-style-type: none"> • Police crime analysis • Quasi-experiment
Phase 6	Jun '09 - Jul '09	<ul style="list-style-type: none"> • Identify implications of the findings for future policy and practice • Provide recommendations regarding the police use of ANPR and how it can be used more effectively • Identify future avenues for research 	<ul style="list-style-type: none"> • Research synthesis (triangulation) • Distillation of policy recommendations

As shown in Table 3.1 above, the research forming the basis of this PhD spans six distinct but interdependent phases over a period of three years:

- The **first phase** was primarily concerned with the review of the literature on the subject, research scoping and design and research enabling;
- The **second phase** entailed the exploration of the police use of ANPR both locally (West Yorkshire) and nationally, with particular emphasis on the potential and use of ANPR as an investigative tool;
- The **third phase** explored the public's views about ANPR;
- The **fourth phase** involved triangulation of findings from previous research stages (interim findings) to inform policy and practice at a local and national level. This stage also comprised a follow up survey with police forces in the UK (interviews and self-completion questionnaires) to explore any further developments and changes in perceptions about ANPR;
- The **fifth phase** considered the feasibility of measuring ANPR's impact on crime;
- The **final (sixth) phase** involved the research synthesis, exploring the action implications of the research findings through further interaction with ANPR key stakeholders.

These stages of research involved a variety of research processes and methods which will be explained next.

3.2. Phase one: research scoping and design

The first phase of the study was mainly a scoping and consultation phase involving undertaking a number of actions in support of research, as well as developing a conceptual framework for the study. The end of this first phase saw the research proposal submitted and approved by the University's Research Degrees Committee.

This thesis is a collaborative research study between the University of Huddersfield and West Yorkshire Police. Having invested in ANPR, a number of senior police officers from West Yorkshire Police were interested in finding out more about ANPR's potential to enhance police effectiveness, particularly with regards to intelligence gathering and criminal investigations. Consolidating partnerships and negotiating access was therefore an essential element in ensuring the feasibility of the study, particularly in terms of data collection and collaboration.

Acquiring access to data and respondents was an important step in enabling the research¹⁴⁹. This was very much dependent on security checks with the police and compliance with Police and University regulations and ethics. Following a vetting process and further negotiations with relevant stakeholders from West Yorkshire Police, the researcher was granted access to police data and personnel. Forms and agreements were signed to place the collaboration on a more formal footing. Having acquired the necessary 'legitimacy' with the police enabled the researcher to network with police officers and police staff beyond West Yorkshire Police. Contact was established with the National ANPR Steering Group and the leading authorities for ANPR, ACPO and NPIA. Networking was thus essential in enabling interviews and further data collection at a local and national level.

To achieve the research objectives, the study used multiple methods that sought to incorporate both fixed (i.e. experimental and non-experimental strategies using surveys and statistics) and flexible elements (i.e. case study approach using observation, interviews, surveys and focus groups) which evolved during the three years of its undertaking. It was believed that a combination of research strategies (using qualitative and quantitative

¹⁴⁹ Previous studies highlight the importance of access and knowledge when researching the police (Leishman et al., 1996; Goold, 2004; Gill and Spriggs, 2005).

methods) would provide a better understanding of the issue under investigation and more informative, complete and balanced research results¹⁵⁰, while overcoming weaknesses that typically arise with the use of one strategy¹⁵¹.

Therefore, the use of qualitative methods such as observation, interviews and focus groups intended to overcome some of the limitations of the quantitative methods in explaining any underlying principles, while quantitative methods such as self-completion questionnaires were used to improve the validity of the study, particularly the ability to generalise the emerging findings (external validity) or to validate and test the content of a research tool before dissemination to a wider sample of population (content validity).

¹⁵⁰ Teddlie and Tashakkori (2003); Johnson et al. (2007); Creswell and Plano Clark (2007).

¹⁵¹ Jick (1979).

3.3. Phase two: exploring ANPR's role and use within policing

The second phase of the research was mainly concerned with the exploration of the police use of ANPR, with a particular focus on ANPR's input in intelligence gathering and the crime investigation process. Specific objectives were to:

- Explore the context and purposes for which the police used ANPR;
- Explore awareness of and knowledge about ANPR's role and potential in all areas of policing;
- Gather views about the advantages and limitations to the use of ANPR in general and crime investigations in particular;
- Identify examples of ANPR successes;
- Highlight areas in need of further improvement to optimise the benefits of ANPR.

This research stage used a combination of research methods, mostly qualitative in nature, involving a significant number of hours spent in the 'field' engaged in meetings, observation, interviewing and data collection at a local, regional and national level.

It was felt that, in order to provide a greater insight into how the police use ANPR and perceive its role in enhancing police effectiveness, it was important to extend the scope of analysis beyond West Yorkshire. At a national level, a series of semi-structured face to face interviews were conducted with relevant police officers and staff from police forces in the UK, ACPO and NPIA. At a local level, semi-structured interviews with ANPR practitioners, the ANPR force manager, force analysts and relevant stakeholders within West Yorkshire Police were undertaken. ANPR's 'historical' use and post-investigative potential was further investigated through interviews with senior investigating officers and an electronic survey with police officers and police staff from West Yorkshire Police. In addition, a systematic review of all police literature and documents on this subject was conducted in order to corroborate and strengthen the evidence gathered throughout.

3.3.1. Informal observation

The researcher spent a substantial number of hours shadowing practitioners in a variety of settings, ranging from observing daily operational ANPR use to participating in ANPR meetings and workshops at a local, regional and national level. A daily fieldwork diary was

kept by the researcher in order to record her main observations and thoughts and to identify further actions and questions emerging from the time spent on the field. These observations enabled the researcher to gain a further understanding of ANPR, but at this stage it also reinforced the literature review findings highlighting gaps in research and knowledge about ANPR.

Spending time with participants prior to having them engaged in ‘formal’ interviews and focus groups proved to be a bonus as it enhanced their willingness and openness to participate in the research, particularly as the police tend to be sceptical of ‘outsiders’ or ‘students’. Being aware of the possible biases that could be introduced in the observational process, the researcher tried to discount them as much as possible by having an open mind, paying equal attention to situations and people which were not ‘central’ to the observation or not and trying to keep the right balance between subjectivity and objectivity when recording her personal impressions and comments.

3.3.2. Interviews

Observation was a key factor in identifying relevant individuals for interviewing and focus groups. In total, 33 interviews with 38 respondents from 20 police forces and one agency with national policy remit (i.e. NPIA) were conducted during this phase. Officers ranging from the rank of Police Constable to Chief Constable were interviewed to gain an understanding of ANPR at an operational and strategic level. The interviews conducted during this exploratory phase sought to provide a greater understanding of the police use of ANPR in general and in crime investigations in particular.

Respondents were selected purposively, based on their role in relation to ANPR at a national and local level. ACPO were very helpful with selecting and contacting representatives from each police force. Other respondents were identified through snowball sampling, using existing contacts with the police. An invitation to interview was sent by e-mail to the selected sample of respondents, introducing the researcher, explaining the purpose and nature of the research (e.g. selection, confidentiality, duration of interview, recording procedures etc). A brief description of the project and its background, research objectives, employed methods

and intended outcomes, together with a consent form were sent to potential respondents at the same time. A copy of relevant documents is available in Appendix 1.

A questionnaire was developed and piloted prior to starting the main set of interviews to ensure the design was appropriate and to test if the duration of the interview was in line with the terms described to respondents in the invitation. The pilot highlighted a number of problems with the questionnaire, particularly with regards to the wider applicability and relevance of the questions and the time necessary to complete it. Hence it was decided to adopt a more 'open' approach to interviewing, reducing the number of questions and adapting their content accordingly, while keeping in line with the study's main objectives. The interview schedule reproduced in Appendix 1 does not, therefore, contain the questions asked in the pilot exercise; the schedule is not a reflection of all questions or probes used during each interview, it is an indication of possible questions asked and themes explored during these interviews.

Prior to each interview, respondents were reassured that their answers would be treated in the strictest confidence and anything they might mention 'off the record' would not be included in the study. In line with appropriate ethical regulations, the names of participants and police forces involved in the research were kept confidential and no sensitive information on police procedures and tactics was disclosed. Quotes from interviews used in this thesis are fully anonymised¹⁵². Police forces were randomly allocated a number from 1 to 28 (e.g. F1, F2 etc) and interviewees' names were kept anonymous (e.g. Police Officer, ACPO/NPIA Representative, Member of the National ANPR Steering Group).

The researcher's prior experience of interviewing offenders, prison and probation staff, police officers, support workers and various stakeholders in the Criminal Justice arena proved useful in this part of the research. This experience, coupled with adequate preparation and background research, enabled the researcher to acknowledge and anticipate potential limitations. Police specific terms and non-sensitive questions were used so that interviewees

¹⁵² The information acquired outside these formal interviews (i.e. through discussions with police officers and staff while 'on the job') was not used to generate quotes. Near-contemporaneous notes were kept and used to open lines of enquiry for the formal interviews and later on fill in 'gaps' from these interviews.

would feel at ease and comfortable answering these questions. Leading questions were avoided to reduce potential interviewer bias. Although the researcher appeared welcoming and reinforcing to all respondents, at all times she sought to be neutral and avoided leading the discussion or sharing respondents' views. A full record of the interviews was kept through notes and tape or digital recording.

3.3.3. Electronic survey

The 'electronic' survey undertaken in October 2007 was informed by the initial set of interviews and sought to explore ways in which ANPR was perceived by West Yorkshire Police, with particular emphasis on the views and opinions of police officers and police staff involved with ANPR in the investigation process.

A self-completion questionnaire was found most appropriate to explore these objectives, given the wide range and number of police officers and staff within West Yorkshire. Considering potential limitations linked to the use of self-completion questionnaires (e.g. reduced control over the question order, individual context and respondents' understanding of questions), careful consideration was put into the design and preparation of the survey. The majority of questions used in this survey followed those from the interviews, with appropriate amendments to cater for West Yorkshire Police's use of ANPR. Questions were predominantly closed with predetermined response sets. Some open questions were included to ensure the questionnaire would capture more specific in-depth information.

Given the commonly acknowledged low response rate typical to self-completion questionnaires¹⁵³, the researcher took extra care in designing the questionnaire, making it clear and easy to complete in order to increase the response rate. A draft questionnaire was pre-tested informally with a small number of officers and staff from West Yorkshire Police. This piloting exercise enabled the researcher to test the content of the questionnaire and best ways for dissemination and completion, as well as to identify potential respondents. The sample of respondents was selected purposively to include all staff believed to be in a position to use ANPR in their field of work. A sample of 594 police officers and staff were

¹⁵³ Gilbert (2001); Robson (2002); Brynan (2004); Hagan (2005); Kraska and Neuman (2008).

sent the questionnaire for completion by e-mail through the police's internal e-mail system – a restricted access network owned and managed by West Yorkshire Police.

To further increase the response rate, the questionnaire was accompanied by a letter sent by the researcher on behalf of a senior police officer to encourage participation, as well as to explain the scope and purpose of the research and the potential benefits for the police. Respondents were reassured that the questionnaire was completely anonymous and their answers could not be traced back to them. A database was set up on a secure server facilitating the storage of the emerging data. The database comprised SPSS (Statistical Package for the Social Sciences) and Microsoft Office Excel files which were populated by the data coming through. These files were used for the quantitative statistical analysis, which was complemented by thematic analysis of results emerging from open question.

The questionnaire achieved a response rate of 24.7% (that is 147 officers and staff within West Yorkshire Police). This was an encouraging response rate for an electronic survey¹⁵⁴, particularly given the limited time for completion (two weeks) and other potential limitations such as holidays and absence from work, respondents' access to a police terminal, work commitments etc. It was considered that the sample of respondents was sufficiently representative of the wider population (i.e. those police officers and staff potentially using ANPR in their field of work) to produce valuable results which would be used for three main purposes:

- To complement previous research findings identified through interviews;
- To inform future West Yorkshire Police strategies and developments regarding ANPR by identifying advantages, limitations and best areas for improvement and
- To inform future research procedures such as the thematic focus groups employed in the later stages of the research.

¹⁵⁴ There is evidence suggesting that e-mail surveys have lower response rates than postal or paper surveys (Kaplowitz, Hadlock and Levine, 2004; Schaefer and Dillman, 1998).

3.4. Phase three: exploring the public perceptions of ANPR

This phase aimed to explore the ethical aspects of the police use of ANPR, in particular the public's view on and acceptance of ANPR surveillance. More specifically, the public opinion study aimed to explore:

- Public awareness of ANPR
- Perceived role of ANPR and its effectiveness
- Level of support for ANPR in Leeds after its installation
- Concerns about ANPR
- Confidence in the police use of surveillance technologies, in particular ANPR
- Perceptions of anti-social behaviour, crime and victimisation amongst residents of Leeds
- Socio-demographic or experience-related factors which might influence people's views about ANPR and the police.

3.4.1. The survey strategy

In order to address these objectives, a research strategy involving a public opinion survey (using self completion questionnaires) and focus groups was used. The study commenced in February 2008 with the distribution of a postal survey to a representative sample from Leeds population. This was followed by focus group sessions conducted in April 2008 with a smaller sample of residents, the undertaking of which was dependent on the completion and results of the postal survey.

3.4.2. Sampling

In order for the results of the study to have adequate external validity, it was important that respondents were sampled in an appropriate manner¹⁵⁵. In the present study it was decided that the population from which the sample of respondents was to be drawn would comprise all residents in the Leeds Metropolitan District (LMD). LMD is the second largest in England and the largest settlement in West Yorkshire with a population of 715,402 spread over thirty-

¹⁵⁵ Robson (2002); Kemper, Stringfield and Teddlie (2003). Researchers typically try to demonstrate that the findings from a sample in a particular situation at a particular time are representative or typical of the wider population to which they belong and apply more generally.

three wards¹⁵⁶. Leeds was selected because of practical considerations (e.g. excellent contacts with the police and the local authority), but also because of the introduction of a new ANPR system in Leeds City Centre, the largest in West Yorkshire, which coincided with the timescale of the research. The names and addresses for the population residing within the boundaries of Leeds districts were selected using Quick Address Pro incorporated with GIS software¹⁵⁷. These included 337,682 households. The data were cleaned to comprise residential addresses only.

A probability simple random sampling design was used, thus each resident of the population of interest had an equal non zero chance (probability) of being selected for the sample¹⁵⁸. This was considered appropriate in order to establish valid comparisons and to allow generalisation from the sample to the population of interest; objectives which would have not been possible with non-probability sampling. Non-probability or purposive sampling was mainly used for the qualitative methods (interviews and focus groups), where there was less emphasis on formal comparisons and participants were selected because of the relevance and specificity of their knowledge and role with regards to the topic under investigation.

However, the accuracy and validity of a sample is not solely dependent on how the sample is selected. Although probability sampling allows generalisations from sample to population, these generalisations are probabilistic. The size of the sample also plays an important role in ensuring the validity of the conclusions drawn from the exercise; up to a point, the larger the sample, the lower likely error in generalising¹⁵⁹.

To ensure that the survey would generate a sample on which valid statistical tests could be performed, the sample size for the postal questionnaire was calculated using a sample size formula. The sample size was calculated taking into account the total population in the target area (i.e. 715,402), the confidence interval (standard error at +/-4%), the confidence level (percentage reflecting how sure one can be of the answer, i.e. 95%), variability (the likely

¹⁵⁶ Cf. figures from 2001 Census for Leeds.

¹⁵⁷ This was done with the assistance of West Yorkshire Police. Quick Address Pro is a software developed by Experian capturing name and address data for specific populations.

¹⁵⁸ Nachmias and Nachmias (1997); Arber (2001); Robson (2002); Maxwell and Loomis (2003); Kemper, Stringfield and Teddlie (2003); Kraska and Neuman (2008).

¹⁵⁹ Robson (2002: 161, 261).

spread of responses, i.e. 50:50, 60:40, 70:30) and a response rate of 15%. According to the Home Office¹⁶⁰ guidelines regarding the police use of surveys to measure user satisfaction, the key requirement is to generate survey results with confidence intervals no wider than +/- 4% at 95% confidence. It is believed that the most cautious assumption in calculating sample sizes would be for maximum variability (50:50).

However, the generalisability of the results is not solely dependent on the sampling type and sample size, but also depends on whether respondents are typical of recipients of the survey. This is explained in the results presented in Chapter Seven of the thesis.

Once the size of population to be surveyed was decided, a random selection using Excel generated the final sample for the postal survey, which was 8,310 contact details (names and addresses) of Leeds residents.

3.4.3. The postal questionnaire

A self-completion questionnaire was considered the most appropriate tool to collect data from such a large sample of respondents¹⁶¹. A low response rate was identified as the main potential limitation to this self-completion survey. To counter this threat, special consideration was put into the planning, design and distribution of the questionnaire. Thus a first draft of the questionnaire was developed following an extensive literature review which served to define and refine the study parameters. The process comprised an assessment of existing research (i.e. studies looking at public attitudes towards surveillance, police cameras, and in particular CCTV) and a review of methodological considerations and recommendations regarding similar surveys. Questions which were considered relevant were adopted and adapted to the current survey for comparison purposes. The rationale behind the content of some questions was closely related to 'opportunity' theories mentioned previously. The questions were also influenced by the context in which the survey was to take place and usual practice with regards to ANPR and crime prevention within West Yorkshire.

¹⁶⁰ Home Office, ACPO, APA (2008).

¹⁶¹ Self-administered questionnaires are generally considered less time consuming and more cost effective than telephone or face to face interviews (Oppenheim, 1992; Robson, 2002: 234, 237; Gilbert, 2001; Nardi, 2006). A notable advantage of self-completion surveys is that they allow anonymity which can increase openness and might encourage respondents to participate, particularly when sensitive topics are involved.

Taking into account the complexity and novelty of the research topic, questions were kept simple and straightforward and closed questions with predetermined response sets were predominantly used. A few open ended questions were included to ensure the questionnaire would capture more specific in-depth data regarding respondents' views and concerns about ANPR. A 5-point Likert scale¹⁶² was employed for most closed questions, ranging from 'Strongly agree' to 'Strongly disagree', with a neutral central position.

To enhance the content validity of the survey, the draft questionnaire went through a pre-testing and piloting process¹⁶³. The questionnaire was sent by e-mail to all research students and staff attached to one of the main Schools within the University of Huddersfield (non-probability purposive sampling). They were reassured of the confidentiality of their answers and were encouraged to raise any issues about the topic, content and structure of the questionnaire. The pilot generated a good response (50 replies) and useful suggestions. These were taken into consideration and the questionnaire was amended accordingly. Both the pre-testing and piloting established that questions were clear, meaningful and appeared to measure what they were designed to measure, thus increasing confidence in the reliability and content validity of the survey. A final version of the questionnaire was produced and printed for distribution (see Appendix 1).

The questionnaire was accompanied by an introductory letter which was carefully designed to draw the attention of potential respondents and enhance the response rate. The covering letter highlighted a prize draw¹⁶⁴ for those who would complete the questionnaire and explained the nature and purpose of the survey. A brief description of the research topic was also provided. The letter made explicit reference to the sample selection process, confidentiality of responses and procedures regarding questionnaire completion, prize draw and postal arrangements. To further increase the response rate a pre-paid envelope was provided with

¹⁶² Fink (1995). See also Albaum (1997) and Armstrong (1987).

¹⁶³ The questionnaire was pre-tested with colleagues who provided feedback on its content and structure. Pre-testing and piloting are important stages in ensuring a comprehensive and valid questionnaire is designed before sending it out to a wider sample. See, for example Moser and Kalton (1979); Nachmias and Nachmias (1987) and Robson (2002).

¹⁶⁴ It is believed that the use of incentives in self-administered questionnaires can increase response rate (Oppenheim, 1992; Edwards et al., 2002).

the survey. A separate prize draw entry form containing a Data Protection statement was included to reassure respondents about the confidentiality of their details. A copy of the covering letter and entry form is included in Appendix 1.

The survey was distributed in February 2008 by post to a sample of 8,300 households in Leeds, achieving a response rate of 19% (i.e. 1,573 valid returns by the specified date), therefore producing a significant number of responses which were used for statistical analysis. Respondents' demographics were compared to those of the population of Leeds as a whole (2001 Census) to assess the extent to which the sample population was representative of the wider population. This is discussed in the chapter presenting the results from the survey (Chapter Five).

Data from all valid questionnaires (returned by the time specified in the survey) were coded, inputted and analysed using SPSS. The numerical data were analysed using descriptive statistics (frequencies, cross-tabulations and correlations), while a coding frame and thematic analysis were used for the qualitative data. Significance tests were carried out across a wide range of comparisons and, unless otherwise mentioned, these were based on the chi-square statistic using a 0.01 significance level. More details about the analysis of the results and emerging findings are presented in Chapter Five of this thesis.

3.4.4. Focus Groups

Findings from the postal survey were explored in depth via group discussions with a small sample of residents from Leeds. While self-completion questionnaires were mainly used to obtain quantitative information and identify how many people held a certain opinion, focus groups were thought to be more appropriate for exploring the reasons behind these opinions¹⁶⁵. Three focus groups with a total of thirty respondents were conducted.

To address the gap in responses from the postal survey and to enrich the results generated by the discussions with mixed groups, it was decided to organise a homogeneous group with

¹⁶⁵ Kitinger (1995).

young people with the view to consider any emerging differences and access opinions that might otherwise not have been heard¹⁶⁶.

As non-attendance is a common cause of failure in focus group research, particular care was put into the organisation of the group sessions (recruitment of participants, location and timing of sessions, incentives etc). As in the case of the public opinion survey, the researcher obtained the full support of West Yorkshire Police to undertake the research. Leeds City Council offered additional help with the recruitment and facilitation of the group sessions. Young people were recruited with the assistance of West Yorkshire Youth Association (WYYA)¹⁶⁷. Respondents for the heterogeneous (mixed) groups were recruited with the assistance of an independent research company, QA Research, which used the Citizens' Panel for Leeds to select eligible respondents¹⁶⁸. Recruitment criteria for the latter were set to ensure a good spread of respondents, taking into account respondents' age, gender, ethnic background and area of residence. Prior to the sessions, respondents were informed about the purpose and beneficiaries of the research, time, location and duration of the sessions. They were told that the sessions would be audio-recorded (subject to their consent) and transcribed and the content of discussions would be securely stored and kept confidential and used only for research purposes.

A focus group script was developed to provide a guide for the sessions. The topic guide covered similar issues to the postal survey, but with particular emphasis on respondents' views regarding ANPR positives vs. negatives, safety vs. privacy, discrimination and covert vs. overt surveillance – issues which could not be easily captured in the postal questionnaire. While respondents from the postal survey were presented with a letter explaining the topic of research before they were asked about their views, participants to the group sessions were gradually introduced to the topic in order to capture their initial reactions and explore whether more knowledge or information about the subject would influence their perceptions. For

¹⁶⁶ Results from the survey indicate that young people were slightly under-represented of the wider population.

¹⁶⁷ West Yorkshire Youth Association (WYYA) aims to create opportunities for children and young people to make positive changes in their lives.

¹⁶⁸ QA Research manages and consults the Leeds Citizens Panel on behalf of Leeds City Council (LCC). The panel consists of 2007 Leeds local authority residents recruited to be demographically representative of the wider population of Leeds. They are sent regular postal surveys and occasionally invited to attend qualitative research exercises to inform the policy decision making processes in LCC.

further comparison purposes, one group was offered extra information about ANPR. A copy of the script for the group sessions is included in Appendix 1.

All group sessions took place as planned, with encouraging results in terms of attendance, discussion and feedback. The sessions were held in the evening at the Town Hall, which is a central and easily accessible location in Leeds¹⁶⁹. For ethical reasons, young people were accompanied by a programme coordinator from the West Yorkshire Youth Association. Sessions were relaxed and comfortable but efficiently moderated to encourage people to fully express their views, drawing out reticent participants, while addressing dominant ones. The group discussions lasted an average of 60 minutes and they were all recorded, transcribed and analysed using the main emerging themes. The findings were reviewed with those from the public opinion survey for triangulation purposes to draw out common themes and areas of difference.

¹⁶⁹ QA Research assisted with the moderation of the focus groups. Their input did not bias the results of the research as they were not involved in the analysis and reporting of the results.

3.5. Phase four: interim findings and follow up survey

This research phase involved the use of the following methods:

- ‘Interim’ triangulation/synthesis of findings from Phases Two and Three;
- Thematic focus groups with officers and staff from West Yorkshire Police;
- Follow up electronic survey with representatives from police forces in the UK.

3.5.1. ‘Interim’ triangulation

Findings emerging from the first set of interviews, participant observation and public opinion study were reviewed at this point in order to provide the police with interim findings and inform policy and practice with regards to ANPR at local and national level. This early reflection on the findings had the additional advantage of informing the subsequent research stages and choice of methods.

3.5.2. Thematic focus groups

Three thematic focus groups with thirty one officers and staff from West Yorkshire Police were organised within this timeframe. These were informed by findings from the previous phases of research and were used to further explore ANPR’s role in intelligence gathering, crime investigations and response to criminality, as well as to identify the best way to improve the police use of ANPR within West Yorkshire and maximise its benefits.

Respondents were chosen purposively from West Yorkshire Police’s employees who were thought to be using or would benefit from using ANPR as part of their role. The sampling criteria aimed to get respondents from each department or division within West Yorkshire Police with different roles and ranks within the force (e.g. managerial, operational, strategic, research, investigations). An invitation to the group sessions was sent out to this sample, explaining the purpose and nature of the sessions. A focus group script was developed to provide a guide for the sessions (see Appendix 1). Given the thematic nature of the groups (i.e. ‘response’, ‘intelligence’ and ‘crime investigations’), the script was amended for each session accordingly. All sessions took place on West Yorkshire Police premises and were facilitated with the support of experienced moderators from the force, lasting an average of 150 minutes. For confidentiality purposes, not all sessions were recorded (in these cases, notes were taken instead). The notes and transcriptions of recordings were analysed manually using the main emerging themes.

3.5.3. Follow-up interviews

Fifteen follow up interviews were conducted during this phase. Eight out of these were undertaken with key stakeholders from West Yorkshire Police to further explore the role of ANPR within policing at local level. These interviews incorporated results emerging from earlier interviews, the electronic survey and the focus groups in order to inform the ANPR force strategy and future developments in West Yorkshire.

Seven interviews with members of the National ANPR Steering Group were conducted to discuss the interim results from the study and explore current and future developments with regards to ANPR at national level.

3.5.4. Follow up electronic survey

This research phase concluded with a follow up survey (electronic self-completion questionnaire) exploring the police's views on a more current local and national ANPR picture (see Appendix 1 for a copy of the introductory letter and the questionnaire). The questionnaire was sent to representatives from fifty-two police forces in England, Wales and Scotland, twenty of which have replied and completed the questionnaire by the established time limit.

The focus groups, interviews and the survey were complemented by research notes taken during ongoing research observation and a series of meetings and forums in which the researcher was involved during this research phase.

3.5.5. Analysis of results

The results were generated by using a mixture of qualitative (drawing out themes) and quantitative (i.e. percentage of each response) analysis. The qualitative data generated by participant observation, semi-structured interviews, focus groups and self-completion questionnaires were coded and analysed both manually and with the assistance of specialist software packages such as NVivo. NVivo was used to organise text under main themes and identify commonalities and differences between respondents, groups of respondents or methods used. It should be noted, however, that NVivo is a helpful tool once all the data is

inputted, but it does not perform the analysis, it is a time consuming process. The researcher has to be skilled in using both manual and software enabled coding in order to analyse complex data coming from different sources. As indicated before, the quantitative data produced by the self-completion questionnaires were analysed using Excel and SPSS. More information on how the results were generated is presented in the relevant results chapter, i.e. Chapter Six.

3.6. Phase five: issues in measuring ANPR's impact on crime

One of the objectives of this research was to explore the mechanisms whereby ANPR might impact on crime and police effectiveness and the conditions needed for ANPR to reach its potential in producing these outcomes¹⁷⁰. In that respect, this study falls more within the realm of process or formative evaluation rather than an outcome or impact evaluation of ANPR. However, some basic quantitative analysis was incorporated into the study to explore the extent to which traditional ways of measuring an intervention's impact on crime could be applicable to ANPR. This analysis¹⁷¹ looked at changes in police recorded crime following the introduction of ANPR and aimed to identify main challenges to the process of measuring ANPR's impact on crime which future evaluators should take into account.

3.6.1. Choice of research design and intrinsic limitations

As the main focus of this analysis was concerned with the exploration of the quantitative impact of ANPR on crime, it is worth outlining here some of the methodological approaches which are typically used to answer such outcome questions ('did it work?') and discuss the main limitations to the approach adopted in the current study. The 'ideal' impact evaluation of a crime prevention initiative is expected to have a high degree of internal, construct and statistical conclusion validity¹⁷². The internal validity refers to the correctness of inferences about cause and effect¹⁷³, in other words how well the research demonstrated that the intervention had an effect on the outcome. Construct validity refers to the adequacy of the operational definition and measurement of the theoretical constructs underlying the intervention and the outcome¹⁷⁴, while statistical validity is concerned with whether the cause (i.e. the intervention) and the effect (i.e. the outcome) are related. There are two main types of evaluation designs that could potentially achieve an appropriate level of validity: the randomised experimental and quasi-experimental designs.

¹⁷⁰ Pawson and Tilley (1997).

¹⁷¹ The analysis was explanatory to the extent to which it tried to measure ANPR's impact on crime, but did not necessarily outline a direct causal relationship between ANPR and crime.

¹⁷² Welsh and Farrington (2002).

¹⁷³ Shadish, Cook and Campbell (2002: 34).

¹⁷⁴ Farrington (2003: 54).

3.6.2. Randomised control trials (RCT)

The randomised controlled trial (RCT) is considered the ‘gold standard’ in evaluation designs¹⁷⁵. In this case, offenders or places are allocated at random either to the intervention group or to a control group who will either receive a different intervention or treatment as usual. This approach minimises the chances that the treated and comparison groups differ in significant ways and that one group is biased from the outset to do better or worse. Hence the subsequent differences between the groups are more likely to be attributable to the intervention. To maintain the validity of a randomised experiment, a sufficiently large number of target groups need to be randomly assigned to ensure that the treatment group is equivalent to the control group on all extraneous variables (within the limits of statistical fluctuation)¹⁷⁶. It is evident that a RCT approach would not have been feasible in this case, as ANPR was not introduced in a sufficiently large number of areas, nor was the introduction based on random assignment of control groups/areas.

3.6.3. Quasi-experiments

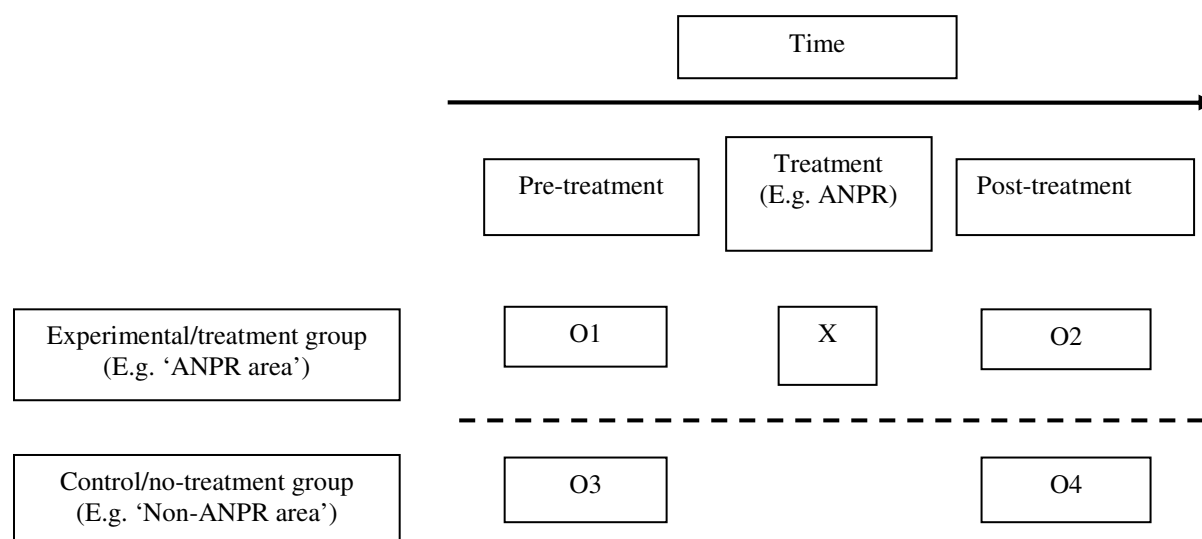
As noted above, with area-based studies, there are not usually sufficient areas to conduct an RCT. The ‘next best’ design for area-based studies (similar to the current study) involves before and after measures in experimental and comparable control conditions – the quasi-experimental evaluation design¹⁷⁷ (see Figure 3.1 below). In this instance, groups (in this case, areas) exposed to the intervention are matched with groups given no intervention or some other intervention in order to estimate the ‘counterfactual inference’, i.e. what would have happened to the target/experimental group if the intervention had not been applied to them?

¹⁷⁵ Farrington (1983), Welsh and Farrington (2002).

¹⁷⁶ Farrington (1997) mentions minimum fifty target groups necessary for the research to be valid.

¹⁷⁷ The term quasi-experiment was introduced by Campbell and Stanley (1963). The minimum interpretable design believed to be most adequate to draw conclusions about crime prevention measures is considered to be Level 3 of the Maryland Scientific Methods Scale (SMS) of quasi-experimental analysis (Sherman et al., 1998, 2002). The SMS was largely based on the ideas of Cook and Campbell (1979) and was influenced by the methodological quality scale developed by Brounstein et al. (1997) in the National Structured Evaluation of Alcohol and Other Drug Abuse Intervention.

Figure 3.1 The quasi-experimental design



***Conventions devised by Campbell and Stanley (1963)**

N.B. The dashed line indicates non-random assignment to comparison group

However, the ability of this type of design to rule out threats to validity is very dependent on the closeness of the match and the ability to control for all the variables which might theoretically be expected to impact upon the outcome measure(s). The control group (e.g. area) is generally used in order to exclude as much as possible other plausible alternative explanations of the effect, which means that the geographical areas used as a control need to be free of the intervention and similar in nature, size, layout and crime problems to the target area. This influences the internal validity of a study which – as argued before - refers to the correctness of inferences about cause and effect.

Shadish, Cook and Campbell (2002: 55) identified a variety of threats to internal validity, such as:

- 'Selection' (when the effect reflects pre-existing differences between experimental and control conditions);
- 'History' (when the effect is caused by some event occurring at the same time as the intervention);
- 'Maturation' (when the effect reflects a continuation of pre-existing trends);

- ‘Instrumentation’ and ‘testing’ (when the effect is caused by the method of measuring the outcome or changes to it);
- ‘Regression to the mean’ (when an intervention is applied to high crime or low crime areas, as natural fluctuation will cause a change in scores in the post-test which could be mistakenly interpreted as an effect of the intervention);
- ‘Differential attrition’ (when differential loss of units from experimental compared to control conditions cause the effect) or
- ‘Causal order’ (when it is unclear whether the intervention preceded the outcome).

It is widely recognised that a randomised experiment has the highest possible internal validity because it can rule out these threats¹⁷⁸, but a randomised method of assignment is not always relevant or feasible, as was the case in the current study.

The selection of the methodology was based upon several factors generally relating to the type of data available for analysis and the difficulties of measuring and attributing changes in crime levels to an intervention such as ANPR. In real world research, experiments are very difficult to conduct: it is rare that control groups do not receive any treatment, whether it is the treatment whose effect is intended to be measured, or any other treatment that is different from the experimental intervention. Indeed it was impossible to find two entirely comparable areas for the purpose of the analysis in the current study. It is probable that other policing operations (including ANPR) might have been implemented in the ‘non-ANPR’ areas, hence the possibility of ‘contaminated’ control areas could not be excluded. There was no consistent approach to ANPR in West Yorkshire and the information regarding which areas have received which ANPR intervention was not available. These factors had an impact on the internal and construct validity of the study.

3.6.4. Internal validity issues: selection, history and maturation

Changes in crime rates over time may be due to factors other than the introduction of ANPR. There are three main threats to the internal validity of the findings within this research: selection, history and maturation. As argued above, the ‘selection’ of the control group was

¹⁷⁸ Farrington (2003: 53).

not entirely appropriate, as pre-existing differences between the experimental and control conditions were identified. The ‘history’ effect is another threat. It is argued that some event other than ANPR possibly occurred during the period under study and might have influenced the outcome measure (in this case, the crime rates). Crime rates could have been influenced by factors (other than ANPR) such as:

- Concurrent policing initiatives (e.g. the introduction of PCSOs, NPTs, ‘Designing Out Crime’ initiatives) or changes in policing tactics;
- Economic and social factors which could be local specific or national/international, such as the current recession (e.g. higher prices for petrol and vehicles; high unemployment rates), changes in urban landscape (e.g. city centre regeneration schemes; new housing developments) or big sporting events (e.g. Football World Cup, Olympic Games);
- Improved security measures and vehicle design, which is believed to have fuelled the development of new types of crime and *modus operandi*, having an impact on the recording rates for theft of motor vehicles and
- Local and national changes in recording mechanisms and counting rules for certain types of offences.

‘Maturation’ could be considered as another threat to validity as the emerging ‘effect’ reflects a continuation of pre-existing trends for the crimes under investigation.

3.6.5. Construct validity issues: police crime data

The main threats to construct validity relate to the extent to which the introduction of ANPR reduced the type of crime expected to be reduced (i.e. theft of motor vehicles). The main threat here is regarding the use of police recorded crime data, its validity and adequacy in reflecting true crime rates.

Although police recorded crime statistics provide a good measure of trends in well-reported crimes, they do not include crimes that have not been reported to the police or that the police decide not to record¹⁷⁹. It is well recognised that police recorded crime data is generally

¹⁷⁹ Information from Home Office RDS website: <http://www.homeoffice.gov.uk/rds/recordedcrime1.html>.

subject to under-reporting; the latest British Crime Survey 2007/08¹⁸⁰, for example, indicates that as many as 58% of crimes are not reported to the police. However, unlike the majority of crimes, police recorded data for theft of motor vehicles is less likely to be under-reported¹⁸¹, mainly because people tend to report this crime for insurance purposes. Indeed the 2007/08 British Crime Survey data indicates that theft of motor vehicles are most likely to be reported (93%), while reporting rates for violent crimes (including domestic violence) are relatively low (35%).

The quality of the data is another issue. For example, the accuracy of the data regarding incidents of theft of number plate is questionable. Consultation with West Yorkshire Police reveals that the way offences are recorded is not consistent, particularly as theft of number plate offences do not necessarily appear as a Home Office category. As for the theft of motor vehicle offence, the police argue that certain changes in policing tactics or in offending patterns have influenced the way that this offence is recorded. For example it is believed that the introduction of new security measures for motor vehicles has fuelled the ‘Hanoi’ style burglaries outbreak. Because the new vehicle designs have become more resilient to theft (e.g. the need for a key to start a vehicle), offenders have decided to break into people’s homes to steal the keys before making off in their vehicle. This is what the police call ‘Hanoi’ burglary. When this happens, the crime is typically recorded as burglary so the theft or the taking without the owner’s consent (TWOC) of a vehicle is not recorded as such, unless the suspect denies the burglary (only in these circumstances the police have to record a separate vehicle crime to the burglary). The current study has not attempted to model the data for these changes, thus these limitations need to be taken into account.

3.6.6. The ‘displacement’ issue

Construct validity in ‘evaluations’ of crime prevention interventions is also about investigating the displacement or the diffusion of benefits¹⁸². The possible displacement effects have not been measured on this occasion. One of the reasons is that it was difficult to

¹⁸⁰ Kershaw, Nicholas and Walker (ed.) (2008).

¹⁸¹ O’Brien (1985), Dodd et al. (2004) and Webb (2005) argue that vehicle theft recorded data is particularly accurate compared to other types of crime.

¹⁸² Clarke and Weisburd (1994).

identify a relevant buffer zone¹⁸³ around the ‘ANPR target area’. ANPR involves cars and roads, not people and designated areas, as in the case of CCTV, hence *vicinity* and *comparability* have different meanings when measuring ANPR’s impact on crime. Probably the buffer area would need to consider a road rather than an area defined by squares meters/kilometres. Limitations regarding the recording of the location of crime should also be considered. The location of the event’s occurrence is not always accurate; it is usually assigned to the nearest landmark or street intersection¹⁸⁴. The majority of police operational gazetteers do not contain non-postal spatial references. This means that the geo-references for non-postal offences may be inaccurate due to police practices of using postal addresses and removing the house or business’s reference. Therefore, because of the non-residential nature of the location of theft of motor vehicle or theft of number plate (i.e. not necessarily at a postal address but on the street outside the postal address), careful attention needs to be paid when geo-coding these offences.

Similarly, when measuring temporal displacement, it is advisable to use the average between the earliest and latest time of offence as recorded on the police’s crime information systems, rather than using the time when the crime was recorded (as some offences take a long time before they get recorded). However, this should be less of an issue if the same type of data was used for both the experimental (e.g. the peak time for theft of motor vehicle before ANPR) and control timeframe (after ANPR).

For clarity of understanding of results emerging from the analysis conducted during this research phase, a more detailed account of the summary statistics used and the statistical significance on tests on changes is presented in Chapter Six.

¹⁸³ Usually the term used to define an area of a certain distance radius (e.g. 100 metres, 1 mile) from the edge of the target area or up to any natural boundaries (e.g. railways) which prevent displacement.

¹⁸⁴ Hirschfield (2005: 645). The location of the crimes is also dependent upon the accuracy of police gazetteers derived from the Ordnance Survey (OS) ADDRESS-POINT gazetteer. This is a dataset that uniquely defines and locates residential, business and public postal addresses in Great Britain. It is created by matching information from Ordnance Survey digital map databases with more than 27 million addresses recorded in the Royal Mail® Postcode Address File (PAF®).

3.7. Phase six: synthesis of research findings and distillation of policy recommendations

The last phase of the study was reflective in nature and implied weighing up the emerging findings and considering the implications of the research in terms of policy and practice. This research stage involved a final consultation with relevant stakeholders in the ANPR arena, with particular emphasis on the future direction of ANPR within policing.

3.7.1. Triangulation

Findings emerging from interviews, focus groups, self-completion questionnaires and observation were reviewed for triangulation and synthesis purposes¹⁸⁵. The aim was to reflect on the findings to further validate the results emerging from the previous research stages and to deepen and widen our understanding of the issues surrounding ANPR surveillance both from the perspective of the police and the public. This final reflection on the findings highlighted any regularities and contradictions in the research data. The ultimate goal was to make sense of the evidence to spell out implications for policy and practice.

3.7.2. Distillation of policy recommendations

Although, to a certain extent, each research stage explored the main impediments to the use of ANPR and sought advice with regards to the best ways to improve ANPR's effectiveness, the last phase of the research was much focused on the 'improvement' aspect and perceived necessary changes to policy and practice with regards to ANPR. To achieve this, the researcher organised a series of meetings to discuss the research findings and outline her recommendations.

Twelve formal meetings were held involving nine officers and staff from West Yorkshire Police, as well as representatives from NPJA, ACPO and HMIC. The aim was to evaluate the feasibility of change and produce realistic recommendations in line with local and, to a certain extent, national strategies, policies and priorities.

¹⁸⁵ Triangulation enables the researcher to get a clearer picture of the social reality being studied by viewing it from several different perspectives (Webb et al., 1966; Denzin, 1970; Jupp et al., 2000; Altrichter et al., 1993; O'Donoghue and Punch, 2003).

Given that the interpretation of the results emerging from this study is closely linked to the methodological approaches used, for clarity of understanding, more information about the methodology used in these research phases is presented in the results chapters.

3.8. Ethical considerations

The research was carried out in accordance with standard ethical procedures, in particular those set out in the British Psychological Society's *Ethical Principles for Conducting Research with Human Participants*¹⁸⁶ and the British Society of Criminology's *Code of Ethics for Researchers in the Field of Criminology*¹⁸⁷. These revolved mainly around obtaining informed consent from all participants; informing participants that they can withdraw from the research at any point they wish; handling any material with the strictest confidence and anonymity and reporting on the subject matter in a responsible manner. No particular health and safety or sensitivity issues were identified with regards to access to participants, from the police (and organisations with policy remit) and the general public.

The researcher has approached the University of Huddersfield's Research Ethics Panel (SREP) and has obtained full ethical approval for the proposed research. The ethics application set out the precise manner in which the research would be carried out. Information about the researcher, her supervisors, the aims and objectives of the study and a brief overview of the research methodology was provided. Copies of consent forms, invite letters and indicative questionnaires to be used for interviews, focus groups and surveys accompanied the form for approval. This was done to ensure that respondents were not subject to any unnecessary intrusions into privacy, sensitivities, leading questions, labelling and stigma. Risk analysis and management forms were also attached to the application. A copy of the relevant form is available in the Appendix 1.

Throughout the duration of the study the researcher ensured that all data were collected, stored and analysed subject to the conditions of the Data Protection Act 1998, Human Rights Act 1998, Public Interest Disclosure Act 1998 and other relevant procedures regarding the use of confidential and strictly confidential information and information sharing. Where necessary, a Data Processing Agreement was put in place to set out the terms and conditions under which confidential police data was disclosed to the researcher and to ensure compliance with the Data Protection Act 1998. This was particularly relevant to the use of police recorded crime data, restricted documents and other information from the police. The

¹⁸⁶ BPS (2009).

¹⁸⁷ BSC (2006).

data were securely stored (encrypted and password protected), analysed and destroyed subject to the conditions of the data sharing protocols agreed with the Data Protection Officer of each individual police force. It was agreed that at the completion of the research all police data would be destroyed to comply with this protocol. Other data were to be stored securely for five years and then would be destroyed.

3.9. Conclusion

This chapter has described the stages involved in the research and justified the selection of the methods used, their advantages and limitations.

All together, the ‘research journey’ had its undulations along the way, restrictive and challenging at times, but very rewarding at other times. Some objectives proved to be harder to attain than initially thought; some questions remained unanswerable; some data proved to be unfit for purpose; some unexpected findings generated new interesting questions. An account of the journey and the various changes made along the way is provided where appropriate, which will help to clarify and situate the research.

Chapters Four, Five and Six present the findings generated by the analysis of the data gathered through the methods described in this chapter. The next chapter is based on police perceptions and experience of ANPR and provides an account of the processes underpinning the development of ANPR in the UK and common practice in the police use of ANPR at local and national level. Particular emphasis is placed on the investigative use of ANPR.

Chapter Four: Results (I)

Present and future challenges in meeting ANPR's potential within policing: the Police's view

4.1. Introduction

The literature review highlighted the need for further research in order to enhance our understanding of ANPR's role and potential within policing and generally, in the fight against crime. Several questions were raised regarding gaps in research and knowledge about ANPR and it was indicated which of these gaps will be addressed by the current thesis and which need further exploration. Improvement and change are central elements to this Thesis. It was highlighted the need to identify the main barriers to the effectiveness of ANPR in crime investigations and generally as a policing tool, with the aim to produce systematic knowledge which would inform the implementation and development of ANPR. In light of this, the current chapter explore police perceptions, knowledge and experience regarding the current practice with regards to ANPR.

Although the chapter has particular emphasis on the investigative use of ANPR, advantages and limitations of ANPR in all areas of policing will be highlighted. The chapter presents results emerging from the empirical work in this Thesis, based on the analysis of the following methods:

- 48 interviews conducted with 53 representatives from 28 police forces in the UK (53.8% response rate)¹⁸⁸ and 2 agencies with national policy remit, ACPO and NPIA;
- One electronic survey conducted with 147 officers and staff from West Yorkshire Police (24.7% response rate);
- Thematic focus groups with 31 officers and staff from West Yorkshire Police;
- One electronic survey with 20 representatives from 20 police forces in the UK¹⁸⁹ (38.5% response rate);
- Observational notes;
- Police documents;

¹⁸⁸ Out of the 52 police forces in the UK.

¹⁸⁹ As indicated in Chapter Three of the Thesis, this survey targeted further developments and updates at a national level, two years after the initial survey (i.e. the interviews).

- 12 formal meetings with 9 strategic officers and staff from West Yorkshire Police, ACPO, NPIA and HMIC.

In total, **260 respondents** were consulted via interviews, self-completion questionnaires and focus groups.

4.2. Common practice in the police use of ANPR in the UK

For clarity of understanding of ANPR's potential and use within British policing, this chapter starts by briefly introducing the reader to the main processes underpinning the development of ANPR and common practice in the police use of ANPR at national level. As part of the empirical work in this Thesis, police officers and staff were asked a number of questions about their role in relation to ANPR and details about the development and use of ANPR within their force and the link to national developments. A specific objective here was to identify processes in the development of ANPR at national and force level, believed to have had the greatest impact on ANPR's effectiveness as a policing tool.

It is important to reiterate that the results portraying national developments with regards to ANPR emerge from two main surveys:

- The first survey was conducted in 2007 entailing 33 interviews with representatives from 20 police forces. Interviews with two agencies with national policy remit (NPIA and ACPO) were also conducted to capture strategic views with regards to national developments in the ANPR arena.
- The second survey was conducted in 2009 and entailed an electronic questionnaire which was completed by 20 police forces in the UK. This survey explored views on the current ANPR use and infrastructure.

The surveys were similar as they had a common ground (ANPR), but not directly comparable, as the later survey was quantitative in nature. Of the twenty-eight respondent forces, twelve responded to both surveys. Where appropriate and where information was available, changes in views between the timeframes coinciding with the two surveys are highlighted.

It should be noted that the current research was conducted in a dynamic environment with the infrastructure, policy and operational oversight of ANPR rapidly changing locally and nationally. Though conceived over thirty years ago, ANPR has seen major developments over the last six to ten years. As will be argued next, these developments were perceived by those questioned as part of the empirical work of this Thesis to have had a significant impact on the overall success of the national ANPR project and the implementation of ANPR at force level.

4.2.1. The journey to ANPR

When asked about the development of ANPR within their force, officers spoke enthusiastically about the ‘ANPR journey’ they had experienced - from an idea, a project, a camera and a couple of police officers involved, to a more complex infrastructure, a national ANPR data centre and the contested ‘Big Brother’ of the British roads. It emerged that whilst ANPR was introduced as a national initiative, police forces were given local discretion in its implementation.

Unsurprisingly, the development and use of ANPR revolved (and still does) around funding. Lack of funding for the initial national testing of the ANPR project was the drive behind testing a cost recovery scheme for dedicated ANPR enabled intercept teams. This meant that ANPR enforcement was intended to be part-funded through receipts from fixed penalty issued for vehicle documentation offences by the ANPR intercept teams¹⁹⁰. It appears that this particular development had an impact on the way ANPR would be perceived from that point onwards. ANPR was labelled as a ‘motor offence’ policing tool, a ‘traffic’ tool. Respondents highlight that, although the main purpose of ANPR intercept teams was to address criminality, not to create revenue, early ANPR enforcement focused mainly on documentation offences. As a result, early ANPR successes were linked to the effectiveness of ANPR intercept teams to issue fixed penalty notices and the value of this cost recovery element.

Ultimately, the revenue generated fell some way short of the actual costs, thus the hypothecation discontinued in March 2006. However, the overall success of ANPR-enabled intercept teams and the recognised potential of ANPR in intelligence gathering and crime investigations, led to additional government funding between 2005 and 2007. The objective of this capital investment was to expand the national infrastructure beyond Spectrum vans and intercept teams, in particular to enhance the intelligence and investigative capability of ANPR. A National ANPR Data Centre (NADC)¹⁹¹ and a Force Back Office Facility (BOF) were developed to provide a more effective way to exchange information between forces

¹⁹⁰ This coincided with the introduction of four new fixed penalties, three of which were relevant to the ANPR teams, i.e. driving without insurance, driving without MOT certificate (where required) and not displaying a vehicle excise licence.

¹⁹¹ The rationale for and characteristics of the NADC were described in Chapter Two of the Thesis.

across England and Wales. At local level, forces were provided with additional funding to develop their local infrastructure and improve the ANPR coverage, especially fixed sites.

The BOF was initially developed to allow the storage of ANPR data within a police force. The facility went through a series of developments aiming to improve the technology and to enable direct linkage and compatibility between forces' BOFs and the NADC - a centralised database of vehicle reads in England and Wales which would enhance the intelligence and investigative benefits of ANPR.

Whilst a centralised database has now materialised, technical issues have impeded the effectiveness of the search facilities of the NADC. Searches are therefore being developed at three levels:

- Level 1 investigation (counter-terrorism and major crime), allowing full NADC search;
- Level 2 investigation (cross-border crime), allowing BOF to BOF searches between different forces;
- Level 3 investigation (local crime), allowing searches of the local force BOF.

The national ANPR leaders argue that, in due course, the three different levels of search will have a layer of analytical tools which are expected to enhance the investigative use of ANPR data across all levels.

These are some of the ideas behind the development of the NADC – a very optimistic project, ahead of its time, fighting its way through numerous problems since its installation as a pilot in 1999. But NADC has remained behind in its timetable to implementation and there are still questions about when or whether it can actually deliver:

'We now have about half the country feeding data into it [NADC], it is going to be another couple of months before all country feeds in and it's only at that point that we really start to get our idea of its usefulness on serious and organised crime and counter terrorism. It remains to be proved [...] Clearly there are financial issues about its sustainability, but I

think it will prove itself very quickly and these issues will disappear. But as long as we haven't got all forces feeding in and interrogate it, it remains a concept.'

(ACPO Representative, National ANPR Steering Group)

To overcome some of these problems, in April 2007, the responsibility for the national coordination and development for ANPR moved from ACPO and the Home Office PSU to NPIA. The NPIA has assumed policy and operational oversight for ANPR and is at present responsible for supporting the development of a national programme aiming to enhance the effectiveness of ANPR, particularly in light of the newly expanded infrastructure across England and Wales. This change is perceived by senior police officers as an opportunity to review the ANPR strategy and address some of the issues limiting the effective development and use of ANPR at local and national level:

'We moved from being an enterprise opportunity business to one that is much more mature, much more mainstream, bigger - which requires systems and processes and programs which go with bigger organisations [...] I think we made the important national transition now and those systems and processes and program management structures that NPIA will bring will allow us to be much more able to drive home the local changes in a much more forceful manner.'

(ACPO representative, National ANPR Steering Group)

4.2.2. Balancing national and local ANPR developments

National developments are hindered not only by technological limitations but also by competing local priorities. Whilst national ANPR developments have been all conceived, they have not always translated practically at the local level. The development of the NADC has indeed opened opportunities to use ANPR beyond Level 1 criminality (local) and address Level 2 and Level 3 criminal issues (at cross border, national or international level). The police are aware of this potential, realising the value of the NADC in providing intelligence on criminals operating across geographic boundaries. However, whilst this is beneficial, the approach is perceived at times to be in conflict with the development of ANPR to meet local force priorities, which vary from one force to another.

Police forces are typically assessed against *individual* performance targets with funding and resources focused on achieving these targets. This is not an issue specific to ANPR, it is 'target' culture governing police forces and the public sector generally. Whilst overarching and sustained crime prevention measures are more likely to be successful, police commanders will not necessarily commit resources and funding towards them if immediate benefits in meeting targets are not apparent. Police officers generally viewed the national approach as unrealistic and at times holding back local benefits, a belief that undermined their confidence in the national approach to ANPR and further developments.

Respondents believe that national ANPR strategies have failed to anticipate problems arising with the newly expanded infrastructure, particularly at local level (e.g. incompatible technology and infrastructure, the Back Office technology) which then have impacted on the effectiveness of ANPR at national level (e.g. the NADC).

4.3. Scoping the police use of ANPR and the types of ANPR systems

The police forces respondent to the 2009 electronic survey indicated they used ANPR on a regular basis, whether for real time response to hits through intercept capability (60% of the 20 respondent forces) or for intelligence gathering for historic searches (post-incident investigation) and intelligence-led operations (25% and 15% respectively). Some forces, however, did not use ANPR for any of the above actions, just storing the ANPR data on the Back Office.

Chapter One explained that ANPR can work with mobile (vehicle based) and purpose built fixed cameras/sites, as well as with existing CCTV systems. The police have focused on applications of ANPR based on these three main platforms but, although less common, other type of systems are also used, such as ANPR laptops, hand held and helicopter based ANPR. Results indicate that all respondent forces used both fixed (including ANPR integrated with Local Authority or other CCTV) and mobile systems. Just over half of these (58%) mentioned the use of other ANPR systems, in particular portable or re-deployable ANPR (e.g. laptops, flight cases, covert cameras).

Given the significant capital funding invested in the expansion of the national ANPR infrastructure, the number of fixed sites developed by police forces has increased considerably. In addition, there has been an increase in partnerships with the Local Authorities to allow the use of CCTV infrastructure for ANPR. Results indicate that a high percentage of respondent forces (70%) have developed partnerships with third parties, mostly with the Local Authority, but also with other agencies such as the Driver and Vehicle Licensing Agency (DVLA), the Highways Agency, Traffic England and Traffic Wales. Some police forces have also succeeded establishing partnerships with the Private Sector (e.g. petrol stations, industrial estates, supermarkets and shopping centres).

Fixed ANPR sites are being complemented by roll out of mobile ANPR systems in both Roads Policing and dedicated ANPR unit vehicles (used in conjunction with ANPR Intercept Teams). Mobile ANPR allows rapid deployment for data collection and intercept in high crime or high security risk areas. These units are connected to the central ANPR computer

that ensures that data collected is immediately available for analysis and that police units connected to the ANPR systems can be alerted to vehicles of interest within seconds.

When asked about the advantages and disadvantages of different ANPR systems used, police officers argue that fixed sites are beneficial as they provide wider coverage than mobile ANPR and 24/7 intelligence gathering capability. However, fixed sites can be extremely expensive and difficult to run from a technical point of view (e.g. installation, power supply and communication links, maintenance and repair) as well as from an operational point of view (increased number of hits, increased demand on command, control and intercept resources). Fixed sites are limited to one location, while mobile ANPR cameras can be deployed to specific locations very quickly, enabling a more flexible and targeted deployment, in line with changing crime patterns in a force area. Fixed sites are believed to be more appropriate for major arterial routes, mobile ANPR systems for local areas.

Mobile systems have their share of criticism – some of the interviewed police officers working with ANPR seem to be frustrated by technical problems with cameras in traffic cars or ANPR vans. Evidence gathered through participant observation confirms this, indicating that police officers working on the ground with ANPR technology encounter difficulties in setting up the system to work effectively. On more than one occasion, the cameras proved to be hard to set to produce accurate reads, the supporting back office facility was unreliable or there was slow response from communications department – all crucial elements in ensuring a fast, effective real time response to ANPR hits. Respondents also highlight that the installation of ANPR cameras on law enforcement vehicles requires careful consideration of the type, quality and position of the cameras, particularly as the environment in which it is used is less stable and predictable (e.g. moving vehicle, queuing traffic, light conditions, presence of pedestrians etc). Flexible systems that can be configured with different adjustable cameras seem to be the ideal setting, but of course quality comes to a price.

Although less frequently used, other types of ANPR are thought to have their advantages. Airborne ANPR is perceived as very effective at gathering vehicle intelligence in hard to reach locations. Hand-held ANPR is appreciated for its ability to read vehicle registration numbers and associated intelligence without involving control rooms, while portable ANPR

(fly-cases) is seen as effective in gathering information for covert or targeted operations at any location.

Even though the use of ANPR in conjunction with local authority CCTV is highly appreciated, particularly in terms of extended coverage and value for money, respondents talk about a conflict of interests which has an impact on ANPR's effectiveness in policing the roads. Because the cameras are owned by the local council - which have their own responsibilities for crime and disorder – the use of ANPR through CCTV is not always a priority. The way the CCTV cameras are placed (e.g. too high or overlooking the pedestrian areas, wrong angle or direction) also impacts on the effectiveness of ANPR systems in capturing vehicles' number plates or images of the vehicle and its occupants.

4.3.1. Private ANPR systems, information sharing and legal implications

Recognising the potential of tapping into existing private CCTV in strategic locations such as shopping centres and petrol stations, some police forces have established partnerships with private third parties. These developments are at an early stage, but the police strongly believe that there are numerous advantages to be gained. Installing ANPR in petrol stations is perceived as a good opportunity to identify vehicles of interest to the police. This is in line with the routine activities theory (people who commit crime use vehicles, like everybody else, vehicles need petrol) and the self-selection assumptions (people who commit minor crimes, e.g. making off without payment, are more likely to commit serious crimes) highlighted in the literature review.

However, integrating police-owned ANPR systems with other CCTV systems (particularly private) is not a straightforward process, raising issues about the suitability of the legislation covering the information sharing of vehicle movement data between third party agencies and the police. A review of relevant police documents with this regard highlights that, in January 2007, the Home Office put forward legislative proposals relating the use of ANPR. In the absence of case law (as ANPR has not been challenged), Counsel's opinion was sought regarding the implications of the current legislation that each organisation relied upon to collect vehicle movement data and use it for their own purpose. The legal consultation indicated that at present the police use of ANPR technology and data generated by these

systems do not raise any legislative concerns, as it complies with current legislation. Sharing of information gathered by ANPR systems is allowed within the police service if it is for the purpose of prevention and detection of crime, in the same way that other information and intelligence is utilised within policing. The storage of data is permitted but must be cognisant of the restrictions set by the Data Protection Act 1998 and the Human Rights Act 1998, particularly the requirement to use and store data in a proportionate and non-excessive way. Each data owner is responsible for justifying the reasons for the storage of data. The police use of ANPR must also comply with the requirements of the Regulation of Investigatory Powers Act 2000 for covert ANPR operations or when ANPR is used directly against a specific target¹⁹².

However, the review highlighted that the legislation was less clear with regards to the use of ANPR by agencies other than the police, particularly those not specified in the Crime and Disorder Act 1998, i.e. private organisations. To comply with the law, these organisations collect ANPR data in an anonymous format (so it is not regarded as personal data under the Data Protection Act 1998) however, the powers and reasons for collecting the data are unclear in many cases. The review concluded, therefore, that new legislation is required regarding the sharing of vehicle movement data between third party agencies and the police, particularly data that was not originally captured for policing purposes. These recommendations highlighted that, for ANPR to be effective in the detection and prevention of crime, an appropriate legislative framework should be secured both for the use of vehicle identification technologies such as ANPR and for the collection, use, analysis, storage and inter-agency sharing of ANPR generated data. In order to secure a statutory footing for the development of the national inter-agency ANPR infrastructure, the Home Office was expected to put new legislative proposals before the parliament. It is unknown at this stage whether these proposals have been enacted.

For a summary of the perceived benefits and limitations of different ANPR systems, see Table 4.1 below. These are specific to each system, although some characteristics are likely to overlap.

¹⁹² Otherwise ANPR systems are exempt from the requirements of the Regulation of Investigatory Powers Act 2000.

Table 4.1 Perceived advantages and disadvantages of different types of ANPR systems

ANPR System	Advantages	Disadvantages
Fixed or stand-alone ANPR	<p>Could be used 24/7</p> <p>More accurate reading</p> <p>Extended coverage</p> <p>Can be cost effective if modern technology is used such as wireless and partnerships are used to share the costs</p> <p>Very useful on arterial routes, ‘rat runs’* and motorways</p>	<p>Limited to a fixed location</p> <p>Cannot follow crime trends/hot spots</p> <p>Expensive to move to another location – but, if sighted correctly, then there should be no need to move unless development in that area changes road layout or flow of traffic</p> <p>Expensive to maintain and repair</p> <p>Needs a clear strategy on deployment, response etc.</p>
ANPR linked to CCTV (Local Authority, private)	<p>Could be used 24/7</p> <p>Extended camera coverage, with limited additional costs</p> <p>Vehicle tracking</p> <p>Use of car parks, shopping centres and petrol stations</p> <p>Improved probability of getting photograph of the driver</p>	<p>Urban environment, less specific to travelling criminality</p> <p>If no appropriate agreements in place, conflict of interest between local authority and policing objectives</p> <p>Inefficient positioning of cameras (too high, focused on pedestrian area etc)</p> <p>Lack of appropriate legislation</p>
Mobile ANPR (fitted cars, Spectrum van etc)	<p>As and when needed</p> <p>Can be deployed at specific locations</p> <p>Can be moved without cost to follow a hot spot or a problem in an area</p> <p>Response real time</p> <p>Provides officers the ability to identify a vehicle which has matched against a hotlist which they may not otherwise have stopped</p> <p>Can receive hits from the fixed ANPR cameras and respond in real time</p>	<p>Prone to damage</p> <p>Less reliable at reading number plates</p> <p>Linked to cars which inherently break down, need servicing etc</p> <p>Reliant on officers on the ground to set up and monitor the system</p> <p>Disadvantages most likely to be down to operator error which could be overcome by the correct training and selection of officers</p>

Table 4.1 (cont.) Perceived advantages and disadvantages of different types of ANPR systems

Other ANPR	Portable	<p>As and when needed (less frequent)</p> <p>Easy set up</p> <p>Any location</p> <p>Independent of vehicle</p> <p>Targeted/covert deployment</p> <p>Similar advantages to the mobile systems mentioned above</p>	<p>Difficult to handle in vehicles, e.g. wiring of laptops</p> <p>Similar disadvantages as those mentioned for mobile ANPR (see above)</p>
	Hand-held	<p>Early stages of implementation</p> <p>Ability to read number plates and associated intelligence without involving control rooms</p> <p>Do not necessarily have to be able to read but could just receive and have the ability to check vehicles against not only PNC, but ANPR hotlists</p> <p>Useful for surveillance officers to receive alerts</p>	<p>Security issues regarding data retention and handling (not advisable to store data on them and any details of hits)</p> <p>‘More of a gimmick than a really reliable product for actual reading’</p> <p>Nearly as quick to type in the numbers</p>
	Helicopter	<p>Access to areas hard to reach by police officers or vehicles</p>	<p>Very limited use</p> <p>Expensive and resource intensive</p> <p>Connectivity not always live with the data</p>

*‘Rat runs’ is a term used by the police to describe offenders’ set ways of travelling to and from crime, back routes or escape routes they use.

4.3.2. Types of ‘ANPR crimes’

As indicated in Chapter One, ANPR systems read number plates and create an electronic log of vehicle movements with date, time and location. While the system is only able to read the plate, the software enables to cross-check the number plate against a variety of databases (otherwise known as *ANPR hotlists*) and automatically produce warnings for vehicles of interest (also known as *ANPR hits*). For future reference, the information produced by the ANPR software in combination with these databases – ‘data’ which is usually stored in the Back Office facility - is usually referred as *ANPR intelligence*.

In order to establish the nature of incidents for which the police use ANPR, respondents were asked to identify the most common types of crimes or incidents generated through the use of ANPR within their force. Given that the Police National Computer is the most common database used in conjunction with ANPR, it is not surprising that the types of ANPR hits most frequently mentioned by officers are in relation to theft of motor vehicles. Next most common ANPR ‘hits’ generating police response are linked to vehicle documentation offences (e.g. no insurance, tax, MOT), drugs offences and driving whilst disqualified offences. Some forces indicate that they use ANPR for more targeted operations, for example to address gang crime or certain types of burglary in an area. The type of ANPR ‘crimes’ also depends on the type of area an individual force operates. If a policing area is low crime, then the arrests rates resulting from ANPR are much lower. Therefore, to make most out of the ANPR technology, some forces use ANPR more for traffic offences than crime. Other forces concentrate on crime types specific to their area:

‘We have a vibrant night life in the area which attracts drug dealing. Drug dealing is changing and also becoming more violent and ANPR is useful to try to tackle that’

(Police officer, F9)

However, there is a consensus amongst respondents that the use of ANPR does not narrow down to a particular crime, as it generates lots of opportunities and can cover anything from traffic offences to more serious crimes. The nature of the ANPR incidents, particularly theft of motor vehicles and documentation offences, reflects what ANPR was initially designed to

address, but also indicates that ANPR has changed focus and expanded its use, covering a wide range of crimes and police departments.

4.4. ANPR as an intercept tool

As the ANPR technology is improving in terms of accuracy of reads and the types of cameras or platforms on which it can be used, the police's range of capability is increasing as well. However, one of the main challenges for the police is to match these technological advances to current police practice in terms of its ability to use ANPR effectively and respond to ANPR 'crimes' or 'hits'. The use of ANPR falls within two main types: '*real time*' ANPR use, which generally supports the interception of vehicles whilst they are still being driven on the road, and '*historical*' ANPR use, where ANPR data is gathered and analysed to assist with proactive and reactive criminal investigations.

ANPR's impact on response policing and real time intercept is a benefit frequently mentioned by respondents in the current study. This is mainly due to ANPR's ability to process and identify large numbers of vehicles in a fast and automated way, which in turn, makes officers more effective in their stops. ANPR is perceived as another 'pair of eyes' that 'never gets tired or distracted', bringing to officers' attention less obvious vehicles to stop and identify crimes that might otherwise have gone unnoticed. The following quote reflects typical views on this matter:

'... ANPR cameras are amazing [...] You got a car you're looking for, you put it on a hotlist, you load it and the ANPR system picks it up [...] A tenth of the vehicles that pass you, you would go off and stop without the use of ANPR because they are more obvious; the other nine tenths you would not give a second glance to it and it is only the ANPR technology that picks them up.'

(Police Officer, F22)

However, this is not to say that ANPR replaces officers' judgement, rather it is an aid and addition to their existing skills:

'We don't say that ANPR is a "be all" or an "end all" tool. It is a good reason to stop somebody. How you then deal with the people you stopped makes a difference to whether that is an arrest or not.'

(Police Officer, F23)

ANPR is seen as a useful response tool not only because it helps to ‘legitimise’ a stop, but also because it provides officers with additional knowledge about the vehicle they are about to stop, so they can risk assess the situation and make more informed decisions about what questions to ask and how to go about dealing with the suspect/s. The intercept of suspects on the road becomes more effective and less disruptive to the public. However, this is not as straightforward as it might seem. There are crucial limitations which affect the effectiveness and ‘smoothness’ of this process. As will be argued next, the relevance and accuracy of the information used in conjunction with ANPR systems enable officers to make the distinction between offenders and law abiding citizens and, ultimately, make an informed decision about their stop.

4.4.1. Responding to ANPR ‘crimes’: an ongoing challenge

Response to ANPR hits is currently a problem. Results from this study suggest that response to ANPR hits is not consistent across the twenty-eight forces participant in the research. Many officers in the interviews stated that the use of all available ANPR hotlists coupled with the extended fixed infrastructure generate too many ANPR hits¹⁹³ which cannot be addressed in real time by intercept officers. Such an increase in demand requires significant changes to the response approach to ANPR hits. As a result, many forces appear to have filtered off certain types of hotlists (particularly the vehicle documentation offences hotlists which generate too many hits) and have prioritised the use of others, in line with operational objectives, resources available or the severity of crimes. Like with all crimes, the more serious the crime, the more resources and finance go into it and the more likely the response to it. This renders the response more effective, but it also means that, by targeting only serious crimes, there are missed opportunities of identifying other serious criminals who might not be linked to high priority databases, but to minor offences databases, such as those entailing information on uninsured and untaxed vehicles and no keeper.

¹⁹³ The number of ANPR hits has considerably increased after the expansion of the ANPR fixed infrastructure. For example the average monthly number of hits generated by fixed ANPR systems within the City of London Police increased from around 10,000 to over 50,000 after the delivery of additional fixed site cameras and the use of an increased number of hotlists (Home Office PSU, 2007).

A part from resources, a major problem closely linked to the effectiveness of the response to ANPR hits is the quality of the information placed on the ANPR hotlists¹⁹⁴, in other words, '**ANPR intelligence**'. There is a consensus amongst police officers that the quality of ANPR intelligence influences the extent to which a hit is actionable and effectively dealt with. The outcome is only as good as the intelligence that feeds the systems: '*rubbish in, rubbish out*', officers argue. This appears to be an ongoing issue for all police forces in the UK, with officers highlighting a high percentage of the information on hotlists being inaccurate. In this instance, '**inaccurate**' means either out of date or irrelevant information placed on the ANPR hotlists.

The hotlists with most out of date ANPR information are believed to be those belonging to the Driver and Vehicle Licensing Agency (DVLA), in particular the 'no tax' and 'no keeper' hotlists. Previous research ('Laser' studies) provides an indication of out of date ANPR information during the early ANPR trials, with 58% of hits inaccurate¹⁹⁵. This means that, the information available on these databases at the time of the ANPR 'hit' was out of date, which of course means that the vehicle linked to it was no longer of interest to the police. Similar 'inaccuracies' were identified with regards to the Police National Computer (PNC) and the Force Intelligence hotlists, with 21% and 16% inaccurate hits respectively. This is confirmed by research conducted by the Central Motorway Police Group (CMPG) indicating that 25% out of 292 PNC information markers identified by ANPR over a 10 hour period were inaccurate or irrelevant for ANPR intercept¹⁹⁶. The quality of information placed on ANPR in-force hotlists is also questionable. This seems to have an impact on intercept officers' trust in the system and motivation to work with ANPR technology:

'Some intelligence is very good but it does not necessarily mean is good ANPR intelligence. You need intelligence that you can act upon, react, something that you can built your decision on in an instant. Do I stop the vehicle? Do I arrest the person? Is it dangerous? Or is it just to make a note of the car being seen in the area?'

(Police Officer, F12)

¹⁹⁴ A detailed descriptions of ANPR 'hotlists' was provided in Chapter One of the Thesis.

¹⁹⁵ Home Office PSU (2007). Despite the changes that DVLA have implemented in the last few years in order to address the accuracy of their hotlists, there is some indication that there are no significant improvements. The accuracy of these databases is still poor, with an average of 41% inaccurate hits.

¹⁹⁶ Home Office PSU (2007).

Poor ANPR intelligence clearly has a negative impact on police practice and effectiveness. It results in wasted police resources and unnecessary risks for both the police and the general public, who may end up being stopped for no reason. Information collected on vehicles is constantly changing, as vehicles are sold or recovered or no longer used by criminals. Crime is changing. Therefore, some intelligence on vehicles or criminals linked to these vehicles will always be out of date. But this can be addressed by more frequent updates and regular weeding, improvements in data processing and appropriate research capability. Further research is needed to measure the nature and extent of the inaccuracies on ANPR hotlists and to identify best ways to improve the quality of intelligence placed on these hotlists.

4.5. ANPR as an investigative tool

While the police use of 'real time' intercept operations and their effectiveness have been evidenced in the 'Laser' evaluations, there is a gap in research and knowledge about the potential role and use as an investigative policing tool. Many forces still view ANPR as a high profile intercept tool, but there is a consensus that its potential goes beyond this remit. The latest developments in ANPR infrastructure across the UK provide far-reaching scope for ANPR's use in intelligence gathering and the investigation of serious crimes.

The results presented in this section are based on interviews, self-completion questionnaires, focus groups and documentary analysis – methods which have been outlined at the beginning of this chapter and detailed elsewhere (Chapter Three). Some differences between the analysis based on data collected in 2006/2007 and data collected in 2009 have been noted. While the earlier surveys indicate very limited use of ANPR in post-incident investigations, results emerging from the 2009 survey highlight that there is currently wider use and recognition of ANPR's potential to add to criminal investigations and help towards the detection of serious offenders. Gathering ANPR data for post-incident investigations is indicated as the second most common police action after response to hits in real time through intercept capability. The majority of survey respondents (70%) say that they use ANPR in post incident investigations on a daily basis. Four of the twenty forces indicated that they would use ANPR in crime investigations on a weekly basis and only two forces admitted to use ANPR monthly or occasionally. This shows that some progress has been made in this area compared to 2006/2007, when results from the first set of interviews indicated that the use of ANPR in crime investigations was very much ad-hoc and limited to a small number of officers with access to the system at the time.

There is an indication that senior investigating officers' awareness and use of ANPR have improved mainly as a result of a wider access to the Back Office Facility (BOF) and better access to knowledge about ANPR's potential benefits in the investigation of serious crimes. There is evidence suggesting that more police officers have now access to BOF - hence to ANPR intelligence - although the extent to which they use it is not clear. There is a common belief amongst respondents that because intelligence and investigative officers have access to ANPR intelligence, they implicitly make use of it in both proactive and reactive

investigations. But it appears that this is not always the case. There is an indication that many forces have given their divisional intelligence units and crime investigation departments access to the ANPR information, but the extent to which these officers use it is still unknown.

The dissemination of the Investigator's Guide to ANPR¹⁹⁷ and the updated Murder Investigation Manual (MIM)¹⁹⁸ aimed to improve knowledge about ANPR's potential to help with enquiries and investigations of serious crime, particularly amongst Senior Investigating Officers (SIOs), Crime Managers and Intelligence Managers within a police force. The Guidance stressed the need for investigators to understand how ANPR can be used to develop intelligence to support reactive and proactive investigations, improve police activity and ultimately prevent crime. The latest edition of the Murder Investigation Manual (2006) refers to ANPR as another source of investigative opportunities for SIOs. ANPR is included as a potential passive data generator and as a method to be used to identify witnesses or suspects. The guidance appears to have been successful in getting the message across, as research findings confirm that there has been some improvement in knowledge about ANPR and its potential and, as a result, senior investigating officers have started to consider using ANPR more on a regular basis:

'This is the biggest growth area that we have at the moment. We probably have 300 ANPR vehicle enquiries a week, calls for searches within our force and from all over the country. We use it a lot and had some very good successes.'

(Police Officer, F17)

Officers' level of awareness about ANPR's investigative potential is also believed to have been influenced by the level of promotion of ANPR within a force. However, respondents mention their frustration when it comes to passing on the message about ANPR's potential benefits within policing. Common practice is that officers who project manage ANPR at force level make presentations at relevant courses or before senior officers in order to raise awareness about ANPR. But this is not a structured or consistent approach to promote ANPR

¹⁹⁷ ACPO (2006a).

¹⁹⁸ ACPO (2006b).

at all levels within a force, which ultimately has an impact on officers' awareness about ANPR developments and updates.

It appears that investigating officers are now more willing to use ANPR because of the wider coverage of ANPR fixed cameras and the improvements to the Back Office. Respondents argue that the Criminal Investigations Department's (CID) interest in ANPR increased since the DVLA 'White List' facility has been made available. This is a list of all vehicles registered in the UK providing a vehicle classification, model type and colour, which is perceived to have unprecedented benefits in investigations in that enquiries for vehicles can be progressed without the need for a vehicle registration number, as was the case in the past.

It appears that in those forces where the investigative side of ANPR has become a big area of development senior investigating officers adopt ANPR as an imperative line of enquiry in the same way as with CCTV, telephony and DNA. Nevertheless, officers indicate that the extent to which ANPR is used in an investigation is, after all, dependent on the amount of resources that senior investigative officers want to put into an investigation:

'... all we can get them [the investigation team] is a list of registration numbers, somebody then has to find out who the owners are, interview them or possible suspects and so on. And it is all hugely intensive work.'

(Police officer, F1)

4.5.1. Opportunities provided by the use of ANPR in post incident investigations

Post incident or reactive investigations typically start with the discovery of a crime and seek to bring the offender to justice by uncovering material that identifies suspects and provides sufficient evidence to enable a court to determine guilt¹⁹⁹. In order to identify opportunities presented by ANPR in the investigation process, respondents were asked to give examples of criminal investigations where ANPR had an input. They highlighted numerous successful scenarios where ANPR was utilised to investigate serious crimes such as fatal traffic collisions, murder, kidnapping and terrorism. Given the confidentiality nature of some investigations, not all cases are disclosed here but they all fall within the remit of three main

¹⁹⁹ ACPO (2009: 47).

analytical approaches used by officers to assist in reactive investigations involving a vehicle. These are post incident analysis, convoy analysis and vehicle pattern analysis. Along with other analytical techniques such as geographical profiling, location time analysis and sequential time analysis, these products have been designed to assist police officers in both proactive and reactive investigations. Some of these products are already available for searches at national level through the ANPR Data Centre and at force level via the Back Office Facility, others are in the process of being developed and tested by police forces in Britain.

The potential of these analytical tools was highlighted in the *Investigator's Guide to ANPR*:

- *Vehicle Pattern Analysis* is presented as a useful tool to extract ANPR data on vehicles of interest, with particular emphasis on identifying patterns of movement;
- *Geographical Profiling* offers the potential to identify general patterns of travel and specific locations or journeys of interest to the police by representing ANPR data on a map;
- *Location Time Analysis* is designed to highlight inconsistencies in ANPR data so that 'ghost' plates or rung and stolen vehicles could be identified;
- *Sequential Pattern Analysis* facilitates the identification of behavioural patterns of a vehicle of interest and could flag up unusual changes in travelling patterns;
- *Post-incident Analysis* facilitates the research of ANPR data between certain times and specific ANPR cameras to identify potential suspects or witnesses;
- *Convoy Analysis* enables the identification of vehicle of interest travelling within defined time parameters of each other in the same area and direction, so there is the potential to identify additional suspects/accomplices or witnesses²⁰⁰.

Results from the current research indicate that investigating officers typically search through ANPR data in order to identify vehicles within time parameters near to the location of an offence to narrow down potential suspects and witnesses (through post incident analysis). The same type of analysis is conducted in order to verify a suspect's alibis and assist detectives in the interviewing process. It appears that, depending on the type and scope of the

²⁰⁰ ACPO (2006: 14-15).

investigation, investigating officers can use one or more types of analysis to assist in their queries, for example post incident analysis combined with convoy analysis and vehicle pattern analysis. Evidence emerging from the current study suggests that the use of ANPR intelligence in this way has contributed to the success of numerous serious crime investigations. One clear example is the investigation into the fatal shooting of a West Yorkshire Police Constable, Sharon Beshenivski.

4.5.2. Operation Geneva

Police Constable Sharon Beshenivski was shot dead when attending a robbery in Bradford Northern England in November 2005. Her colleague, Police Constable Teresa Milburn was also shot, but survived. Robbers escaped with little more than five thousand pounds. A long and comprehensive investigation followed, *Operation Geneva*, which resulted in six people receiving considerable jail terms.

Operation Geneva is considered one of the most high profile police investigations in recent years. The operation comprised a dedicated team of detectives and support staff under the direction of a Detective Superintendent from West Yorkshire Police. As the senior investigating officer (SIO) for this operation, he was interviewed for the purpose of this study and expressed his views on the proceedings of the investigation. He indicated that the *Operation Geneva* team worked methodically and with determination to identify and convict all those involved in the incident. As part of the investigation process, thousands of hours of CCTV footage from around the country have been examined and re-examined as the full circumstances and the roles of those involved became clearer. Detectives have checked both council-owned and private CCTV from Leeds and Bradford. They have managed to track through CCTV three vehicles involved in the robbery, a silver Toyota 4x4, a black Mercedes SLK 200 and a Toyota Corolla which travelled in convoy from Leeds to Bradford on the day of the incident. The CCTV network was linked in to West Yorkshire Police's ANPR system in Bradford City Centre (also known as the *Big Fish*²⁰¹). Some weeks into the investigation, detectives became interested in a fourth car involved in the robbery, an Audi A6. They found that the Audi had been flagged on the *Big Fish* ANPR system five days before the robbery

²⁰¹ The *Big Fish* ANPR system in Bradford is linked to a series of fixed CCTV cameras within the city centre, aiming to capture details of every vehicle entering the City Centre.

and images of the vehicle were captured on CCTV. The police say that this car drove around the area where the robbery took place on a reconnaissance exercise.

The SIO argues that the CCTV and ANPR played a major role in the presentation used by the prosecution in the trial. The images²⁰² generated by the ANPR system were pivotal in identifying the suspect vehicles and the exact times they were driven to and from Bradford. However, the CCTV and ANPR work was only one aspect of the investigation and many other investigative opportunities have been completed to ensure the capture and collation of all potential evidence. ANPR and CCTV intelligence was used in conjunction with telephony intelligence and other forensic evidence gathered by West Yorkshire Police. Additional support from other forces has also been received, especially the Metropolitan Police Service, Heddle Gwent Police, West Midlands Police and Leicestershire Police. Therefore, when asked about ANPR's role within the investigation, the SIO from West Yorkshire Police argues:

'ANPR becomes powerful when combined with other investigative tools such as CCTV, mobile phones and forensics [...] It is the combination of all methods used that made the investigation successful. That is why it is hard to assign importance to each element; they are all equally important!'

It appears that in the case of *Operation Geneva* the police have used *vehicle pattern analysis* and *post-incident analysis* to identify the cars involved in the incident, but also *convoy analysis* to identify other vehicles linked to suspects. The ability to identify vehicles associated with the main suspect vehicle and potential accomplices is perceived as one of the biggest advantages generated by analysis of ANPR intelligence. In this case, ANPR helped in identifying other suspect cars which otherwise might have not been discovered. These vehicles were used for recognition purposes, days before the crime took place, which proved that there was a conspiracy, a premeditated crime. In this way ANPR supported further evidence leading to new suspects, even months after the incident. *'We had no idea that there was more than one car involved in this'*, argue the leading detectives for *Operation Geneva*.

²⁰² The actual locations of these cameras or where the images were captured were not disclosed in order to avoid any future initiatives or operations being compromised.

This intelligence proved to be crucial in the investigation process. Having located and seized the vehicles involved in the incident enabled the collection of additional forensic evidence which linked the vehicle to the suspects.

4.5.3. ANPR's input in other major crime investigations

ANPR's ability to quickly identify the movements of a suspect vehicle to enable the extraction of other evidence (e.g. DNA, fingerprints, CCTV) is perceived by many detectives as a substantial ANPR benefit. Time is crucial in an investigation, either proactive or post-incident. The more time goes by, the less likely the chances to find the victim, prevent the crime or recover forensic/other evidence to link suspects to crimes and crime scenes. Respondents provided examples of investigations where ANPR proved to be good at quickly identifying suspect vehicles and track them down to enable the recovery of necessary additional evidence. Within *Operation Geneva*, detectives used the intelligence gathered from ANPR to inform a more comprehensive and specific search of CCTV.

This is mirrored in *Operation Olive*, which was the investigation into the road death of a person in Essex. On this occasion, four 'cruiser cars' were seen racing together in the Southend area, which later resulted in the death of a person when a car crashed in Benfleet. A search of the ANPR Back Office was able to place three of the cars together when they entered and left Southend, with corresponding pictures of these vehicles. This gave accurate timelines to the investigation and showed other routes for consideration in the CCTV strategy. Similarly, the investigation into an armed robbery in Loughton, by checking ANPR, officers were able to not only identify a car involved in the robbery, but also link it travelling in convoy with another suspect vehicle. Pictures of both vehicles helped the investigating officers by giving timelines for CCTV coverage along the street where the robbery took place. In particular, one of the vehicles was seen a week earlier 'scoping' the route prior to the robbery. Suspects were arrested and charged.

Another relevant example is *Operation Orchard*, which was a murder investigation in the City of London, where ANPR was used to identify two of the vehicles used by three of the suspects. This facilitated early seizure of these vehicles and the recovery of forensic evidence linking at least one of the suspects to both the victim and the crime scene. Long term use of

ANPR data was deployed throughout the enquiry to assist in keeping ‘tabs’ on the defendants whilst on bail, which proved especially useful when a sub-operation was opened involving witness intimidation. Six men were sentenced for a total of 23 years, including a life sentence for murder.

As the passing of time is one the biggest disadvantages in an ongoing investigation, ANPR’s ability to ‘kick-start’ an investigation or offer new lines of enquiry is highly appreciated. There are examples of investigations where ANPR was not only used to identify suspects and witnesses, but also victims and to prevent further crimes from being committed. Such an example is the investigation into the disappearance of a young girl in London where ANPR (in conjunction with other technologies, i.e. telephony) has helped towards identifying the location where the girl was held and prevented a potential rape or murder which could have followed her abduction. Similarly, by using convoy analysis following the unsuccessful bomb attack on the *Tiger Tiger* night club in London, near the Picadilly Circus area, the police were able to identify the second, still outstanding Mercedes within the critical time period which allowed for the safe disposal of the second device at Hyde Park Corner NCP.

‘... what ANPR does, it gives you a good start for your enquiry. It is giving us the clue as to what the “needle in the haystack” looks like to be able to start the search from somewhere. It makes the search less time consuming and more productive and focused [...] In a murder enquiry it gives you a number of potential avenues you can follow.’

(Police Officer, F25)

ANPR brings forward queries which would have not been possible before, search parameters that previously did not exist, such as the vehicle registration mark (VRM), otherwise known as number plate, or the make and model of a vehicle or the exact time and location of a vehicle. Detectives appreciate the ability to obtain the information about the time and location of a vehicle without relying on police officers, witnesses or chance. Their opinions on ANPR’s benefits in post-incident investigations are reflected in the following quotes:

‘Before ANPR, we just did not have that data. This is extra evidence. Before you would have looked at different evidence, witnesses etc. ANPR is another tool that you can use to try to

narrow down the number of vehicles that you are interested in. This information was not available in the past...'

(Police Officer, F3)

'As a SIO [Senior Investigating Officer], if you had a suspect vehicle, you would ask for stop checks of that vehicle, see if it has been seen by anyone. And people get missed [...] Now you have got this whole coverage of cameras which potentially may have recorded that registration/vehicle to a certain point in time. So for a SIO in a post incident investigation, trying to build a pattern of movement of a suspect, this is extremely helpful. So post-incident is superb, if the facilities are there.'

(Police Officer, F14)

Detectives argue that by using ANPR intelligence, the investigation process shortens and as it is time saving, but it could also save money in an investigation. Because of its computerised and automatic nature, ANPR has the potential to make the investigation more efficient in terms of time and numbers, more cost effective:

'As far as post investigation goes, it is priceless. You just cannot calculate the benefits or how much money you save on resources [...] Because even if it does not give you the result as such, it will give you some information, an area, somewhere else to look. It will always give you a little bit more.'

(Police Officer, F2)

Talking about ANPR's role in a rape investigation, a senior police officer from West Yorkshire Police argues:

'In the first week we had ANPR in Bradford, we arrested a man within six hours of committing a rape on a woman that he was a stranger to, so very little chance of physical identification. We had DNA, but there was no previous conviction. We would have been hunting him for weeks or months maybe. We found him within 6 hours because of ANPR. The victim said "he came down that street about 3pm and there was a black car". That's all we had. But within 10 minutes of research, we found the car, got the man, got the forensic evidence (e.g. victim's clothing fibres on the car seat, semen etc), everything. He got 15 years for rape and we were happy that we took a rapist off the street and saved the taxpayers

of West Yorkshire money. Rape investigations costs can range from £20,000 to £50,000. That money could be spent for something else.'

ANPR's advantages go beyond offenders and suspects. The identification of witnesses is a very important part in the criminal investigation process. Respondents provided numerous examples where ANPR was used to gather information on potential witnesses to serious incidents. ANPR is generally used to identify who would have driven past the scene within a certain time frame. Further research is usually undertaken to narrow down the sample of both suspects and witnesses. The above sections provided examples where ANPR evidence was crucial in identifying witnesses which proved essential in securing a conviction.

ANPR is also appreciated as it can corroborate or negate existing evidence in an ongoing investigation, for example with regards to the movement of suspects, the time and location of sightings. Respondents indicate that there are cases where ANPR can back up information gathered by intelligence teams or it can bring out new or different information which could be crucial in an investigation. Examples provided by respondents point towards ANPR's ability to provide helpful intelligence towards negating or checking an alibi. This is another advantage which is highly appreciated by police investigators, particularly detectives involved in the interviewing process. Examples are provided when ANPR provided evidence towards negating an alibi and having suspects confess their crimes:

'It breaks an alibi [...] By being able to show that someone is lying it helps the interview; it gives you confidence and destroys theirs.'

(Police officer, F10)

Operation Piper is a good example where ANPR was used in this way. *Operation Piper* concerned the brutal murder of Annie Garbutt, 74 years old, found in Mirfield, West Yorkshire, in May 2007. At Leeds Crown Court in May 2008, Joanne Hussey was found guilty of the murder of her grandmother, Annie Garbutt. When interviewed, Joanne said that at the time of the incident she was at home, sleeping. However, ANPR intelligence helped towards negating her alibi. Her car was picked up by ANPR on more than one occasion in relevant locations at relevant times, which linked her to the crime scene. Another example

highlighting this particular ANPR advantage is the investigation into the murder of Hannah Phillips, who was reported missing from Rayleigh, Essex on approximately April 12, 2007. On April 23, Hannah's handbag was found on the beach at Jaywick, near Clacton, 60 miles away from her home. The assumption was that she committed suicide. As a direct result of intelligence provided by ANPR, officers of the Rayleigh major investigation team were able to link the suspects to the Clacton area at the time. They were able to prove that the granddaughter's boyfriend had driven through that part of the coast in the small hours of the morning into town and out a half an hour later. This resulted in sufficient evidence to put to the suspects resulting in a confession of murder.

Detectives argue that ANPR can be used in conjunction with other intelligence to ascertain movements of targets and vehicles. There are cases where ANPR was used to profile a suspect's movement not only in reactive, but also proactive investigations. In proactive investigations, the analysis of spatial and temporal data provided by ANPR hits combined with existing intelligence enable investigating officers to make predictions regarding the likely whereabouts and lifestyle of suspects. ANPR appear to have been useful in offender profiling prior to an operation and there have been a number of significant examples where ANPR has assisted investigations whereby targets have been known to use the main arterial roads coming in and exiting a particular force area (for example as part of intelligence gathering for serious drug trafficking and series of robberies across regions). This approach is useful as it allows preparations and appropriate response to be mounted, resulting in positive outcomes in terms of arrests of serious offenders and an effective use of police resources. An example of this approach was an investigation into three linked armed robberies having taken place in three different locations in Kent. Investigators from Kent Police analysed the intelligence from the ANPR cameras in the vicinity of each of the robberies and discovered that of the 40,000 vehicles recorded overall only two were captured in the vicinity of all three robberies. Through further investigation, one of these vehicles was found to be directly involved in the crimes.

Similarly, in post incident investigations, it appears that ANPR has the potential to help towards creating the geographical profiling of suspects. This is particularly relevant to multiple linked offences, where the examination of time and place is crucial in understanding

criminal behaviour. A relevant example is *Operation Sumac*, a 2006 investigation into the murder of five women working as prostitutes in the red light district of Ipswich, Suffolk. ANPR was used on this occasion in conjunction with CCTV footage to identify the suspect's movements in and out of the red light district around the times relevant to the investigation. On this occasion, ANPR intercept teams were deployed to Suffolk following the murder of the five women, forming a ring around the area where it was believed the victims were picked up by a vehicle. This ring made it impossible to enter or exit the area in a vehicle without passing a static ANPR. This enabled the gathering of intelligence on vehicle movement in and around the area, information which was retrospectively checked to try and identify an offender or potential witnesses frequenting the area.

Interviewed detectives confirm that these are the biggest opportunities offered by ANPR in the investigation of serious crime. They offered numerous examples of investigations where ANPR was recognised to have had an invaluable input. As one police officer stated, '*ANPR is an investigative tool, once you've used it, you use it all the time.*' Another officer states '*... there are so many examples that it becomes everyday practice for us.*'

4.5.4. Perceived limitations to the effective use of ANPR in post-incident investigations

Although the majority of those interviewed (85%) agree that ANPR is a great investigative tool, they also highlight some of the limitations relating to the use of ANPR in the crime investigation process. There is a consensus amongst detectives that ANPR, as any other investigative tool, if used on its own has limited value. Only when combined with other intelligence, ANPR can reach its potential. This is mainly because ANPR's main limitation is its focus on number plates and vehicles rather than individuals. ANPR can typically identify and locate vehicles and link them to crime scenes, but more research and intelligence gathering is necessary in order to link a suspect to this vehicle, to get more weight in an interview and the overall investigation.

The need to use ANPR intelligence in combination with other evidential sources is also related to the technological weaknesses of ANPR. Officers indicate that ANPR, as any technological evidence, is not 100% accurate. One can argue that, just because a vehicle has not been captured by an ANPR camera, it does not mean that the vehicle was not in a

particular location at a given time. As previously argued, ANPR reads could be influenced by poor lighting and weather conditions, obstructed vehicles and volume traffic, speed of vehicles, obstructed or tampered with number plates.

One of the limitations mentioned by investigating officers relates to the mechanisms enabling links between police forces' ANPR Back Offices and the lack of straightforward information sharing processes²⁰³. Speaking of cross-border investigations, detectives highlight their frustration of having to break down the investigation for each force area, a very time consuming process when limited time is available during an investigation, when there is pressure to deliver results. There is hope that the National ANPR Data Centre will facilitate cross-border investigations and searches beyond forces' own area. Similarly, the limited access to ANPR data other than those of the police (e.g. Highways Agency, private sector) is seen as a missed opportunity and an impediment to the effective use of ANPR in an investigation.

Other limitations have been identified in relation to the coverage and set up of ANPR cameras. Poor or inadequate coverage of cameras can definitely hinder an investigation. In Bradford, West Yorkshire, for example, the *Big Fish* ANPR system covers all vehicles coming into, but not leaving Bradford. As a result, detectives have to compensate by using CCTV for any vehicles of interest, which increase the investigation time. So the benefits initially gained by using ANPR are weighted down by these impediments – although senior investigating officers admit that there are cases where the usefulness of ANPR outweighs its limitations.

There is a consensus amongst respondents from focus groups and interviews that an important factor that affects the extent to which investigators use ANPR is a poor understanding of ANPR technology and its capabilities. Without knowing what ANPR can do and cannot do, its advantages and limitations, detectives are more likely to use more established and familiar techniques in the investigation process.

²⁰³ It is expected that this is no longer a limitation, as the majority of police forces in England and Wales have put in place the type of infrastructure which should enable direct links between Back Offices (BOFs).

Not only are officers largely unaware what ANPR can or cannot bring to their area of work, but there is also a mindset within roads policing that ANPR is an intercept tool rather than a ‘crime’ tool. Unsurprisingly, because it is seen more as a traffic policing tool, there is less interest from crime and intelligence departments. Some respondents believe that it is time to make a decision to move ANPR firmly away from the roads policing environment to the crime or intelligence business area:

‘Roads policing have taken ANPR as far as they could with the resources and knowledge they have got [...] Given all the limitations in terms of intelligence and resources, they have done a great job in securing all the arrests and disrupting criminals on the road. But to fully realise ANPR’s benefits in the future, the ownership has to be handed over to crime and intelligence [...] It is a natural progression, it’s taking it to another level and hand it to the people who have the right resources and skills to take it to that level.’

(NPJA Representative, National ANPR Steering Group)

Investigators and analysts appear to know little about ANPR in terms of how the data can be interrogated and used in more advanced investigations. Some senior investigating officers are confused about ANPR’s capabilities and recognise that they lack the basic knowledge that they need in order to use ANPR in an investigation. Gaps in the knowledge include: knowing the location of cameras and their specifications; how to access the Back Office and how to make most of the data; if the system supports 14/7 usage; if the ANPR data collected by organisations other than the police could be used in investigations; regulations on handling and presenting ANPR evidence etc.

If detectives do not know what exactly ANPR can and cannot do, how can they judge whether it can be of use, how can they know what to ask of it? This lack of knowledge about ANPR’s capabilities and limitations appears to influence officers’ opinions about what they would like the system to provide them with. As there is little awareness, there is little interest and use. This links in with lack of training of officers from all relevant departments, not just traffic. The presentations provided by ANPR managers to intelligence development courses are useful but not sufficient to raise awareness of ANPR amongst police investigators.

Training needs to be more streamlined and applied to existing officers using ANPR technology or working with ANPR data, not just new recruits.

4.5.5. The use of ANPR intelligence as evidence in prosecutions

There is an indication that the use of ANPR intelligence as evidence in Court follows the national guidelines regarding disclosure and CCTV evidential procedures and regulations. ANPR evidence is typically presented as an image of a vehicle and therefore treated in the same way as CCTV evidence. The exhibit also includes the registration mark and the time and location of the picture. When using ANPR evidence in courts, forces appear to apply for PII, which stands for Public Interest Immunity. PII is a branch of the law of evidence dealing with claims arising from public interest grounds to exemption from the normal processes of disclosure²⁰⁴. This means that, when presenting ANPR evidence, the police generally do not disclose or disclose sensibly. This is reflected in the following quote:

‘... if we submitted a file we would put on sensitive material and specify that ANPR was used and that we held information on that vehicle. That will then go to the CPS and we will apply for PII and we would say that it was a police tactic and it would frustrate the police’s efforts if that information was released to open court. The judge will then make a decision on how relevant that information was and he or she felt that it would frustrate counter terrorism and policing tactics, then he or she would apply PII ruling out disclosure in an open court.’

(Police Officer, F10)

Respondents indicate that they had a lot of cases go through court but the ANPR evidence has not been challenged just yet. This is perceived as being an advantage, as ANPR has its flaws which could weaken the evidence. By providing a plate patch image one cannot a hundred percent say that the plate was on the car driven by that person, hence ANPR evidence will only be seen as supportive evidence and never be used as primary evidence in a case in court. However, as ANPR is developing and more cases use ANPR evidence, there is an expectation that defence solicitors and barristers will start challenging ANPR, not necessarily the evidence (e.g. the quality of the exhibit, the link between the suspect and the car etc), but

²⁰⁴ Richardson (1998: Para 12.27). A PII order would be issued if the court decides that the public interest in disclosing certain documents is damaging and outweighs the public interest in the administration of justice – which demands that relevant material is available to the parties to litigation. The majority of PII claims come from state agencies due to concerns about risks to national security and reduced effectiveness of the police.

could be just the process of gathering that evidence (e.g. the signage of fixed and mobile ANPR cameras etc). The argument is that, if ANPR data is used for intelligence purposes, it does not have to be 100% accurate, because more research and analysis is done around it and other information is included in order to create the bigger picture. However, if the data is produced for evidential purposes, then the integrity has to be complete. Given the expansion of ANPR cameras and the Back Office search facility amongst all forces in the UK, it is important to make sure that forces use a consistent and strictly regulated approach in producing ANPR evidence. *‘If you want to use the evidence correctly, then you need all the checks being evidenced that they have been carried out on these systems, regardless if the checks produce positive or negative results’* argues a police officer (F24).

There are national standards²⁰⁵ that have been developed in order to regulate the use of ANPR across forces and deal with some of the issues with ANPR as evidential. But the national lead for ANPR has his concerns:

‘... the national standards clearly say that an ANPR camera must work to a nationally agreed time stamp/clock and must have its national positional coordinates stacked onto it, so any read from that camera must have a proper standard of time and location with it. Many of the cameras still don’t and those things have to be sorted. But again the systems and processes we are now bringing in will give us much greater ability to do that. Forces have the guidance on how to use it, but don’t necessarily follow the guidance, so then it becomes an issue of an auditing regime to make sure it is implemented and standards agreed.’

(ACPO Representative, National ANPR Steering Group)

As argued above, the use of ANPR evidence in post-incident investigations is perceived to have its flaws, in particular with regards to ANPR’s ability to link a vehicle to an individual at a given place and time. ANPR can prove that a vehicle was at a certain location at a certain time and that is indisputable; it is photographic evidence and it is all digitally logged and stored. But one cannot prove who was driving that vehicle and that is disputable evidence. With live operations, when intercept vehicles respond to a hit, it is different; the vehicle is normally stopped with the person sitting in the driving seat behind the wheel, so there is

²⁰⁵ National ACPO ANPR Standards (NAAS) (ACPO, 2008).

nothing to dispute. The officer can provide the evidence about who was driving the vehicle at the time. But in post-incident investigations, the situation changes, it is all in the past and the ANPR intelligence cannot be verified other than by checking available additional pictures of the vehicle at the relevant place and time.

4.5.6. Good evidence vs. loss of privacy

This brings up another emerging argument which is that ANPR good evidence is dependent on the quality of cameras and their ability to take clear pictures of occupants of the suspect vehicle. Many officers stated that the chances of identifying the driver and passengers of a vehicle are very small and there is a need to improve the quality of images captured by ANPR cameras or possibly increase the use of these cameras alongside Digital Video Recording (DVR). But this poses a dilemma between the effectiveness of ANPR as an evidential tool and ensuring people's privacy when travelling in their vehicles.

ANPR was designed to capture vehicles' number plates, and from that perspective, the laws and guidelines regulating its use are appropriate, as number plates are publicly displayed and not considered private space. But if ANPR's purpose changes or adapts and cameras are designed and used to identify people in vehicles or if used in conjunction with facial recognition software, then it raises important ethical issues which need to be addressed. Higher spec cameras and systems could be more effective but also more intrusive. Similarly, the extensive use and analysis of ANPR data in conjunction with other police intelligence (or information gathered from third party agencies) could raise issues around the infringement of civil liberties particularly of those individuals whose vehicles do not generate ANPR hits, hence are, for what we know, law abiding citizens. As will be argued next, using ANPR data in this way brings the potential to improve police effectiveness and prevent crime. There is, of course, the potential to solve undetected crime or identify unknown criminals, but there is also the potential to impact on innocent people's privacy rights, so where do we need to draw the boundaries?

4.6. ANPR's potential to generate strategic intelligence in crime investigations

With the development of the National Intelligence Model (NIM), the police have started to look beyond reactive investigations and move towards targeting active criminals on the basis of intelligence. The National Intelligence Model (NIM) is an intelligence led business model utilised by police forces in the UK to gather and manage information in order to enhance police activity. The model requires that information is fully researched, developed and analysed to provide intelligence that helps drive the decision making process, guide investigations and influence deployments in the law enforcement effort. The ACPO ANPR Strategy for the Police Service²⁰⁶ advocates integrating ANPR into mainstream policing and fully embedding ANPR into the NIM by developing local, cross-border and national intelligence applications alongside other criminal intelligence analysis.

Intelligence usually means making inferences from large amounts of data. As argued before, the data produced by ANPR systems can be used to inform intelligence processes, operational policing and investigations. Historical ANPR data can be searched to identify specific information necessary in a post-incident investigation, but it can also be analysed proactively to create the profile of a target (i.e. a suspect, related suspects or a criminal network) or the profile of a problem (crime patterns). The retrieval of ANPR data within predetermined search parameters is very useful for investigations – and the sections above highlighted some of the benefits arising from the use of ANPR in this way – but the data need to be further analysed to enable an intelligence-led approach and enhance police activity in all areas. Results emerging from this study indicate that ANPR's potential to generate strategic intelligence does not match current police practice.

Interestingly, 75% of the twenty police forces surveyed in 2009 pointed to the investigative potential of ANPR data as the main benefit of ANPR, particularly in terms of intelligence gathering and intelligence-led policing. Respondents seem to believe that by exploring ANPR data there is the potential for the police to:

- Work 'smarter', so they could make more effective use of resources through targeted operations, proactive deployment and response to ANPR hits;

²⁰⁶ ACPO (2007).

- Aid surveillance and intelligence gathering on strategic routes for counter-terrorism and serious crime or help towards early intervention on tackling threats;
- Understand crime patterns and trends and enable offender profiling, which would help them to stay one step ahead of criminals and
- Build the bigger picture of criminality, which would enhance effectiveness in all areas of policing.

4.6.1. Missed opportunities

The majority of respondents (75%) could see the benefits of using ANPR proactively, yet this is the area least developed. There is some evidence suggesting that forces have started to proactively analyse ANPR intelligence to support the production of NIM products (as part of the tactical tasking and coordination process), particularly to identify target vehicles and conduct more informed operations – in terms of the optimal location and time for intercepting these vehicles. However, despite all progress in this area, ANPR still appears to operate in isolation of the full intelligence picture. ANPR is typically not linked to in-force crime or intelligence systems, which makes the analysis and layering of data more difficult to achieve. To address this issue, some forces have purchased or developed analytical solutions to enable the integration of ANPR intelligence with other sources of intelligence for analysis – although the extent to which this type of approach could be currently replicated by other police forces is limited.

There is also the issue around information sharing. This is likely to be due to a typical resistance to change within policing and reluctance to share information (between departments and divisions within a force or with other police forces). ANPR is about vehicles which are mobile; vehicles cross divisions, police forces; crime does. If relevant departments are not working together, then there are missed opportunities, particularly if patterns of crime are changing in the current climate of increased number of vehicles on the road and increased commuting distances. As argued in the literature review, there is a belief that offenders tend to travel short distances to commit their crimes ('least effort principle'), although it appears that ANPR could challenge the existing evidence about travelling criminality. Back Office searches indicate that offenders appear to travel further and beyond force boundaries and further than previously believed. Are offenders more likely to be 'commuters' than

‘marauders’?²⁰⁷ Is criminal behaviour more organised and planned than we think? Are criminals travelling further to commit crimes and avoid detection? ANPR could be used to enrich our understanding of travelling patterns and criminal behaviour.

ANPR provides useful information regarding the presence of a vehicle, both in time and space. At present ANPR is typically analysed in isolation of the full intelligence picture. The intelligence that could be provided by ANPR is not fully realised mainly due to the lack of integration within other core data capture systems such as crime, incident, warrants, intelligence data recording or partnership data. If these other legacy systems provide datasets that could be collated into a single data warehouse then where the number plate or details of a vehicle are captured, the links between disparate data sources can start to be fully examined. This data warehouse could provide a repository to facilitate both data collection and analysis, with the key benefit of having information in a single location as opposed to data recorded in unrelated and potentially incompatible formats throughout the organisation. With the data warehouse providing the mechanism to extract, transform and load data into a corporate standard, an over-arching search tool could then perform queries on various sources on information for use within further analytical products. With the ability to link a spatial occurrence from one dataset to another, the inclusion of ANPR data would provide a potential link between seemingly separate incidents. For instance, an ANPR record may not trigger a ‘hit’ from the link to national systems, but bringing the data into a warehouse might reveal the vehicle was seen acting suspiciously near a spate of burglary dwellings (link to the crime data), or that the vehicle had been causing nuisance through inconsiderate parking (incident data) or even that a vehicle with a similar vehicle registration mark had been seen close to an operational address of interest to the counter terrorism unit (link to intelligence data).

With the ANPR providing a record of a vehicle location, and with the other key datasets also recording the geographic location of crimes or other police and partnership data, the police analyst will have the ability to utilise a Geographical Information System (GIS) to start to

²⁰⁷ Research distinguishes two types of traveling offenders: ‘marauders’ who commit offences close to their homes and ‘commuters’ (Canter and Larkin, 1993) who tend to travel further away from their home or base to commit offences. Previous research (Wiles and Costello, 2000) indicates that the average distance travelled by an offender to commit theft of motor vehicle is on average 2.36 miles.

spatially analyse the relationship between different sources of information. The number plate becomes the unique key to unlock further information and to start to derive evaluated inferences to start to make either tactical or strategic decisions from the intelligence presented when linked to other key sources of police data. On a national level (as criminality is not limited by Police geographical boundaries) the information added to PNC is limited in its scope as it relies upon the individual police forces to ensure that the data is added manually and accurately. A more sustainable method of including information to PNC automatically via individual Police data warehouses, based upon the collation of intelligence gathered from the amalgamation of various data, would help spread the intelligent picture beyond the scope of the single police service. Thus a bigger intelligence picture could be developed, linking locations, activities, vehicles and people. Such a complex analysis could be used to estimate future movements of vehicles associated with criminality or could identify situational features common to problem areas and help design appropriate crime prevention techniques. A better understanding of crime and criminality would help towards developing and applying more appropriate enforcement or crime prevention strategies at local, regional and national level.

But how feasible is such an approach? Results from the current study indicate that officers are aware of the need for more in depth analysis of ANPR data and information sharing, but a majority (70%) highlight the impediments to such an approach. They argue that there is still a common belief that ANPR is an individual tool, mainly related to traffic and operational support. This means that the analysis tends to be left to one person, generally from operational support. Although there is the will to do it, the road policing department does not usually have the appropriate intelligence capability and resources. Conversely, there is poor commitment and little buy in from both the intelligence department and divisions.

There is usually a limited number of dedicated analysts for ANPR intelligence, which is not surprising, given the call and need for resources within each policing area. Not all forces have succeeded to secure research and analyst capabilities for ANPR. Hence ANPR intelligence tends to be 'second-handed' and ignored. The ANPR intelligence is usually dealt with by analysts and intelligence unit staff who have access to the ANPR data through the Back Office facility (BOF). But, as argued before, access does not necessarily imply that they

actually utilise the BOF or use ANPR data proactively. Statistical analysis of these searches indicates that a very small number of ANPR users that have access to the Back Office account for the majority of searches related to ANPR. Force analysts have other responsibilities and ANPR is not seen as a priority. When ANPR is on the analysts' or detectives' agenda, it is likely to be used for searches on target vehicles, rather than conducting more in depth analysis looking for trends, patterns or relationships between data. Their lack of time coupled with a limited awareness and knowledge about how to exploit ANPR data limits the extent to which ANPR data is analysed in this way. The police are talking about plans to analyse the ANPR data extensively, integrate it with other existing intelligence, although there are currently few forces that can provide examples showing success in doing this.

The intelligence limitations are also exacerbated by a perceived lack of flexibility around IT issues which incurs massive ongoing revenue costs for ANPR and limits its capability to link ANPR data with existing in-force crime and intelligence systems and analytical packages. A comprehensive intelligence led approach to policing would be ideal, where all intelligence, including ANPR intelligence, would be carefully analysed in order to identify common patterns, enable inferences and an understanding of the bigger picture of crime and criminality at local level, potentially at a regional and national level. This is one of the missing links within intelligence led policing nowadays. As one of the officers argued, *'The biggest impediment to ANPR is our lack of imagination'*.

However, establishing such links is expensive and resource-intensive. It will take resources and time to put the right mechanisms and infrastructures in place to enable such extensive analysis and the transformation of all crime and disorder information available into valuable intelligence which would eventually lead to more informed police operations and effective crime prevention strategies. Crime is sophisticated and ANPR is just another tool providing extra information. Analysts have to do all the work to establish links, track back through data, so they need time. There are obviously resource implications. It will need dedication from senior police officers and belief from those working with ANPR technology and ANPR data.

There is an indication that the effectiveness of ANPR as an investigative tool is highly dependent on the mind set of police officers using it. There is a need for a cultural change; a change in the way data is submitted on systems; a change in the way police conduct their investigations and the need to move from reactive to proactive deployment; a change in the way data is analysed to produce valuable intelligence.

'... We just started using ANPR that way. But we are fighting against the established ways of operating – detectives and their check lists and how to go about in their investigations. You're talking about effectively fitting into tasking where it hasn't been done before. I wouldn't say it is meeting resistance because people think it's rubbish; it's just that it's not the way that we go about our business. It's about cultural changes. It's about people thinking that this is the right thing to use.'

(Police Officer, F5)

4.7. Other factors impeding the effectiveness of ANPR as a policing tool

A part from ANPR's role and input in crime investigations and intelligence development, respondents' views were sought on a variety of issues to assess whether they felt that ANPR was a benefit to policing in general and to explore the reasons behind their judgement. Overall, respondents expressed their desire to be able to use ANPR more effectively and pointed out that, in practice ANPR is not exploited to its full potential and will not be unless some of its most significant limitations are addressed.

The biggest impediments to ANPR in general were believed to be closely linked to the management, practice and culture of the police. These cluster around following themes:

- ANPR, a low priority
- Lack of knowledge and performance management
- Resistance to change
- ANPR, the victim of its own success?
- Unreliable registration system
- Political issues: the government, the police and the citizen

4.7.1. ANPR, a low priority

Much of the criticism expressed by police officers and staff related to their belief that ANPR is not seen as a priority at force level, or at least not given the same priority as other policing tools. Whilst there is evidence that some forces have improved and managed to incorporate ANPR into mainstream policing, most did not accord ANPR the same priority level as other policing tools and have problems securing the appropriate funding for ANPR. The majority (85%) of those speaking on behalf of the twenty police forces participating in the 2009 survey mentioned the lack of appropriate resources as the first biggest impediment to the effective use of ANPR - resources to enable the inputting and cleaning of intelligence used in conjunction with ANPR systems, the effective monitoring and response to ANPR hits in real time and the proactive work and investigative use of ANPR data. This is confirmed by results from interviews and focus groups. There are too few people doing too many things and this is believed to be one of the main reasons why ANPR is not entirely effective.

Thus ANPR appears to struggle to compete with other force priorities for funding. Chief Officers and divisional commanders are, not surprisingly, sceptical about prioritising ANPR over other initiatives and investing their local budgets for ANPR without clear evidence of its effectiveness. Lack of support at senior level obviously has an impact on the amount of funding dedicated to ANPR at force level. Funding is typically restricted, particularly revenue funding towards maintaining, using and enhancing ANPR.

It appears that one of the reasons for lack of support from the management team and local commanders is the belief that ANPR is a resource intensive tool. ANPR is indeed expensive to buy, run and use effectively. As previously indicated, ANPR has the potential to be time and resource saving, but only if appropriate resources are dedicated to it in the first place. Hence in order to save, there is a need to invest, but the investment needs to come first. Officers using the technology on a regular basis believe it is worth the expenditure because they can see the ANPR benefits, but without a valid cost analysis and proof of outcomes, senior management and local commanders remain unconvinced about ANPR's value and less likely to support significant investment towards it. But as with any crime prevention strategy, ANPR cannot 'work' without the appropriate time, people and money invested in it.

The problem here lies in the implementation processes and development of ANPR both at force and national level. As argued at the beginning of this chapter, ANPR was one of those crime prevention tools that were 'forced' by the government upon police forces around the country, being praised for its effectiveness within policing. The government provided all forces with ANPR technology but no guidance regarding the best ways to develop it and make the most out of it. Police forces have embraced the technology with much enthusiasm, but wrongly assumed that, once the technology in place, there was no need for further investment or commitment. Once the initial 'craze' about ANPR passed, it appears that the belief in it diminished, particularly at senior officer level. The police realised that ANPR brought with it significant revenue or running costs, which 'slowed down' its development and overall effectiveness and with it senior officers' enthusiasm to support the technology and invest in it. Even some of those officers working with ANPR on the ground have ceased to believe in its potential to deliver, after many unsuccessful attempts to gain support from management, to make things 'work'. Lack of support could also be the result of the fact that

ANPR was labelled as a ‘motor offence’ policing tool, a ‘traffic’ tool. Lower rank officers complain about the lack of support from middle/upper management.

‘If you just leave it on an ad-hoc basis with the wrong officers and if you don’t invest in the intelligence side, it will just go to waste. The only time it might come back to light is if we have a terrorist offence down in London and they will check all cameras and ANPR will be great again for 2 minutes [...] ANPR won’t be used to its potential unless you’ve got senior officers who understand it, who put time and investment in it, officers on the street using it and in the back offices doing intelligence work...’

(Police Officer, F27)

Lack of commitment to ANPR from senior officers and the implicit lack of funding have a direct impact on the quality and use of ANPR intelligence and the ability to respond to ANPR hits. The importance of having good quality intelligence inputted onto the ANPR systems has been previously highlighted. There was consensus that poor or irrelevant intelligence hinders ANPR’s effectiveness in terms of operational response to hits and police stops. It appears that, because of the lack of direction from senior management, officers working with the technology on the ground submit intelligence on suspects but not necessarily their vehicles, missing an important possible link between criminals, vehicles and crimes.

Police officers on the beat and neighbourhood policing officers have an advantaged position to collect vehicle intelligence through their routine and consistent engagement with the local community. Previous research has indicated that neighbourhood officers can make a valuable contribution towards enhancing community intelligence²⁰⁸. With their knowledge-based expertise about the location of suspects, associates and their vehicles, neighbourhood policing officers could provide valuable situational intelligence for ANPR. The information they provide on vehicles and people linked to these vehicles could corroborate or even contradict existing intelligence. The lack of knowledge on situational details and context (which could be provided by experienced officers performing response and community policing tasks) and the lack of information sharing between relevant departments hinders the effectiveness of ANPR and policing in general. Previous research has argued that the unsystematic ways in

²⁰⁸ Fielding (1995), Manning (2004) and Innes and Roberts (2008).

which the police access and make use of intelligence data could have an impact on the effectiveness of policing at ground level:

'... as the internal division of policing labour becomes increasingly complex and organised around a multiplicity of specialist roles, the problem that arises is how potentially relevant situational intelligence is communicated across and between specialist units who are focused upon particular problems. It appears probable that a "horizontal entropy" will occur to undermine the operational effectiveness of such arrangements by constraining the "richness" of intelligence that is shared. In effect, certain parts of the organizational system will know certain key things, but other components that need to know these same things, will not. As a result, we will see an increasing number of problems for the police, where intelligence was present in their systems, but not available in a timely fashion to officers who needed it to inform their operational interventions "on the ground".'

(Roberts and Innes, 2009: 353)

Low prioritisation has a direct impact on the operational side of ANPR. Not all cameras are monitored, thus response to hits is limited. While the number of cameras has increased, the intercept capability has typically stayed the same in most forces. Some senior officers argue that this is because ANPR is no longer about the interception of hits, but the intelligence gathering and the investigative use of data. However, this does not reflect practice. There is a general feeling that there is lots of intelligence gathering for no specific reason and that something should be done with the data, either by responding to it in real time or using it proactively in investigations. There is no clear direction on how this transition should be managed; what resources should be committed to response or intelligence; what are the exact objectives of gathering the ANPR data and what are the expected outcomes. It appears that there is still an ad hoc approach at force level, with no coordinated response to ANPR. There is a sense of uncertainty about whose responsibility it is to pick up a hit and deal with it. ANPR is entirely at the discretion of each divisional commander who chooses to use it as they like. Some would not even consider using ANPR, as they believe it generates more work and puts a strain on available resources. Others use it on and off to make up numbers and targets. In other words, there is an inconsistent approach to response to hits across police forces. Some forces appear to have developed a very effective intercept capability responding to hits generated by both mobile and fixed ANPR systems, while others have devolved their

ANPR teams and stopped any response to hits altogether, just storing the data on the Back Office.

4.7.2. Lack of knowledge, performance management and evaluation

Lack of commitment from officers, rank and file, goes hand in hand with the level of knowledge and understanding of ANPR. As previously indicated, there is limited awareness of ANPR at all levels (rank and file) and branches of the police service. This is more apparent amongst detectives and analysts who appear to know little in terms of how the data can be interrogated and used in investigations and intelligence development. Without the appropriate knowledge about ANPR, both in terms of its potential and its effectiveness, there is no motivation and drive to prioritise or use ANPR. Knowledge about ANPR's effectiveness is an additional motivational factor, both for senior management and for those officers working with the technology on the ground (operational) or in an analytical environment.

Many police officers argue that people would believe in ANPR more if 'it proved itself' and there would be more support from divisional commanders and chief police officers. But there is no benefit assessment of ANPR at force level. There is a common belief that policing outcomes generated by the use of ANPR combined with intercept capability are still greater than traditional policing on the street. ANPR's input on the number of arrests and offences brought to justice is the most frequent example provided by interviewed officers – and this was evidenced by the 'Laser' evaluations. Other examples relate to the recovery of substantial assets and the removal of unworthy vehicles from the road. The problem, however, is that the police do not typically performance manage ANPR or if they do, they do not cover all areas of policing. The police tend to come up with statistics regarding the number of ANPR reads, hits, stops and arrests, but generally only with regards to the mobile systems and the use of dedicated ANPR teams. Results from the twenty police forces participating in the 2009 survey indicate that the fixed systems are not currently performance managed.

However, measuring ANPR's benefits in all areas of policing is not a straightforward process. Not only there are no mechanisms in place to do it, but it is hard to single out ANPR's specific benefits, as ANPR is typically used in conjunction with other policing tools,

both in operational/response policing situations and in crime investigations and intelligence development. Respondents indicate that they are still exploring ways to measure ANPR outcomes. Some highlight that it is a difficult thing to actually monitor ANPR's effectiveness because, generally, somebody who might have been arrested as a result of ANPR activation, a lot of time they are actually charged with a different offence. Trying to track these offenders through is not an easy process, they argue.

Measuring ANPR's input in crime investigations and intelligence development is difficult, if not impossible at this stage. For example, ANPR's input in the investigation into the murder of PC Sharon Beshenivsky. How was that measured? There is an effect of ANPR on crime and behaviour, because ultimately offenders were arrested and sentenced to prison, but it is an indirect effect; it provides just one form of intelligence or evidence among many others in the wider investigation. In an operational setting, it is easy when you stop a car and you arrest somebody to measure the performance, but measuring intelligence is not a straightforward process. One officer (F2) argues: *'As far as post investigation goes it is priceless. You just cannot calculate how much money you save on resources...'* Another indicates:

'The first problem that we need to overcome is the actual collection of the figures. It is very difficult to collect ANPR "results". The problem is that ANPR is not a stand-alone tool any more than fingerprints, DNA etc stand alone. It can push you in the right direction, it can give you the introduction in a crime investigation and a good starting point in an interview, but it is never used on its own, it's not a stand-alone tool.'

(Police Officer, F25)

Furthermore, no rigorous cost benefit analysis has been undertaken at force level, therefore beliefs about ANPR's cost effectiveness are merely based on officers' views and experience of ANPR. Interviewed police officers indicated that they believed the benefits of ANPR to outweigh its cost, both in terms of operational policing and crime investigations. One police officer (F6) used an interesting analogy, stating that ANPR *'takes road policing from the hunter gatherer system into the industrial age in a trice'*. However, the lack of valid evidence regarding the cost effectiveness of ANPR has led other respondents to appear sceptical about its worth:

'I don't believe that ANPR is cost effective at the moment. We have a lot of equipment that we are not responding to. To make it cost effective we need the research and response capability. And then we will start to see benefit for what we are doing.'

(Police Officer, F1)

Finally, there is no assessment of ANPR's impact on crime. Respondents perceived ANPR as a potential deterrent to crime and a good way to disrupt criminal activity. Where the deployment of ANPR is highly visible and is targeting an area, it is believed to have a 'knock-on' effect on crime levels. These claims are supported to some extent by statistical reports provided by force analysts showing that crime levels have reduced after ANPR operations in an area targeting specific crime and disorder problems:

'We have numerous examples of dedicated operations we ran for a few days in an area and found out that there was an impact on crime in the surrounding area, not just because of stops, but because people became aware that there was a police operation in the area. They tend to have an impact on criminal behaviour in the vicinity. When we did the post crime analysis after the operation, what surprised us was for the time we were doing the operation, half a mile/a mile around the area we disrupted criminal activity to almost a halt; when we left they actually rushed to catch up on their crimes.'

(Police Officer, F14)

When the resulting benefits from such ANPR operations are widely publicised it is believed they serve to increase public confidence and deter the offender from committing crimes in areas where there is visible ANPR deployment and police presence. Respondents believe that, because ANPR cannot 'discriminate' or 'cherry-pick', the public are likely to be reassured that the police are targeting and stopping offenders rather than law abiding citizens.

But no formal evaluation yet exists assessing the benefits delivered by the ANPR systems following the completion of each implementation project amongst forces in the UK. The Home Office collected statistics regarding ANPR's contribution to arrests and offences brought to justice in order to inform the 'Laser' evaluations, but this is no longer the case, as

the evaluations have come to an end in 2006. This decision was welcomed by most officers working with ANPR on the ground, as it has reduced the need to complete lengthy forms, but it also left a gap in gathering information about ANPR's benefits or failures and ultimately assessing its worth.

4.7.3. Resistance to change

An indirect impediment to ANPR's effectiveness is the typical organisational resistance to change within policing. As argued above, there is resistance from local commanders to embrace ANPR, as ANPR is perceived as too resource intensive and involves changing ways police operate to address new crimes and more crimes. To a certain extent, this is understandable, as the police are still driven by Home Office targets, priority policing areas and various initiatives and police commanders are under pressure to meet them. If ANPR is not seen as contributing to this, then commanders will not consider it as a priority. The National ANPR Coordinator (NPIA) states in this regard:

'... you can understand it, when there are only limited resources, that they [the police] won't start embracing something new, which from the outset, is actually quite resource intensive: you need police officers to be there and react to ANPR to get the results back. And many times, Chief Officers have said to me "What would you like me to stop doing to enable me to start doing ANPR?" Well, they do not realise yet that the business benefits of ANPR are significant. But you won't realise the business benefits unless you actually put the resources there in the first place [...] I can understand why some commanders are more reluctant than others. It is a result of the fact that, firstly, they are probably not aware as fully as they ought to be and, secondly, they are not being coerced by the HMIC and the Home Office in using the technology more effectively. That is my view.'

As for the lower ranks, although many officers are keen to use the technology regardless of its limitations, there are others who are simply reluctant to learn and work with new technologies such as ANPR, preferring to use more traditional ways of policing. Some respondents highlight that people who have more years in the job or who have come to an end of their service have their mind set against it, as they think they know their job and they do not need a computer to tell them how to do it. It appears that ANPR highlighted a group of individuals who are 'technophobic' and would do anything to avoid using ANPR. This is

why it is important for the system to be user friendly and ‘bobby proof’, so police officers embrace it more easily. There is also resistance from IT to change existing infrastructures to enable new avenues for analysis, coupled with resistance from crime and intelligence departments which are reluctant to take risks and unexplored avenues:

‘The real barriers to ANPR are not the technology or the costs, as ever it is culture! It’s whether people choose to use it, to believe in it, whether they see the opportunities, whether they know how to use it. It is not perfect, but it can do a lot more than people are currently using it for. And it will be able to do a lot more in the future.’

(ACPO Representative, ANPR National Steering Group)

4.7.4. The victim of its own success?

An important question raised by the development of ANPR within policing is whether ANPR has brought about any undesirable or unexpected consequences which impacted on police practice. Many officers interviewed felt that ANPR is the victim of its own success. The more effective ANPR is, the more crimes are identified, the more work is generated. Firstly, this puts a strain on resources, already stretched to maximum, challenging existing police practice. Secondly, it impacts on officers’ attitudes towards ANPR and their commitment to use the technology effectively:

‘The use of ANPR involves additional man hours processing arrests and completing checks via radio/operators, custody sergeants etc. Frequently these practical necessities are overlooked in the processing of individuals arrested or reported and massive queues develop. We are the authors of our own downfall through over efficiency.’

(Police Officer, F27)

‘The sergeants in custody are very busy anyway and there are more people brought in from ANPR stops. It increases the number of detained people coming into custody. And I think there is resistance there because they are busy anyway and they just think that there is too much work. Some senior officers will say they don’t want any more cameras on their BCU because it generates more work. This is where there is a negative side to it.’

(Police Officer, F4)

ANPR can also have a negative impact on officers' understanding of their responsibility and input in ensuring effective police practice. Many respondents highlight that with ANPR, there is an expectation that it can do everything. There is an argument that ANPR can make people lazy, as some officers tend to rely too much on the technology and not make use of their other policing skills. *'ANPR can be regarded as the panacea for all ills, which is unrealistic. It needs to be regarded as a tool, not a cure'*, argues a police officer (F6). Officers need to understand that all ANPR does is identify to a police officer a vehicle of interest and this is where it stops. Given the poor intelligence used in conjunction with ANPR and technical limitations to the system, it is then down to the officer on the ground to decide whether the ANPR hit is worth investigating and use their questioning and policing skills to develop that into an effective result. One officer highlights the importance of having experienced and skilled officers working with ANPR technology:

'ANPR is like a fishing rod, it allows you to catch your bait, it gives you something, you catch it and then you start interrogating it. After that your policing skill are kicking in. When you pick your team, you need the officers who know how to "dig" and go that extra mile looking into the suspect. And if you don't have that sort of officer, you don't get the results just from the ANPR hit. So whilst I do not think ANPR itself actually brings bad practice, the only thing I could say is that, if an officer becomes too reliant on it they are not going to perform.'

(Police Officer, F27)

Some officers, however, were more positive regarding the extra work generated by ANPR:

'... even if it is more work, it's fine. Because it is our business to stop criminals, that's what we are about after all. But we also have to respond to the public's needs, if there is a domestic incident, a lost child, a car accident, we also have to respond to that. It has given us more work, but also the ability to know more about criminals, information that we did not have before and can be extremely useful in linking incidents with crime trends and getting more clever about the way we operate and prevent more crimes.'

(Police Officer, F8)

4.7.5. Counter-measures

In addition to the challenges presented by the police, ANPR's effectiveness is obstructed by measures taken by offenders to avoid detection. This is in line with the theoretical assumptions presented in the literature review, e.g. the rational choice theory. Respondents indicate that there appears to be an increased offender awareness of ANPR which is believed to have generated some forms of offender adaptation and displacement and the development of *counter-measures*, such as changing or stealing number plates, using other means of transport (e.g. trains, motorbikes, hire vehicles) or avoiding roads which are believed to be covered by ANPR cameras.

Police officers indicate that there is anecdotal evidence pointing towards a sharp increase in hire cars being used for some serious criminal offences. They speak of change of policing tactics to keep up with these criminals, for example, getting involved with hire companies to detect them and provide examples where the partnership was successful and good results have been produced, arresting and sentencing serious criminals.

'The more serious the criminals – the career criminals – the more conscious of ANPR. These criminals never use their own car, never stole a car, they go "safe" and rent a car just to do their crime for one day and change. We didn't see this 10 years ago for example [...] While there is nothing wrong with that car, as it will always have insurance, tax and everything that ANPR could eventually detect and flag up [...] There are always going to be ways to tamper with number plates or change them, to borrow somebody else's car and dealing with it, having a pool car that's having 5 or 6 people that use the same car. The thing that we know is that they will always use a vehicle. [...] they will always try to find ways to beat us, but we are working towards countering their counter measures.'

(Police Officer, F2)

4.7.6. Unreliable registration system

It was previously argued that a major impediment attached to ANPR is the fact that the system identifies vehicle number plates or vehicles rather than individuals. This limitation is exacerbated by a poor vehicle registration system which impacts on the reliability of vehicle registration marks as well. Motor vehicles are usually identified by a number plate displaying a vehicle registration mark (VRM) at the front and rear of the vehicle. All number plates must

meet the Road Vehicles (Display of Regulation Marks) Regulations 2001 and the current British Standards²⁰⁹. The police say that analysis of the Back Office ANPR data indicates that around 12% of VRMs are misread by ANPR cameras. Police officers believe that one of the reasons behind these misreads is that some motorists are using non-compliant VRMs with modified characters or fonts for aesthetic reasons or, as argued above, they tamper with the plates in order to avoid fines or detection from the police. VRMs as they stand are viewed as too vulnerable to traffic or weather conditions and, most importantly, to criminals who alter the number plates to avoid capture. This is believed to impact on the effectiveness of ANPR to read a number plate and correctly identify the vehicle displaying the number plate.

Officers indicate that there is a need for more research and development to improve the identification of vehicles through number plates in conjunction with other technologies. Respondents mentioned the development of tamper proof number plates, so when you try to remove the number plate from the vehicle, it shatters into pieces, and so cannot be reused. It appears that DVLA has approved these tamper proof number plates, but they are not mandatory, which further frustrates the police. A member of the National ANPR Steering Group argues:

‘... it would be very easy to say all new vehicles from the first of January must have these number plates fitted and all other cars must have their number plates by a certain date and it will be tested by the MOT to see if they are there. So literally, within 3 years, you’ll have every single vehicle with a tamper proof number plate. And the cost is not great. Normal plates are about £15, these would cost £20. Even the Motor Insurance Bureau would be happy to make some concessions on the motor insurance if people did it, so the cost would be neutral.’

Other respondents mention a trial conducted by the Driver and Vehicle Licensing Agency (DVLA) which aimed to improve the accuracy of reads by using ANPR technology in conjunction with EVI (Electronic Vehicle Identification) technology²¹⁰. The trial produced a

²⁰⁹ BS Au 145d.

²¹⁰ Between April and June 2006 DVLA conducted a trial of Radio Frequency Identification (RFID) for cars and motorcycles in order to determine if RFID used in conjunction with ANPR could be cost effective to detect stolen or cloned vehicles, Vehicle Excise Duty (VED) evasion and vehicles involved in crime. There is an European working group trying to develop EVI (e.g. chipped number plates, chipped windcreens or chips fitted

very high read rate of over 98% and indicated that EVI was one solution which could be used to overcome problems associated with ANPR such as damaged, dirty or misrepresented plates or poor weather conditions and visibility. Although the use of EVI (either separately installed to the vehicle or to the number plate) has shown to enhance the effectiveness and accuracy of number plate recognition systems, a number of drawbacks were identified. For example, fitting the electronic tag to vehicles would require primary legislation and significant extra costs, while the security of the tag would be questionable. However, the mandatory fitting of tags to number plates would involve mandatory use of theft resistant number plates, development of theft resistant number plates for motorcycles and significant costs estimated at around £3.5 billion per annum. Unsurprisingly, the scheme was scrapped and number plates went back to where they started.

Respondents were very frustrated at this outcome, as they believe it is worth investing in theft or tamper proof number plates. Long term this would not only enhance the police use of ANPR and its effectiveness in detecting criminals, but could also increase the chances of identifying drivers evading tax, speeding fines etc and implicitly increasing revenue for the DVLA. Many respondents indicate that ANPR is only as good as the registration system for vehicles in the UK. The following quote reflects a poor and inefficient registration system:

'... in London there is about 48% conviction rate for speed cameras or 48 per cent effective process rate for the speed camera notifications and that is great against the 20 something per cent clear up rate. But that means that over half of drivers for some reason can evade detection and that is because their vehicles are not registered properly, they nicked somebody else's number plate or the vehicle is sold on ... there are all sorts of reasons why we might not be getting a hit and of course criminals are always trying to find ways of evading detection. We are not sure if it is already specific to ANPR, but in terms of speed cameras, they are doing all sorts of things to evade them, like putting reflective coatings on their number plates etc.'

(Police Officer, F5)

in the vehicle's electronic control unit). They are working towards having Pan European agreement on this, so these chips could be built in manufactured vehicles. But being Pan-European is very difficult to get everybody to agree, particularly if not all car manufacturers agree with the proposal. Germany decided to go against the agreement and, because they are such big car manufacturers in Europe, it was decided that the gap would be too big to continue with the proposal.

Other respondents expressed their concerns and frustration regarding the security of the manufacturer regulation supply of number plates. DVLA have a register of number plate suppliers and they have the responsibility to make sure the number plates are made to a certain standard. But there are around 40,000 suppliers and not all comply with all regulations, for example they will produce number plates that do not reflect in the dark. The police argue that it is hard to identify how big the problem is. They carried out some policing operations with fifteen forces involved, but the results were inconclusive, so they could not produce the evidence for the Department for Transport (DfT) to say that this is not fit for purpose. Unless the number of suppliers is reduced and better regulated, then it is going to be hard for the police to work effectively. Respondents believe that if tamper proof number plates were made mandatory and the number of suppliers were reduced to no more than five or six, policing would become easier and more efficient.

It is believed that the more successful ANPR becomes, the greater the problem of non-compliance is likely to be. The national ANPR leaders cite an example of collaborative work with the DVLA with regards to personalised number plates and express their frustration regarding the feedback from DVLA:

'... we [the police] have agreed with the DVLA that when police officers find a number plate which is not right, they will complete this form, photograph it and get the owner of the vehicle and the police officer sign it and send it to DVLA to count as a first warning. And the next time, they should revoke the number plate. I think in the last 8 or 9 months we submitted to DVLA 6 to 7,000 forms and they have revoked 2 number plates. We actually told them that at this rate it is not worth the effort.'

(NPIA Representative, National ANPR Steering Group)

More support from the DVLA and the DfT appears to be a must in order to improve the registration system in the UK. A better registration system, coupled with more advanced ANPR technology is more likely to increase ANPR's accuracy which is crucial to identify the offenders and protect the law-abiding citizens.

4.7.7. Political issues: the government, the police and the citizen

Other issues identified as limiting the effectiveness of ANPR are less specific to local policing and more about the way ANPR is overseen and driven at national level, particularly with regards to the Home Office's role and regulations and controls regarding the use of ANPR in the UK. The legal status of ANPR surveillance in the UK and any concerns about human rights and privacy issues which the use of these cameras raises are relevant issues here.

Firstly, respondents share their frustration regarding the ability of governmental departments to share information and to find the right balance between a lawful and efficient approach to using ANPR:

'I think there are major issues within the government departments not actually agreeing with each other. The Home Office brought in this system which they put substantial money into it and ... credit to them for that. But then you've got Department for Transport (DfT) that are being awkward about the Highways cameras being plugged into the system. You've got Transport for London (TfL) being awkward about the congestion charge and ANPR being plugged into the system. You've got Data Protection and regulations stopping people sharing data and you've got commercial data (petrol forecourts for example) being stopped from being brought into the thing [ANPR system]. It's a hassle. [...] There are different legal systems, England and Scotland for example which create a problem regarding data sharing [...] So there are lots of political issues.'

(Police Officer, F3)

While grateful for the government's initial investment in ANPR, respondents criticised the lack of consistency in supporting ANPR over the years. The police would prefer the Home Office to have a more active role that they had to date and produce an ANPR Strategy.

'The Home Office had been an intermittent partner in this. On occasions, they have promoted ANPR quite actively, on others they haven't. Funding has been good at times, not so good at others. It doesn't seem to be a clear long term strategy from the Home Office. It very much changes from year to year. [...] I can see no great problem with the police service leading

the operational side of ANPR and NPIA the delivery side; there just needs to be more coherent and consistent government policy to support us.'

(ACPO Representative, National ANPR Steering Group)

Members of the national ANPR leading team believe that the HMIC have not been as supportive as they should have been. As the government spent in total around £40m on ANPR in the last few years, there was an expectation that the inspectorates would take the responsibility to make sure that this investment was actually being used properly by the police service. The ANPR leaders are frustrated that the HMIC has not fully engaged with or endorsed ANPR. The lack of a clear government agenda for ANPR, coupled with little 'enforcement' from the HMIC and the Home Office to use the technology more effectively and limited knowledge about ANPR and its potential could explain why some police commanders are reluctant to develop and use ANPR within their force.

As with any form of 'mass surveillance', ANPR is also limited by its potential to infringe people's privacy and, without the right legal framework in place, to undermine police investigations and prosecutions. There are issues around the legal status of ANPR and concerns about the legitimacy and proportionality of its use by the police. However, as with most surveillance technologies, ANPR has been developed and implemented faster than the legislation regulating and controlling its use. There are aspects that are still vague in particular with regards to the purpose of collecting information on entire driving populations or ways to notify the public of being under ANPR surveillance. The Surveillance Commissioner²¹¹ has warned that ANPR could be operating illegally, as the boundary between overt and covert ANPR is still unclear and, as a result, ANPR cameras could be categorised as covert surveillance under the Regulation of Investigatory Powers Act 2000 (RIPA). He argued that the questionable legal status of the covert cameras could impact on prosecutions and could have an adverse effect on the fairness of the proceedings. The commissioners advised that new legislation may be required to provide a framework for the latest ANPR developments. Similarly, the Information Commissioner's Office (ICO) is examining a complaint by Privacy International over the retention period of ANPR data, who described it as 'unnecessary and disproportionate'. While the police argue that the retention

²¹¹ Office of Surveillance Commissioners (2006, 2007).

of data has ‘intelligence gathering’ value and is useful for national security, the ICO argues that the prolonged retention of ANPR data needs to be clearly justified based on continuing value not on the ‘mere chance it may come in useful’²¹². Finding the right balance between privacy and security is the key to ensuring that ANPR is effective in protecting both the safety and the freedom of citizens.

The police confirm that some of the criticism surrounding ANPR is indeed sensible, although they argue that the way the English Law works can be contradictory:

‘... maybe it is our fault, as we haven’t been very clever ourselves in relation to the police use of ANPR. When you site a camera, have you really thought what user specification for that camera would be? Because we go and put a camera up for speeding, next to a camera up for a red light, a camera up for congestion charging. Highways Authority have put one up for congestion in order to work out at the traffic light phasing. We will put our one up for ANPR, the Local Authority will put one up because they have a responsibility under Crime and Disorder Strategy and then local businesses will put loads of cameras up around their building because they don’t trust us to do the job for them and quite rightly so. I mean you look round you and it is absolutely stunning, so the Surveillance Commissioner has got a point maybe we ought to be working harder at this duality of purpose. I mean if you’re looking at the motorway system you have the Highways cameras, don’t put a CCTV camera next to ANPR, link your highway camera to the ANPR! There is no “joined-up-ness”! We put rules that stop passing information to each other, what’s that all about? And then we all interpret the law in different ways.’

(Police Officer, F5)

When asked their opinion about the formal and informal controls regarding the use of ANPR in the UK, the ANPR leaders at national level are confident that, although there are concerns that need to be addressed, ANPR is subject to controls and regulations and complies with the Data Protection Act 1998 (DPA), the European Convention of Human Rights (ECHR) (Human Rights Act 1998) and the Regulation of Investigatory Powers Act 2000 (RIPA). They argue that they have undertaken work to provide national guidelines on how to interpret

²¹² The Information Commissioner’s Office Report (2006). The ICO generally deals with complaints on the basis of data protection breaches, while the Surveillance Commissioner deals with issues of criminality and RIPA.

the law and to ensure that forces around the country comply with these guidelines. But officers appear frustrated by the Information Commissioner or Surveillance Commissioner's Offices as they tend to criticise police practice but offer little guidance on what is expected to be right. There is a difference between what a regulation says and the interpretation of what it means. Without clear guidance from the Commissioners' Office, the police have a difficult time to 'legalise' the use of ANPR. In light of this, they state:

'... we've issued those types of interpretation of what we think the Data Protection principles mean, but that doesn't mean we are right and until the Information Commissioner makes a ruling either in favour or to the contrary because somebody has contested it or it ends up in Court, it remains a matter of interpretation. That is how the English Law works [...] But the Information Commissioner has actually not issued any guidance. One of the frustrations we do have both with the Surveillance Commissioner and the Information Commissioner is that they will criticise, but they won't issues interpretations. They will tell us they think we're wrong, but they won't tell us what they think it's right. And that is actually quite difficult to work with.'

(ACPO Representative, National ANPR Steering Group)

4.8. An obsolete technology?

Respondents to the interviews were also asked their opinions about ANPR's role within policing in the coming years and their thoughts about ANPR's worth or place in light of new technological developments.

In terms of technological advancements, it is commonly believed that, as long as vehicles are marked by number plates, ANPR technology will not become obsolete. There is, however, a consensus that the most likely move forward is the use of electronic vehicle identification (EVI) chips, either in combination with ANPR technology or on its own right – in a more distant future, as vehicles might move away from number plates for recognition purposes. This means that rather than having an infrared camera reading a plate, there will be a proximity reader, an EVI pole on the side of the road which will read the chip in the car, compare it with the ANPR read of the number plate and the camera which will take an overview picture of the car and its occupants. In this case, the actual identification of the vehicle will be done by the EVI GPS technology. However, respondents consider that, given the massive number of vehicles on the UK roads (estimated by DVLA at around 33.4 million), at least for another decade ANPR will work alongside rather than be replaced by new technologies. As one respondent (F22) states: *'... realistically, EVI tagging is going to happen with new cars and it's going to take a good 10 to 15 years to get through the system.'*

The electronic recognition is a developing technology, but as with most crime prevention technologies, there are flaws and impediments which the police, the technology providers and the car manufacturers are trying to address. It was argued above that the electronic tagging has been previously tested in combination with number plates but, due to its limitations, was withdrawn at the time. Number plates can be easily removed, so counter-measures are likely to render electronic number plates inefficient. Knowing how criminals operate, adapt and develop technologies to counteract the counter-measures, the police and manufacturers have a difficult task to stay a step ahead. Technologies advance, so do criminals. *'The minute we upgrade what we do, there will be some development on how to get round it'*, argues a police officer (F22).

4.9. What next?

In terms of the police use of ANPR in the next few years, respondents believed that the national ANPR focus is going to move away from intercept teams and response more towards intelligence gathering and post-incident investigations. This appears to be due to current interests in national security and counter-terrorism and the disparity between the increasing number of cameras and available resources to respond to ANPR hits. The national objective is to have a strategic road network to be able to track suspects and develop intelligence for the investigation of serious crime and terrorism, to monitor cross border criminality and to promote sharing of intelligence between forces. Once the national ANPR centre is fully functional, the police expect they will become more effective at linking ANPR information between forces and be able to track vehicles linked to crimes more effectively around the country, which is perceived as a bonus for investigative purposes and intelligence development for national security.

There is hope amongst the ANPR leaders at national level that the Assisted Implementation Programme supported by NPIA will help police forces around the country to bring ANPR into mainstream policing. They consider that the most important development in the ANPR world in the last couple of years has been bringing the NPIA on board and having them committed to allocate mainstream resources to ANPR. An interview with one of the ANPR leaders (July 2008) reveals that ACPO were pleased to pass on some of the work to NPIA:

'We've come so far, we cannot go much further without a big agency supporting us. Hence in the next two to three years will see more growth than we've seen before. I am quite optimistic about this and overall I think we have achieved two thirds of what we've set out to do and we can achieve the rest in the next few years. Equally I am not deluded enough to think it is perfect. It is a work in progress and will be for some time to come and will continue to change.'

(ACPO Representative, National ANPR Steering Group)

The national ANPR picture is expected to change once the national ANPR centre delivers a national capability. With the NADC fully operational and an increase in the analytical use of ANPR, the ANPR leaders believe that the issue of inconsistent government support will be

addressed. Once the value of the national product has been proven (as opposed to the local, isolated product), there is hope that it would be easier to win mainstream government support. It is also expected that, as the infrastructure becomes more complete and effective, more government agencies such as the Serious and Organised Crime Agency (SOCA), HM Revenue and Customs (HMRC) and Security Services will start to buy into the use of ANPR, which would see ANPR as more of a national rather than a police asset.

The private sector appears to be the unknown development. Police officers working with the technology call for a partnership with the private sector, in order to enhance detection and police activity. National ANPR leaders would like to see more involvement from the private sector, but they are sceptical whether that will be the case or not. They argue that there is work undertaken in this area, to identify mutual benefits and find the most appropriate ways to share and use this data²¹³. But at the moment the link with the private sector is quite limited. They use ANPR independently of government agencies and there is little join-up, mainly because it is still unclear what would be the benefits for the private sector. The police are fully aware of the benefits emerging from ANPR use in garage forecourts and supermarkets, two places most people (including criminals) go to:

‘Every vehicle has to go to a garage forecourt, so they might not pass one of our cameras on the route, but at some point they will stop at a garage forecourt for petrol. Here they will get out of the car, so there is more of a chance to have a CCTV picture of the driver as well [...] potentially credit card details and transactions. So particularly for dealing with reactive investigations, the private sector could give us far more information than we collect from a road side camera.’

(ACPO Representative, National ANPR Steering Group)

Similarly, there is still uncertainty about the size of the strategic camera network in the UK, as the police have been unable to share ANPR data with the Highways Agency. It appears that there are a lot of ANPR cameras out on the major road network that do not provide data to the police, which creates duplication of work and unnecessary expenditure which could be used to enhance the use of the system and its effectiveness as a crime prevention tool:

²¹³ The ANPR leaders at national level are in the process of negotiating this matter with the British Security Syndicate which is a subsidiary of the UK Petroleum Retailers Association.

'Progress [in sharing data with the Highways Agency] for all sorts of political reasons has been very slow and I am not even sure whether that position is going to change or not. The alternative is we end up building a network alongside the Highways Agency network, but it is a huge waste of public money [...] Unfortunately that might be the route we have to take because of the politics.'

(ACPO Representative, National ANPR Steering Group)

This is likely to have a negative impact on future ANPR developments at national level and on public reassurance as there would be some doubt over the cost benefits of ANPR. The public's support for the government's use of such surveillance technologies would be further undermined if ANPR changed focus from crime prevention to revenue collection. To justify the extensive investments in the technology, the government might decide to use ANPR for revenue under the umbrella of taxation, 'traffic management' or 'green' policies.

This was an issue raised by officers at force level. Respondents feared that ANPR might be used for the 'wrong' reasons, for example congestion charging schemes, like the one in London. The police think the government will be interested in using the infrastructure to change the road taxation system, to make drivers pay for what they drive, rather than for a fixed road tax. Vehicles will eventually be chipped so they can be tracked on the road. If the government decides to change the way the road taxes are used, then they would use the data collected by the ANPR cameras to estimate how far people are travelling on the road and make people pay accordingly.

'What I hope they don't do is ANPR being used for congestion charging outside London, as it will bring the whole ANPR system into disrepute. It's not what ANPR cameras are about – they are there to target criminals, not to tax the public for road tolls!'

(Police Officer, F22)

'Unfortunately in the future it might start to get used for road tolling [...] They already have VOSA looking at using it this way, to charge heavy goods vehicles between certain locations. I think that could be the future, toll charging.'

(Police Officer, F12)

The police point to another potential scenario, where all the speed cameras around the UK would be fitted with ANPR systems for speed enforcement. There is consensus amongst respondents that this would not be an appropriate development, particularly as the public have mixed views regarding the use of speed cameras²¹⁴. Overall, the police can see the potential benefits from using ANPR in conjunction with tolling or speed enforcement only from the point of view of securing and sustaining the cost of the infrastructure, but they tend to disagree with the use of ANPR for such purposes, arguing that ANPR should stay within the crime enforcement arena.

It is strongly believed that using ANPR beyond its crime remit would de-motivate officers working with the technology on the ground and alienate the public. With ever changing purposes, multiple sites developed, vehicles fitted with tracking/identification devices and the system linked to speed cameras, ANPR has the real potential to become Big Brother of the roads. So what would the public make of such a scenario? The following chapter aims to answer some of these questions, by exploring the public's view regarding the police use of ANPR technology.

²¹⁴ There is an extensive debate around the use of speed cameras and their effectiveness, which is beyond the scope of the current thesis. It should be noted here that previous research indicates that the public support the use of speed cameras (see for example the evaluation conducted by the DfT in 2005), but they are also reticent about the duality of purpose, revenue vs. road safety.

4.10. Recommendations

This chapter has highlighted perceived benefits and limitations to ANPR, both in terms of its effectiveness as policing tool and wider socio-political implications of ANPR surveillance. The purpose of identifying impediments to the effective and efficient use of ANPR was not to dismiss ANPR as a potentially successful crime prevention strategy, but to draw attention to its weaknesses in order to try to address them. The thesis proposed to identify these limitations in order to provide suggestions for improving current practice and inform future policies with regards to ANPR.

Therefore, as well as being asked about their knowledge and views regarding ANPR's potential, its benefits and limitations, participants in this study were also encouraged to think of best ways to improve the police use of ANPR technology. Their comments were analysed and ten main recommendations emerged. These recommendations are closely linked to the limitations highlighted within this chapter and generally relate to how ANPR can be improved through:

- A well coordinated and more accountable approach at national and force level;
- Mainstreamed funding and training;
- Greater awareness and knowledge about ANPR technology and its potential;
- Evidence of (cost) effectiveness and
- Shared responsibilities and stronger partnerships at force level.

4.10.1. Mainstreaming ANPR within policing

ANPR's effectiveness appears to be closely related to the way ANPR is incorporated in governmental plans and crime prevention strategies. It is believed that more commitment from the Home Office and a long term strategy for ANPR would provide more direction to police forces and partners, and more accountability to ensure that the ANPR strategy is delivered. The police think that this would encourage senior officers to embrace ANPR as a mainstream policing tool and would translate into forces' policing strategy and priorities.

At a local level, the police believe that a key to the effectiveness of ANPR is linking it with strategic objectives at force and Basic Command Unit (BCU) or Crime and Disorder Partnership (CDRP) level. As such, ANPR would be incorporated within tactical/operational

systems and processes of daily policing by linking the Force ANPR Strategy to the Force Policing Strategy. This chapter indicated that ANPR typically falls under priorities linked to Roads Policing. However, as ANPR's remit goes beyond roads policing, this should be mirrored in other aspects of policing like intelligence and investigation, where understanding and use is under-developed. In light of this, it is believed that the ANPR Force Strategy should clearly define how ANPR can address the strategic aims and objectives at force and divisional/district level and the contribution of ANPR to delivering specific targets included in the Annual Police Authority Policing Plan (PAPP) and Local Area Agreement Plan (LAAP) should be more explicitly stated.

There is a belief that, once mainstreamed into planning, ANPR will be mainstreamed into budgeting. There is evidence that inconsistent and/or insufficient levels of funding for ANPR is one of the main impediments to its effectiveness. In light of this, there is a need to make more explicit within the budget planning processes of police forces on what are present and future intended investments in ANPR. The funding should include costs for equipment and people specifically dedicated to ANPR (necessary for monitoring and response, investigative use of ANPR data and intelligence development) as well as 'opportunity' costs (e.g. specific operations).

4.10.2. Measuring ANPR's effectiveness

This chapter argued that ANPR is not routinely and effectively performance managed at force level. It appears that police officers at senior level are less likely to commit to ANPR without having evidence about its benefits and impact on policing objectives within the force. It is believed that producing evidence of ANPR's worth would not only improve senior officers' commitment to ANPR, but would also enhance the motivation of officers working with the technology on the ground to use it appropriately.

Therefore ANPR's development and use should be subject to performance management and evaluation. An effective performance management process for ANPR at force level should be developed. There is a need to assess the cost effectiveness of individual ANPR initiatives, as well as ANPR's benefits in addressing policing targets. Where limitations and ineffective processes are identified, a gap analysis would be beneficial. These 'active'/ongoing

performance management processes would assist current and future strategic and tactical/operational decisions with regards to ANPR and would aim to improve its effectiveness during its implementation, rather than retrospectively, once it was found to be ineffective.

At national level, it is argued that the government should evaluate ANPR's use by police forces (and partners) through HMIC reviews and Home Office and independent academic evaluations. These would assess whether ANPR is a cost-effective policing tool and whether forces comply with formal and informal controls regulating ANPR.

4.10.3. Improving knowledge and understanding of ANPR

The results presented in this chapter indicate that there is very limited knowledge of ANPR amongst police officers and staff at all levels. This has an impact on officers' perceptions of ANPR and the way they use it at a strategic and operational level, and on their belief in and commitment to ANPR. The lack of knowledge covers three main areas. Firstly, with ANPR being a new and advanced technology, there is limited knowledge about how it works and how to use it, being perceived more of a 'techie' policing tool used by specialist departments within the police. Secondly, there is limited awareness and understanding of ANPR's capability (what it can do) and potential benefits in all areas of policing (how to get the most out of it), in particular in intelligence development and investigations. Thirdly, as argued above, there is a lack of knowledge regarding ANPR's impact on policing and cost effectiveness.

Therefore it is believed that ANPR would benefit from more efficient marketing and mainstreamed training. Respondents believe that there is a clear need for awareness raising and benefits realisation of ANPR. At force level, publicity about ANPR should be improved, with regular messages about its use, the existing infrastructure and latest developments, ANPR's potential and benefits both in terms of policing outcomes and cost-efficiency. Stronger and consistent marketing coupled with basic training at force level should aim to raise general awareness amongst officers about ANPR. This should target student officers and detectives, as well as relevant existing officers and staff within the force. Officers think that at national level, ANPR should be integrated within intelligence, crime and operational

training and NPJA should consider including ANPR within the relevant accredited professional development courses they provide²¹⁵.

4.10.4. Improving ANPR intelligence ('hotlists')

Results indicate that vehicle intelligence is generally poor. This has been shown to have an impact at all policing levels, both in terms of operational effectiveness and officers' belief in ANPR. It is argued that, at national level, Police National Computer (PNC) representatives should work with ANPR stakeholders to develop more effective and efficient ways to deal with the data quality issues. There is a belief that the quality of intelligence would improve if the HMIC, NPJA and ACPO provided guidance on minimum standards with regards to the ANPR hotlists.

At force level, vehicle related intelligence should be dealt with through a business and quality control system through which the quality of information on ANPR hotlists would be systematically monitored and reviewed. Any identified inaccurate information should be further analysed to identify main types of errors and possible reasons behind them. For improvement purposes, the results should feedback to those inputting and providing the intelligence on the ANPR hotlists (including the PNC). It is believed that the quality of ANPR intelligence could be improved not only by improving accuracy, but also by developing more time efficient recording processes, for example developing more automated/computerised ways of recording the information (through Back Office interface, Blackberry devices etc) which would not only free the time of officers on the ground, but would create automatic links to the force intelligence system.

Results presented in this chapter indicate that many officers submit intelligence but very few flag up vehicles linked to criminals, missing an important link between criminals, vehicles and crimes. Hence it is argued that the intelligence on suspects should be linked to that on vehicles they use and all vehicle related intelligence should be placed on PNC. This chapter has shown that neighbourhood policing officers could have a valuable input regarding ANPR

²¹⁵ For example this is where senior police officers could be made aware of how to use ANPR for policing of sporting events like football matches and how to incorporate ANPR to monitor risk supporters etc.

intelligence. Therefore, there is a need for ANPR intelligence to be linked into tasking Neighbourhood Policing Teams.

4.10.5. Improving the investigative use of ANPR intelligence

Results in the current study suggest that ANPR's potential to generate strategic intelligence does not match current police practice. ANPR typically operates in isolation of the full intelligence picture and is not linked to in-force crime or intelligence systems. This limitation is exacerbated by a lack of 'proactive' thinking amongst officers and limited information sharing. It is believed that the investigative use of ANPR would be improved if forces were investing in the research and analytical side of ANPR, including human input supported by the right IT tools. There is a need to standardise systems to enable information sharing between departments within a police force and between police forces. It emerges that the potential benefit can only be fully realised once the police service has started to collate disparate data sources into a comprehensive data warehouse. ANPR data would then provide an essential element to the overall rich picture and would help towards a better understanding of the movements of suspects and vehicles to aid in either immediate tactical solutions or longer term strategic intelligence assessments at local, regional and national level. Once the systems are in place, effective management and analysis of the data is needed in order to run proper National Intelligence Model (NIM) focused investigations into serious and priority crimes²¹⁶.

On a national level (as criminality is not limited by police geographical boundaries) the information added to the Police National Computer (PNC) is limited in its scope, as it relies upon the individual Police Forces to ensure that the data are added manually and accurately. A more reliable method of including information to PNC automatically via individual Police data warehouses, based upon the collation of intelligence gathered from the amalgamation of various data, is believed to help spread the intelligent picture beyond the scope of the single police service. Researchers and analysts from different forces should come together to assist in the product development (i.e. ANPR end user driven rather than software/provider driven) and to share best practice and ways to improve analysis of ANPR which would potentially

²¹⁶ ANPR needs to be integrated into all force's tasking processes and used proactively to meet force policing objectives.

impact on the effectiveness of detecting crime at force level as well as cross-border criminality. It is, however, important to mention here that these recommendations are made bearing in mind the many examples of cost overruns and failure to get things on time and meet original specs of government IT projects (e.g. courts databases). It is easy to make a recommendation about IT, but carrying it out is another matter.

4.10.6. Changing responsibility from operational delivery to business development

ANPR tends to sit within Operational Planning Area because of its historical development as an operational tool (used within traffic policing with intercept teams). Results suggest that its future would be better secured if it were to be owned by the Corporate Development Area of the force. This means ANPR should sit within business development areas of the force, e.g. intelligence analysis, corporate development, criminal investigation etc. It is argued that ANPR would benefit from the work of a ‘Think Tank’ group of people within the force which would be looking beyond ANPR’s current use and conception and explore the future capabilities and potential of ANPR. This could be part of the ANPR steering group for the force, or separate, part of a research and development function within the force.

4.10.7. Merging ANPR and CCTV

Whilst the technologies of CCTV and ANPR have emerged separately, there are areas of overlap, complementary aspects and potential synergy. In developing future strategies, there would appear to be benefits in bringing together the two technologies and a potential harmonisation in national infrastructure and investments.

4.10.8. Working in partnership

It is believed that ANPR’s effectiveness would be improved if it were actively developed within existing partnership structures at local force level. ANPR would be developed as a key partnership tool within the Local Strategic Partnership (LSP)²¹⁷ and delegated to Crime and

²¹⁷ A Local Strategic Partnership (LSP) is a non statutory partnership that brings together at a local level the different parts of the public sector as well as the private, business, community and voluntary sectors so that different initiatives and services support each other and work together (Department for Communities and Local Government, available from: <http://www.communities.gov.uk/localgovernment/performanceframeworkpartnerships/localstrategicpartnerships/>). Last checked April 2009.

Disorder Partnerships²¹⁸ to take the strategic lead on ANPR. By working under the umbrella of the LSP in partnership with CDRPs, the Integrated Offender Management (IOM)²¹⁹, the Highways Agency, the DVLA etc, the police and partners would become more effective in using ANPR and ultimately tackle crime and disorder at local level. Such partnership work is expected to generate benefits such as:

- Shared costs and more consistency in investing in ANPR (which will involve reduced costs for individual partners, particularly in times of financial constraints and competing claims for investments) and overall improved cost efficiency²²⁰;
- Improved and extended infrastructure, particularly if ANPR is linked to CCTV;
- More effective offender management services, particularly in relation to monitoring and tracking upon release;
- Better ways to tackle environmental crime such as illegal waste disposal (e.g. fly tipping);
- ANPR expanded beyond known benefits by bringing together people and organisations with different perspectives and enabling creative thinking around potential uses of ANPR which, coupled with sustainable investment, would more rapidly and effectively drive ANPR's development.
- A more holistic approach to community safety.

Moreover, results emerging from the current study indicate that public-private partnerships between the police and private corporations such as supermarkets, shopping centres and petrol forecourts would be very beneficial to the police, both in terms of camera coverage and the potential to gather valuable additional information in crime investigations. However, it was argued that establishing such partnerships would need to be justified and endorsed by appropriate regulations to ensure the legality and proportionality of information sharing and compliance with data protection principles. The Home Office is believed to be best placed to

²¹⁸ Crime and Disorder Partnerships include statutory, voluntary and private organisations with an aim to develop and implement strategies for tackling crime and disorder on a local level.

²¹⁹ Launched in 2008 by the Home Office and Ministry of Justice, the IOM targets offenders in the community who present the highest risks to their communities, especially those short sentence offenders released from prison under no statutory supervision. Information available in the Integrated Offender Management Government Policy Statement (Home Office and the Ministry of Justice, 2009).

²²⁰ For example, by sharing the existing infrastructure with the Local Authority and the Police, Highways Agency can use ANPR data to save costs around traffic surveys.

address the legislative challenges linked to the development of ANPR, partnership work and data protection issues.

4.10.9. Improving the vehicle registration system

There is a consensus amongst respondents that ANPR's reliance on number plates is one of its major weaknesses. Hence it is believed that ANPR's effectiveness could be improved if DVLA, vehicle manufacturers and number plate suppliers would consider enhancing the vehicle registration system and developing more secure/tamper proof number plates. The proliferation of security measures such as non removable number plates or tamper-proof screws fitted to registration plates would be an effective step taken towards reducing the number of theft of number plates. The police also argue that reducing the number of suppliers of number plates in the UK would enable more effective regulation and control.

4.10.10. Developing an automated system for document offences non compliance

Police officers believe that it would be helpful if the DVLA and the police would develop a penalty system for dealing with minor offences detectable by ANPR such as lack of insurance, tax and MOT and failing to display a legitimate set of number plates. Such system would involve sending automated warning letters (not fixed penalty notices) to the owners of the vehicles informing them that their vehicle has been sighted by police (ANPR) cameras and are in breach of law. The vehicle owners would be asked to deal with these contraventions in a defined period of time. Careful consideration would be given to those who have been mistaken for illegal drivers due to ANPR technological errors. If such an error occurred and the owner of the vehicle was not the same as the addressee, then the owner would be asked to inform the DVLA (free hotline) and possibly produce evidence to enable the error to be corrected. It is believed that with such a system in place, police would save some of their monitoring and intercepting costs (hence resources would be allocated towards more serious crime and criminal investigations) and would become more effective in tackling vehicle crime and criminality in general. The system would also enable the identification of vehicles wrongly registered, possibly stolen and cloned plates or 'ghost' vehicles.

Links between the police, the DVLA, the Motor Insurance Bureau (MIB) and relevant stakeholders are already in place and working. Such a system would not require extensive

developments and similar schemes have been previously introduced and proved to be effective²²¹. However, it would be advisable to consult with the public prior to introducing such a scheme and develop a national publicity and awareness campaign sending strong messages about the purpose of the scheme and its expected benefits.

²²¹ See for example the Home Office's vehicle crime reduction toolkits at: <http://www.crimereduction.homeoffice.gov.uk/toolkits/vc00.htm>. The Secure Your Motor campaign was developed in an attempt to reduce vehicle crime and was linked to the government's vehicle crime reduction action team (VCRAT) which was established to improve car security. The campaign included TV, radio and the internet adverts, posters at petrol stations and parking meters.

4.11. Concluding remarks

It is important to highlight that the research presented in this chapter was undertaken against a backdrop of ongoing developments within the ANPR arena. As such, this chapter highlighted issues regarding the use of ANPR within forces as ‘work in progress’ and some of the emerging recommendations might be already under consideration both at a local and national level.

While this chapter highlighted the main ANPR benefits and limitations as perceived by the police, the following focuses on the public’s perceptions about ANPR.

Chapter Five: Results (II)

ANPR under Scrutiny: the Public's View

5.1. Introduction

The previous chapters highlighted the wider social and ethical implications of ANPR and brought to our attention concerns about human rights and privacy issues which the use of these cameras raises. It was argued that with ANPR surveillance there is an increased risk of losing the rights to 'locational privacy'²²². It was also indicated that what makes ANPR effective in one area (e.g. crime investigations) could make it ineffective in another area (e.g. civil rights) and vice versa. The dilemma between privacy and security was highlighted. Indeed, the development of ANPR had already generated debates around the invasion of privacy or breaches of Human Rights and Data Protection regulations. These concerns have been expressed in the media, by interest groups and the Information Commissioner's Office²²³. It is now important to turn our attention to what the public think about these issues. In a society accustomed to surveillance and the 'war' on terrorism, one might expect that a few more cameras, whether they are called CCTV or ANPR, whatever their purposes might be, would not arouse the public's concern. To what extent is that true though?

The literature review revealed that there is no study investigating the extent to which the public are aware of this technology and the extent to which they accept it or feel reassured as a result of its use by the police. While the previous chapter explored the role of ANPR within policing as viewed by police officers and police staff, this chapter turns its attention to how the public respond to the introduction of ANPR in the UK and how they perceive its role as a crime prevention tool.

With this in mind, this chapter presents results emerging from the empirical work in this Thesis, which are based on a public opinion study. The study aimed to fill a gap in our

²²² Blumberg and Eckersley (2009); Clarke and Wigan (2008).

²²³ The Office of Surveillance Commissioner (2006, 2007). See also Richard Ford's (2006) story in *The Times* ('Numberplate Cameras May Break Privacy Law') and Simon Davies (2008), director of Privacy International, commenting on the 'unnecessary and disproportionate' police powers through the use of ANPR databases in 'Privacy fears over car database', story from BBC News: http://news.bbc.co.uk/go/pr/fr/-/2/hi/uk_news/7615892.stm.

understanding of the public's view of ANPR cameras and surveillance issues in general. Although research into public attitudes towards police use of CCTV is not new, this is the first major study exploring public views specifically with regards to ANPR. Thus, to widen our understanding of what the public thinks of such cameras, some of the findings presented in this chapter are compared – where possible - with findings from other surveys on public attitudes towards CCTV, such as those undertaken by Honess and Charman (1992), Bennett and Gelsthorpe (1996), Ditton (2000), Skinns (2000), Dixon et al. (2003), Spriggs et al. (2005) and Gill (2007)²²⁴.

The study was conducted between February and April 2008 and reports on the views of 1573 respondents to a postal survey. This was supplemented with a series of focus groups including 30 participants. All respondents were residents in Leeds, West Yorkshire, England. Specific objectives of the study were to examine awareness of ANPR, perceptions about ANPR's benefits and limitations and overall public support for the introduction of ANPR cameras in the Leeds area, as well as to provide recommendations on how to improve public confidence in the police use of ANPR surveillance. The study paid particular attention to the relationship between privacy and security, exploring what the public considers to be legitimate levels of surveillance and any concerns they hold about ANPR's impact on civil liberties. Additional factors were explored, such as the socio-demographic characteristics of respondents and levels of victimisation, as well as perceptions of crime and anti-social behaviour in the neighbourhood. The aim was to determine which groups were more likely to be 'pro' or 'anti' ANPR and why.

²²⁴ It should be noted, however, that this comparison is limited because of differences in sampling and methodology and the context and timeframe of research.

5.2. Some methodological considerations

Although a detailed discussion of the methodology for this public opinion study can be found in Chapter Three, some key issues are reiterated here in order to improve understanding of the ways in which the results are reported. The postal survey used a self-completion questionnaire (see Appendix 1) with a combination of closed and open questions that measured a number of variables related to the research objectives. The focus groups were conducted subsequently in order to clarify and explore in more depth interesting issues identified in the survey. The focus group sessions encouraged participants to elaborate their understanding and views regarding the police use of ANPR in Leeds.

The response rate for the postal survey was 19.5%. While the sample population for the postal survey was generated by a random sampling method, participants for the focus groups were recruited purposively, with the assistance of the Local Authority.

The results from the public opinion survey are mainly presented in the form of descriptive statistics produced using SPSS, which were used to identify frequencies of opinions and to explore any statistically significant associations within the data. Cramer's V correlation was used to measure strength of relationships between variables (Phi correlation for two by two cross-tabulations), where the higher the correlation, the stronger the relationship²²⁵. As most variables were nominal, only the strength of the relationship was discussed²²⁶. The Pearson Chi-square test was used to test the significance of these relationships, usually measured at the $p < 0.05$ level. For clarity of presentation, most outcome variables that were originally measured on a 5-point scale were categorised into two or three variables. For example, respondents who 'strongly agreed' or 'agreed' with a particular statement were considered to 'agree' (or 'think', 'believe', 'consider' etc) and those who 'strongly disagreed' or 'disagreed' were considered to 'disagree' with the statement. The 'neither agree nor disagree' answer was also included where appropriate, to indicate neutrality or uncertainty about an issue. Where appropriate, for statistical validity purposes, the variables were re-coded into

²²⁵ It is generally considered that a correlation greater than 0.5 is large, 0.5-0.3 is moderate, 0.3-0.1 is small and anything smaller than 0.1 is insubstantial. For more information on statistical significance and correlations, see Morgan, Griego and Gloeckner (2001); de Vaus (2001, 2002); Norusis (2003).

²²⁶ Direction of relationship is measured when working with ordinal and interval variables. A relationship can be either positive or negative.

three categories (from five), in order to ensure a minimum frequency of at least five responses in each cell.

Thematic coding and qualitative analysis and were also carried out on the data generated from open questions in the postal survey and the open discussion in the focus groups. Quotations were used to illustrate the main concepts from the survey and the focus groups.

The following sections present and discuss the results from both the postal survey and the focus groups under common themes. The characteristics of respondents, their geographical spread and the extent to which they represent the wider population of Leeds is also discussed. Awareness of ANPR prior to the study and views and concerns about ANPR are then assessed. The chapter concludes by highlighting any emerging issues, offering a critical analysis of the results in the context of both the current Chapter and the Thesis.

5.3. Respondents' profile

5.3.1. The postal survey

A total of 1573 Leeds residents aged 17 and over completed and returned the questionnaire by the cut off date. In order to monitor differences in opinion about ANPR between groups of people²²⁷, respondents were asked questions regarding their socio-demographic characteristics, such as gender, age, ethnicity, employment status, housing tenure, driving and vehicle ownership. The frequency results show that the sample population comprised a slightly higher proportion of females (53%) than males (47%), characteristics in line with the population of Leeds as a whole²²⁸. The largest group represented in the sample were people aged 45 to 64, which accounted for 37% of respondents, a considerable overrepresentation in comparison with 2001 Census figures for Leeds (22%). The large majority of respondents indicated they were White or White British (91.2%), while there was a slight underrepresentation of Asians within the survey sample compared with the Asian population of Leeds. Respondents who were retired were over-represented within the sample (41.6%), compared with the population of Leeds (13.2%). As explained in Chapter Three, this is a common 'feature' of postal surveys, as older or retired people tend to be more responsive. Almost two thirds of respondents (64.7%) stated they were drivers who owned their motor vehicle, while 27.5% did not drive at all. Given the nature of ANPR surveillance and its potential to target drivers and driving offences, acquiring information about driving and vehicle ownership was thought to be important to get a clearer picture of people's views about ANPR surveillance, its impact on crime and motor offences or other concerns drivers or vehicle owners might have regarding the police use of this technology. A comparison between the demographics of the sample for this survey and the population of Leeds is outlined in Table 5.1, Appendix 2.

²²⁷ Previous studies have shown that views about CCTV differ across demographic groups, for example females and the elderly tend to be more supportive of CCTV (Honess and Charman, 1992; Bennett and Gelsthorpe, 1996 and Dixon et al., 2003).

²²⁸ Figures from the 2001 Census of Population for Leeds indicate 51.6% females and 48.3% males.

5.3.2. Respondents' postcodes and ACORN

As the provision of an address and postcode was not compulsory for the postal survey²²⁹, not all respondents could be geographically distributed or their postcode associated with an ACORN²³⁰ category or group. However, results indicate that those who provided their details (correct address or postcode) (78%; N=1156) were proportionately spread across the thirty-three wards in the district of Leeds.

Respondents' postcodes were also linked to the ACORN classification according to their residential area²³¹. Respondents' residential areas were spread across all ACORN categories, with the highest proportion living in 'Comfortably Off' (N=436; 27.7%) and 'Hard Pressed' (N=313; 19.9%) ACORN areas; which is line with the population of Leeds as a whole. However, those living in 'Urban Prosperity' ACORN area (5.6%) were under-represented (compared to the population of Leeds, 13.3%), in particular those living in the 'Aspiring singles' and 'Educated urbanities' ACORN areas (1.4%, compared to Leeds, 5.3% and 1.1.% compared to 4% respectively). For more details on the geographical spread of respondents, see Tables 5.2 - 5.3 and Figure 5.1, Appendix 2.

High or low response rates to the survey could have been influenced by a wide range of factors, varying from the methods used (as explained in Chapter Three) to the personal characteristics and beliefs of the sample population (i.e. time available; hesitation and fear of scams; the level of confidence in the police; willingness to express views about an issue etc). Some studies indicate that there are certain personal and household characteristics usually associated with a higher or lower response rate on surveys²³², for example females and older people tend to be more responsive, while lower response rates come from households in inner-city areas, single personal households and where the head of household was not born in

²²⁹ The survey was designed to be confidential. Those who chose to provide their address details have done so because of their choice to be included in the prize draw.

²³⁰ ACORN is a geo-demographic tool used to identify and understand the UK population. ACORN categorises all 1.9 million UK postcodes, which have been described using over 125 demographic statistics within the UK and 287 lifestyle variables. Information from CACI's website: 'What is ACORN?' available from:

<http://www.caci.co.uk/acorn/>

²³¹ It should be noted, however, that ACORN treats the whole postcode as a unit, so results should be interpreted with care.

²³² DWP (2002). This is also generally reflected in results of the British Crime Survey studies.

the UK – which could explain the under-representation of respondents in the current study living in ‘Educated Urbanities’, ‘Aspiring Singles’ and ‘Asian Communities’ ACORN areas.

This section indicated that the sample of respondents to the postal survey were reasonably but not entirely representative of the wider population of Leeds. This should be considered when interpreting the results of the survey, particularly with regards to the generalisability of findings.

5.3.3. The focus groups

Three focus groups were conducted in April 2008, with a total of 30 participants (all Leeds residents). Two out of the three groups comprised samples of people of different age, sex, area and ethnic backgrounds (equally represented within groups). One group was deliberately restricted to young people in order to address the gap in responses from the postal survey and to access opinions that might otherwise not have been heard. Children and young people are not often included in public consultations on policing or government matters, but surprisingly for their age they had thoughtful opinions on the police use of ANPR surveillance in the name of crime prevention and reduction. Their opinion sometimes differed from those of adults and these differences will be highlighted later. Details of all attendees are provided in Table 5.4, Appendix 2.

5.4. Perceptions and experience of crime and anti-social behaviour (ASB)

Respondents from the postal survey were also asked about their experience of crime or anti-social behaviour as a victim. Overall, 15.4% (N=242) of those who have answered the question²³³ reported being a victim of at least one incident within the twelve months prior to the survey (February 2008). The survey measured the level of reported victimisation in order to assess whether being a victim of crime or anti-social behaviour influences people's perceptions of ANPR, police surveillance and the police in general.

Perceptions of crime and anti-social behaviour in the neighbourhood were also gathered in order to establish whether perceptions about ANPR are linked to those about crime and ASB in the neighbourhood. Results from the postal survey indicate that respondents were more likely to perceive anti-social behaviour as a common characteristic of their neighbourhood than crime. Just over a third of respondents (36.5%) strongly agree or agree that crime is commonplace in their neighbourhood, while 44% strongly agree or agree that anti-social behaviour is commonplace in their neighbourhood. Their answers are based on either their knowledge of crimes or/and anti-social behaviour incidents - as the majority of respondents (64%) state they are aware of these incidents taking place in their neighbourhood over the last twelve months – or simply their assumption regarding the likelihood of crime and anti-social behaviour in their neighbourhood. For more information on reported victimisation by socio-demographic characteristics, see Table 5.6, Appendix 2.

The following sections will indicate, where appropriate, to what extent demographics or factors relating to respondents' views or experience of crime and anti-social behaviour affect expectations of and support for ANPR.

²³³ Respondents who have not answered the question (missing answers) were not taken into account; if they were, victimisation would be 18.1%.

5.5. Awareness of ANPR prior to the survey

Previous studies have indicated that public attitudes to crime and the criminal justice system vary according to the degree of knowledge about these issues²³⁴. It is therefore important to explore whether the public know about ANPR and whether there is a relationship between knowledge and views about ANPR.

When asked if they were aware of ANPR, two thirds of respondents from the postal survey (66.6%) indicated that they knew about it before receiving the questionnaire. In common with other studies looking at public awareness of CCTV²³⁵, findings here indicate a gender difference in awareness with men more likely to say they were aware of ANPR than women (74% compared to 61%)²³⁶. This could be a result of men being more sceptical about the police and having greater concerns over ANPR's impact on their privacy (and implicitly more interested in surveillance or measures which might impact on their civil liberties) than women do. The analysis also revealed a fairly weak but statistically significant correlation between awareness of ANPR and age²³⁷, for example younger respondents (17-24 years old) were less likely to know about ANPR than respondents in the other age groups. No relationship was found between awareness of ANPR and respondents' area of residence or the number of local authority and police CCTV and ANPR cameras in their neighbourhood.

The extent of knowledge and understanding of ANPR, however, was not tested in the questionnaire, so it is unclear what exactly people knew about ANPR before the survey or whether their views have been influenced by media stories²³⁸ or by the introductory letter sent out with the survey which provided information on ANPR (i.e. what it is, how it works, how and what do the police use it for). The focus groups aimed to address this potential limitation and knowledge of ANPR was explored further. Unlike the postal survey, respondents' awareness of ANPR was tested 'cold' during the group sessions (i.e. no information was provided prior to the discussion). Similar to the survey, most respondents from the focus groups seemed to be aware of ANPR, although this appeared to be different according to

²³⁴ Roberts (1992 and 2002), Hough (1996), Hutton (2005).

²³⁵ Honess and Charman (1992), Dixon et al. (2003).

²³⁶ The relationship between gender and awareness of ANPR was weak but statistically significant ($p < .01$; Cramer's V 0.187).

²³⁷ $p < .01$; Cramer's V 0.123.

²³⁸ The impact of media on shaping perceptions about ANPR was not the focus of this study.

groups: young people were more familiar with the concept, while the mixed groups seemed to have slightly more knowledge regarding ANPR applications, mainly relating to its use for documentation offences (no insurance, tax etc). The majority of respondents (85%) from the focus groups referred to the media as the main source of their information about ANPR.

Even though the public appear to be aware of ANPR, their understanding regarding the type of cameras involved, the crimes targeted by ANPR or the consequences of ANPR surveillance is limited. People seem generally confused about the type and range of cameras available and still do not know how to differentiate between different surveillance systems. This might have an impact on their views regarding ANPR's effectiveness in tackling crime or any concerns they might have about the police use of this surveillance technology. If they do not really know what it does, how can they have an informed opinion about it? The public's views about ANPR, its effectiveness in dealing with crime and its perceived impact on civil liberties will be discussed next.

5.6. ANPR's perceived and expected benefits

Respondents to the postal questionnaire were asked to state whether they agreed or disagreed with various claims about ANPR's potential to impact on crime rates, feelings of safety, reassurance of victims and road safety, criminal behaviour, police practice and effectiveness or ANPR's impact on civil liberties. These quantitative results were complemented by qualitative data emerging from open questions in the postal questionnaire and the group discussions, where participants were encouraged to freely express their views about all issues surrounding ANPR. In effect, the focus groups added value to the results from the survey, as the discussion brought to light views or concerns which might have remained unknown or unclear after the public consultation through the survey. Emerging results from the quantitative and qualitative research cluster around the following themes:

- *ANPR's perceived and expected benefits*
- *Perceived concerns about ANPR*
- *ANPR, public reassurance and trust in authority*
- *Overall support for ANPR in Leeds*

5.6.1. Perceptions about ANPR's impact on crime and community safety

This study investigated whether public perceptions regarding ANPR's effectiveness are supportive of a reduction in crime. Respondents from the postal survey were presented with a list of statements regarding ANPR's potential impact on crime rates, criminal behaviour, policing and on their feelings of safety and reassurance. They were asked to rate how much they agreed or disagreed with these statements on a 5-point scale ranging from strongly agree to strongly disagree and including a neutral option. Results indicate that the majority of respondents agreed or strongly agreed that the police use of ANPR cameras on the streets of Leeds would be a benefit to the community. Most notably, over 90% of respondents considered that ANPR would enhance police practice and effectiveness in that the police would be better equipped to track and identify criminals that use the roads and helpful evidence for criminal investigations and convictions would be provided. This indicates that the value of ANPR is judged mainly in terms of better identification and detection of offenders, a finding concurring with the theoretical assumptions about ANPR's effectiveness underlined in the previous chapters.

There seems to be general agreement that crime would be reduced (74.4%) and feelings of safety will improve (73.2%) as a result of the police use of ANPR. When these perceptions were correlated with the level of awareness of ANPR prior to the survey, no relationship was found. This could indicate that respondents' views about ANPR's effectiveness in reducing crime and fear of crime or improving police detections are based on general assumptions about the impact of ANPR rather than more precise information reflecting ANPR outcomes. This is not surprising, as research into attitudes towards CCTV, for example, indicates that the public tend to think of CCTV as an effective crime prevention method, even though there is limited evidence supporting these beliefs. Moreover, when public perceptions before and after the installation of CCTV systems are measured, it appears that CCTV is more appealing in theory than in practice, as support for CCTV reduces after its installation. For example, there is evidence of significant change in public perceptions regarding CCTV's effectiveness in reducing crime after its installation – from 79% in the 'pre-installation' study to 48% in the 'post-installation' study²³⁹.

As shown in Table 5.7 below, just over a half of respondents agreed or strongly agreed with other potential impacts of ANPR, such as its potential to reduce the number of innocent people stopped by the police (59.8%), reassure the victims of crime (59.8%) and improve police response time to crimes (53.2%) - although about a third were not really sure that this would be the case. Respondents were also uncertain whether ANPR would increase road safety by reducing road traffic casualties and even more hesitant when it comes to ANPR's non-discriminatory potential (a large percentage of respondents chose the neutral/'don't know' option, i.e. 37.7% and 45.4% respectively). Interestingly, further analysis indicates that those who knew about ANPR prior to the survey were slightly more likely to disagree that the victims of crime would be reassured. A weak but statistical significant relationship was found between the level of awareness of ANPR and perceptions regarding ANPR's effectiveness in improving feelings of safety amongst victims²⁴⁰. This could suggest that respondents who already know about ANPR are slightly more sceptical about these issues, but the relationship is too weak to make strong claims on the bases of these correlations.

²³⁹ Skinns (2000). See also Gill (2007).

²⁴⁰ $p < .01$; Cramer's V is 0.081.

Furthermore, when asked about their perceptions regarding ANPR's impact on criminal behaviour, the majority of respondents (58.6%) thought that offenders would be deterred from committing crimes in the areas covered by ANPR, but a higher proportion of respondents (78.7%) believed that offenders would not stop committing crimes altogether – they would just use different roads where there are no ANPR cameras; findings which mirror the assumptions following the rational choice theory and the phenomenon of displacement previously argued. Studies looking at perceptions of CCTV similarly found that one of the unintended consequences of CCTV is displacement of crime, generally to a different location where the cameras are not installed. Interestingly, it appears that the public seem to acknowledge displacement more nowadays than it used to over a decade ago. For example, the percentage of respondents who think that crime will be displaced as a result of CCTV goes from 30%²⁴¹ to 62%²⁴² and 79% in the current study.

²⁴¹ Squires and Measor (1996).

²⁴² Skinns (2000).

Table 5.7 ANPR's perceived and expected benefits

With ANPR cameras on the streets of Leeds	Agreed or strongly agreed	Neither Agreed nor Disagreed	Disagreed or strongly disagreed
Police will be better equipped to track and identify criminals that use the roads	92.0 % (N=1415)	5.2% (N=80)	2.8% (N=43)
Police will get helpful evidence for criminal investigations and convictions	90.4 % (N=1394)	7.1% (N=109)	2.5% (N=39)
Offenders will still commit crimes, but will use different roads where there are no ANPR cameras	78.6 % (N=1201)	16.1% (N=246)	5.3% (N=81)
Crime will be reduced	74.4 % (N=1150)	17.4% (N=269)	8.2% (N=127)
You will feel safer	73.2 % (N=1134)	20.4% (N=316)	6.4% (N=99)
The police will be less likely to stop innocent people	59.8% (N=918)	27.3% (N=420)	12.9% (N=198)
Victims of crime will feel more reassured	59.8% (N=916)	27.1% (N=415)	13.1% (N=200)
Offenders will be afraid to commit crimes in the area covered by ANPR cameras	58.7% (N=904)	22.4% (N=345)	18.8% (N=290)
Police will respond more quickly to crimes	53.1% (N=812)	31.3% (N=479)	15.5% (N=237)
The possibility of police discriminating against minority ethnic groups will be reduced	41.9% (N=643)	45.5% (N=697)	12.6% (N=193)
Road traffic casualties will be reduced	40% (N=613)	37.7% (N=578)	22.3% (N=342)

Source: Question '*Do you agree or disagree with the following statements?*'

Total number of respondents is 1573

Rows do not necessarily sum to 1573, as reported frequencies exclude missing data

5.6.2. 'Open' views about ANPR's effectiveness

Survey respondents were also given the opportunity to express any views or concerns they might have about ANPR through open-ended questions. About a third of respondents chose to write down their comments by highlighting issues already covered in the survey or bringing out others which were not. The focus group discussions expanded on these issues, examining the reasons behind people's acceptability or opposition to ANPR and exploring the complexity of the issues involved in people's perceptions of ANPR's effectiveness in reducing crime and improving feelings of safety.

Confirming the quantitative results presented above, the qualitative analysis reveals that people perceive ANPR as a benefit to policing and community safety, although they have many concerns regarding ANPR's actual effectiveness, potential limitations and its impact on civil liberties. On the positive side, respondents think that *'ANPR is a good idea: the sooner, the better!'* They argue that anything that could reduce crime and make them feel safer is welcome. ANPR appears to be a good thing because *'it is not a waste of time, as it helps the police to quickly identify and stop wanted people'* rather than randomly stopping innocent people. Below are some of respondents' comments reflecting these views about ANPR:

'If it works, use it! The safer the streets, the better!'

'ANPR makes me feel something is done to protect the community.'

'It's a brilliant idea! Even if ANPR is just used to check disqualified or uninsured drivers, it makes a difference and I feel safer while I am driving. If it's used in other ways to catch criminals, it's a bonus! Hope it's brought into use as soon as possible!'

'I totally agree with the police use of ANPR. Being the subject of a few burglaries and three attempted break ins, the more help the police have to bring criminals to justice, the better!'

There seems to be consensus amongst respondents from both the survey and the focus group sessions that ANPR could help the police to reduce crime through quicker identification and apprehension of offenders, better tracking and monitoring of dangerous offenders and better evidence for crime investigations. Respondents find ANPR particularly effective because it has the potential to pick up on cars which the police would not normally do, which is in line with police officers' perceptions about ANPR. Some respondents also indicate that they are aware of high profile cases where ANPR was very helpful in providing evidence or checking alibis in serious crime investigations.

'ANPR could be very useful to trace people who have been missing [...] or sex offenders or somebody that has skipped bail for example.'

‘ANPR could provide evidence for crime investigations or prosecutions; the police are not always there when a crime occurs, a camera could be.’

Respondents believe that ANPR’s potential benefits extend to other crimes such as drug offences (particularly by targeting ‘taxi dealers’), dangerous driving particularly in residential areas or around schools (including the use of mobile phone at the wheel) or fly tipping.

‘My husband used to be a PC in the 1960s and well remembers much happier and safer times on the streets of Leeds. We both feel strongly that any measure to tackle vehicle and street crime will never be enough, but should help’.

‘No matter what the statistics say, crime is growing and becoming more dangerous, especially in council areas. These cameras would make a great difference to criminals, from underage drunken hooligans that smash up bus stops to drug dealers and takers, burglars etc’.

5.6.3. ANPR’s potential to tackle non-insured driving

There is a general agreement that *‘ANPR should be used to tackle illegal drivers, in particular those without insurance’*. A high proportion of respondents seem to hold strong views against illegal drivers, particularly those driving with no insurance. These findings confirm previous research findings that there is public support for more action against driving offences²⁴³. Results from the postal survey indicate that the vast majority of respondents (94.2%) agree or strongly agree that it is important that ANPR cameras are used to catch drivers without a licence, tax or valid MOT and in particular without insurance. The qualitative results strongly support these views. The consensus from all groups is that driving without insurance is a real issue, particularly in West Yorkshire and they fully support ANPR if it could tackle this problem. Hence ANPR is perceived as helping towards safety because it identifies people without insurance or without licence.

²⁴³ For example MORI findings for Motor Insurance Bureau (MIB) reported that 95% of drivers felt that driving without insurance was wrong and people should be prosecuted for it, whilst a survey conducted for Association of British Insurers (ABI) reported that 83% of motorists view driving without insurance as a serious offence (Greenaway, 2004). See also Kilner (2009).

'The papers say approximately 25% of drivers in West Yorkshire and over 50% in Bradford are uninsured. If the police have let this get to such a serious level, then these cameras should be widely used to catch these people. Then the cost of insurance premiums will decrease [...] We pay road tax, insurance, why should we pay for those who don't? Why should they get away with it?'

5.6.4. Perceived benefits of ANPR and neighbourhood safety

Further analysis was undertaken in order to determine if perceptions regarding ANPR's benefits on crime and community safety are influenced by other factors such as experience or perceptions of crime or by socio-demographic characteristics of respondents. The results indicate that there is a slight tendency for those who perceive crime as a problem in their neighbourhood to be less likely to feel safe as a result of the police use of ANPR in Leeds or to think that crime or traffic casualties will be reduced. Actually, these respondents seem to be more likely to think that crime will not be reduced, it will just be displaced somewhere else. Weak but statistically significant correlations were identified between these variables²⁴⁴ (see Table 5.8, Appendix 2). These relationships could indicate that respondents who perceive crime as a problem in their neighbourhood are less confident in or more negative towards crime prevention measures, including police ANPR cameras. This is consistent with findings from the group discussions indicating that participants who did not feel safe in their neighbourhood were less likely to be confident in the police and their ability to deal with crime and reassure the victims of crime.

5.6.5. Perceived benefits of ANPR and victimisation

Interestingly, no relationship was found between respondents' perceptions regarding ANPR's potential to reassure victims and being a victim of crime or anti-social behaviour. However, victims appear to be less likely than non-victims to believe that ANPR would be effective at making people feel safer, reduce crime, improve the police's ability to track and identify offenders, providing useful evidence for convictions or reducing the number of road traffic

²⁴⁴ It should be noted that correlations are just indications of a relationship; they do not necessarily indicate a causal relationship between two variables (de Vaus, 2002).

casualties in Leeds (see Table 5.9, Appendix 2). This is not surprising, as victims have been shown to be more sceptical about the benefits of police cameras, in particular CCTV²⁴⁵.

5.6.6. Perceived benefits of ANPR by socio-demographic characteristics

Perceptions about ANPR's benefits differ across socio-demographic groups as well. The analysis reveals weak, but statistically significant relationships²⁴⁶ between views about ANPR's effectiveness and gender, age, employment, housing, area of residence (ACORN) and ethnicity. Age appears to be the strongest predictor of views about ANPR's potential benefits, in that the younger respondents were the least likely to believe that crime will be reduced or that offenders will be deterred from committing crimes in the areas covered by ANPR. Correspondingly, the older the respondents, the more likely they were to agree that ANPR will positively impact on police effectiveness, so that the police would respond more quickly to crimes, would better track and identify offenders and would stop fewer innocent people. Unsurprisingly, retired respondents appear more likely to agree with ANPR's suggested benefits. Female respondents appeared to be more likely to believe in ANPR's effectiveness in improving community safety than their male counterparts. Gender differences in opinion surface throughout, indicating that female respondents are less 'anti-ANPR' and more confident in its impact on crime and safety.

These findings mirror those from studies exploring public attitudes towards CCTV indicating that older and female respondents are more likely to perceive CCTV as effective in reducing crime and making people feel safer²⁴⁷. Interestingly, while 17-24 year old respondents appear to be the least confident in ANPR's impact on crime reduction, respondents in the 25-44 age group are the least likely to believe that ANPR will make them feel safer, reassure the victims of crime, increase safety on the road or reduce the potential of discrimination against minority groups. This disbelief could be explained by the fact that respondents in this age

²⁴⁵ Studies looking at public perceptions about CCTV indicate that victims are less likely than non-victims to think that CCTV would be effective at preventing crime and disorder (Honess and Charman, 1992; Bennett and Geltstrophe, 1996; Ditton, 2000; Dixon, 2003).

²⁴⁶ Although the relationships between these variables are statistically significant, even the strongest of these could only be regarded as low to moderately correlated – the analysis used Cramer's V correlation (Nominal by Nominal) which measures the extent to which variables are related using an index range from 0 (no relationship) to 1.0 (perfect relationship).

²⁴⁷ Honess and Charman (1992); Ditton (2000); Dixon et al. (2003); Gill (2007).

group were most likely to have reported being victimised. For a breakdown of perceptions about ANPR's benefits by age and gender see Tables 5.10 - 5.11, Appendix 2.

Some statistically significant differences in opinion by ethnicity and housing also emerged but, as they do not correspond to large numbers of people in the sample, they should be interpreted with caution. For example respondents from a Black or Black British background seemed to be less likely to agree that the police will stop fewer innocent people. In contrast, there is a tendency for those living in rented accommodation from the Council or the Housing Association to have greater expectations regarding ANPR's impact on crime; they appear to be more likely to agree that they will feel safer and reassured and that the police will do a better job as a result of ANPR (i.e. they will respond more quickly to crimes, they will reduce road traffic casualties and they will be less likely to discriminate against minority groups or stop innocent people). It looks like those living 'hard pressed' ACORN areas have more confidence in the police or the use of cameras, although the correlations are too weak to have clear indications that this is the case. Not surprisingly then, respondents living in 'urban prosperity' ACORN area appear to be less optimistic about ANPR's potential to reduce the number of police stops and be less 'discriminatory' against certain minorities.

The demographic characteristics of respondents seem to have an impact on perceptions of participants in the focus group sessions as well, although the restricted number of respondents limits the validity of any relationship between these variables. The results are similar to those from the survey, in that there is a tendency for female older respondents to feel safer as a result of police surveillance in general and ANPR in particular. They reiterate that the more they know there is somebody watching behind a camera, the safer they feel. In contrast, respondents from a Black or Asian ethnic background appear less confident in ANPR's ability to impact on crime or their safety. As will be argued next, these differences in opinion are even more accentuated when it comes to ANPR's potential to impact on civil liberties.

5.7. Perceived concerns about ANPR

Respondents were also presented with a list of views or concerns people might have regarding ANPR, or police surveillance cameras in general, some of which have appeared in newspapers or on TV. While survey respondents were asked to indicate their level of agreement with statements reflecting these issues, participants in the group sessions had little prompting, being encouraged thinking of the reasons behind any concerns they might have regarding ANPR. Results from both the quantitative and qualitative data cluster around the following themes:

- Limitations to ANPR's effectiveness in reducing crime and reassuring the public (counter-measures, ANPR's visibility, police response)
- Unintended consequences of ANPR
- ANPR, the police and civil liberties: 'Nothing to hide, nothing to fear'?
- Trust in the police

5.7.1. Counter-measures, displacement, limited evidence and misidentification

Respondents expressed their doubts with regards to ANPR's impact on crime and fear of crime, highlighting the main limitations of ANPR. The survey analysis indicates that the majority of respondents (83%) are mostly worried that ANPR would not be effective because of 'counter-measures' used by criminals to avoid being identified or stopped by the police, findings supported by the group discussions. Respondents in both the survey (78.6%) and the group discussions argue that it is very likely that ANPR cameras will create spatial and tactical displacement of crimes²⁴⁸, in that crimes will move to areas not covered by ANPR or other crimes will be committed instead (or in addition), such as car thefts for robberies, number plate thefts etc. The belief is that, as with CCTV, ANPR cannot cover all areas, streets, estates, it cannot be implemented everywhere. They fear that criminals would not be caught as a result, on the contrary, innocent citizens will be linked to crimes they have not committed.

The potential misidentification and criminalisation of innocent people is perceived as one of the biggest disadvantages to ANPR, raising concerns about whether the technology alone is

²⁴⁸ This is in line with results from Squires and Measor (1996) and Skinns (2000) who found that respondents believed that CCTV will displace crime (30% and 62% respectively).

sufficient to ensure offender detection and protect the innocent. These issues were discussed extensively in the group sessions, where respondents expressed their worries about the accuracy of the system, the quality of ANPR cameras and the relevance of the information stored on the databases used in conjunction with ANPR. It was felt quite strongly that ANPR has the potential to implicate innocent people and of particular concern was the notion of being ‘guilty by association’ if travelling alongside a suspect car. These associations are perceived as an infringement of people’s freedom of movement and privacy.

There was a consensus amongst respondents that ‘ANPR is only as accurate as the information put on’ and they fear that once the mistake has been made, it is hard to prove one’s innocence and correct the error. People want the power to challenge the system if the information is incorrect. Unsurprisingly, respondents are also concerned that evidence is not sufficient to secure convictions if ANPR captures just number plates (58.3%) and there is uncertainty as to whether evidence from ANPR cameras could be misleading, as the highest proportion of respondents from the survey (47.2%) neither agreed nor disagreed with the statement raising this concern. That is why the quality and maintenance of the systems and the coverage and direction of the cameras are perceived as essential for ANPR to be effective. A respondent from the postal survey argues:

‘ANPR must be reliable and in perfect condition [...] Image quality appears to be a problem with CCTV cameras. A comprehensive robust ANPR system should be installed and this should cover blind spots as well.’

People further question ANPR’s effectiveness because they think ANPR is limited to cars, car crime and in particular to number plate identification. ANPR’s effectiveness relies on the person driving the vehicle to be the registered owner of it at a correct and valid address, which is not always the case. Respondents indicate that ANPR would work better if the cameras could identify the driver and the overall evidence generated by the systems was sufficient for conviction purposes. They believe that there should be something else in conjunction with the number plate to ensure a more accurate identification of drivers. Some of these concerns and suggestions are mirrored in the following quotations:

‘How can the police effectively use ANPR to track criminals if cameras only focus on registration, which more than likely will be bogus? What would the police use ANPR for? Is it about surveillance of cars or surveillance of people?’

‘Cameras cannot catch criminals, the police can. If the cameras assist them in any way, then the outcome has got to be positive. But realistically, ANPR cameras only track cars. Criminals are no doubt aware of this and would therefore find ways round this.’

‘ANPR is not sufficient to ensure convictions if the driver cannot be identified through photograph [...] There is a need for good quality admissible evidence in Court.’

5.7.2. ANPR’s visibility: deterrence or detection?

Many respondents in the survey (67%) felt that ANPR would only make people feel safe if they knew about them and would only act as a deterrent to crime if ANPR cameras, as well as outcomes were well publicised. In contrast, ANPR was thought to work in crime detection if criminals did not know about the cameras (64%), otherwise, crime will be displaced. Indeed most respondents (81.2%) think that the use of hidden cameras for crime prevention purposes is acceptable, while a high proportion (56.4%) consider that the presence of ANPR cameras should be advertised to the public. This ambivalence towards the visibility and implicit effectiveness of cameras is mirrored in the group discussions, where respondents support the use of hidden cameras for offender detection purposes, while endorsing the importance of the visibility of cameras for reassurance purposes. Although there are arguments for and against ANPR’s visibility, the right to know seems to be more important in people’s mind. The argument is that advertising the cameras to the public will help towards having a crime deterrent effect, but will also avoid resentment and suspicion of police intention. Below are some of their arguments:

‘I am not aware of any guidelines or strategy issued with ANPR, so I cannot comment on how it is used. Surely overt and covert operations need to happen simultaneously for maximum impact, weighing up civil liberties – no easy balance!’

‘There is a difficult balance between reassuring the public (knowledge about ANPR) and tackling crime (criminals’ knowledge about ANPR).’

Results from the focus groups highlight similar issues, indicating that ANPR would make people feel safer only under certain circumstances:

'It wouldn't make me feel safer to walk around the streets of Leeds, but whilst driving, if I had an accident, then I would have the peace of mind that there was more of a chance that whoever crashed into me would be covered.'

'If you know it's there, is fine, if you don't think it's there and might be, it's not reassuring, on the contrary, it's a kind of Big Brother, but if you know that it's there and what it's for, I personally find it reassuring.'

People strongly believe that a high ANPR 'profile' together with a criminal justice system that supports punishment that fits the crime is the way to make ANPR work better. This is reflected in the following quotations:

'The biggest deterrent to crime whether it's technology or any other is to think that you're going to get caught.'

'The reason for which many people don't insure their cars is because the cost of insurance is greater than the penalty.'

5.7.3. 'ANPR cameras are only justified if there is police monitoring and response'

The qualitative analysis further indicates that respondents strongly believe that ANPR's effectiveness depends on how the police use the system. Respondents point out that for ANPR to be effective, there should be an appropriate policing strategy and effective response to ANPR:

'Although clever, ANPR's coverage and response are questionable.'

'It is the use of a system, not simply its installation which makes a difference. There is no use having the cameras if we don't generate response. I live within 100m of 2 CCTV masts with controllable cameras and I doubt if they made any difference in reducing crime or anti-social behaviour in the area.'

'A camera cannot stop and arrest somebody. Immediate police action is reassuring.'

In order to effectively respond to ANPR, respondents highlight that appropriate resources should be dedicated to it to ensure a proactive deployment:

'A concentrated well resourced action plan should be implemented, starting with the areas of highest offence, to rid West Yorkshire streets of drivers who refuse to tax, insure and MOT their cars. I feel this is higher priority than car patrols seeking to catch motorists breaking the speed limit by a small margin for example.'

'ANPR needs dedicated monitoring staff and police officers in order to be effective; so it does not take other police officers away from important duties.'

They argue that ANPR should not be static and permanent and a combination of fixed and mobile systems should be used to prevent spatial displacement, including the use of unmarked cars and hidden cameras.

5.7.4. Unintended consequences of ANPR surveillance

Although people appear to believe that police surveillance cameras in general and ANPR in particular play an important part in improving community safety, the consensus is that reliance on these cameras may lead to unintended consequences which long term might affect their effectiveness in preventing crime and reassuring the public. Most respondents fear that ANPR might be used as a substitute for more police on the beat. The argument is that this might impact on people's confidence and trust in the police, as the contact and bond with the police will be diminished or lost. Another concern raised by respondents is that the police might become lazy and too reliant on the technology to do the job for them, which will have an overall impact on the police effectiveness to tackle crime and disorder.

Some respondents worry that the increased use of cameras might lead to the causes of crime being ignored or to an erosion of feelings of responsibility within communities. These findings mirror those of Squires and Measor (1996) and Skinns (2000) who explored public perceptions about CCTV and indicated that 38% and 34% of their sample respectively

thought that the causes of crime would be disregarded as a result of CCTV. Similarly, Dixon et al. (2003) argued that, because public spaces are increasingly electronically surveilled, the public sense of social responsibility and natural surveillance are diminishing. The need for a more civic sense and social responsibilities within communities seems to be strongly acknowledged by respondents from both the survey and the focus groups in the current study. Some of these issues are reflected in the quotes below:

'... the problem with surveillance is that the greater proportion of the population is suffering because of a minority who do not pay their insurance or commit other offences. We should be educating, training and redeveloping a sense of civic responsibility. Surveillance is not going to change offender behaviour too much. You have to tackle the problem a different way. I think that with serious criminals, murderers, the technique might work and it is great to have: it is sensible and usable. But if you go lower down the scale I do not think we are going to solve the problem with people not paying their licence, maybe catch a few, but the problem will still be there. Surveillance highlights a problem, it does not provide a solution.'

'I think that unfortunately we do need it, but I think the society will change eventually and hopefully will get to a point where we will realise that we live together and we have to be peaceful with each other. If you look at youth crime and criminal behaviour, it has all started long time ago within the homes, but family values have broken down. Can that be tackled through cameras?'

Other consequences either intended or unintended mentioned by many participants both in the survey and the group discussions refer to the potential police abuse by the system and the impact on people's privacy. As will be argued next, respondents strongly feel that ANPR could be used for the wrong purpose (e.g. revenue or easy police targets) and that ANPR surveillance has the potential to lead to an erosion of civil liberties and a society where the blameworthiness is generalised to the entire population.

5.7.5. Privacy vs. security: 'Nothing to hide, nothing to fear?'

'Nothing to hide, nothing to fear' is a common argument in popular discourse about privacy, particularly when balancing privacy against security. The Universal Declaration of Human Rights (1948) states in Article 12 (2) that:

'No one shall be subjected to arbitrary interference with his privacy, family, home or correspondence, nor to attacks upon his honour and reputation. Everyone has the right to the protection of the law against such interference or attacks.'

The 'nothing to hide, nothing to fear' argument erodes to a certain extent that right because it implies that people should be willing to reveal details about their everyday life which the law has no right to demand that they reveal. The danger is, however, as this becomes normalised into society, there is an increasing erosion of civil liberties. Interestingly, people are indeed willing to reveal their 'privacy' in the name of 'security'. Studies exploring public perceptions about CCTV surveillance found strong support for the idea that if you are not a criminal then you should have nothing to hide from police cameras²⁴⁹. Emerging findings from the current study support this claim, as the vast majority of respondents from the postal survey (89%) feel that people who have nothing to hide have nothing to fear. Unsurprisingly, respondents indicated to be more worried about crime victimisation (51.5%) than loss of privacy (7.3%), while about 20% were worried about both or neither. As many as 81.2% of respondents from the survey agree or strongly agree that it is ok for the police to use hidden cameras, as long as it is done in the name of crime prevention. These findings are similar to those found by Dixon et al. (2003) in their study exploring attitudes towards public order measures, including CCTV, indicating that as many as 85% of respondents agree or strongly agree that 'people who obey the law have nothing to fear from CCTV cameras', while 78% think that only criminals have any reasons to be afraid of CCTV cameras²⁵⁰.

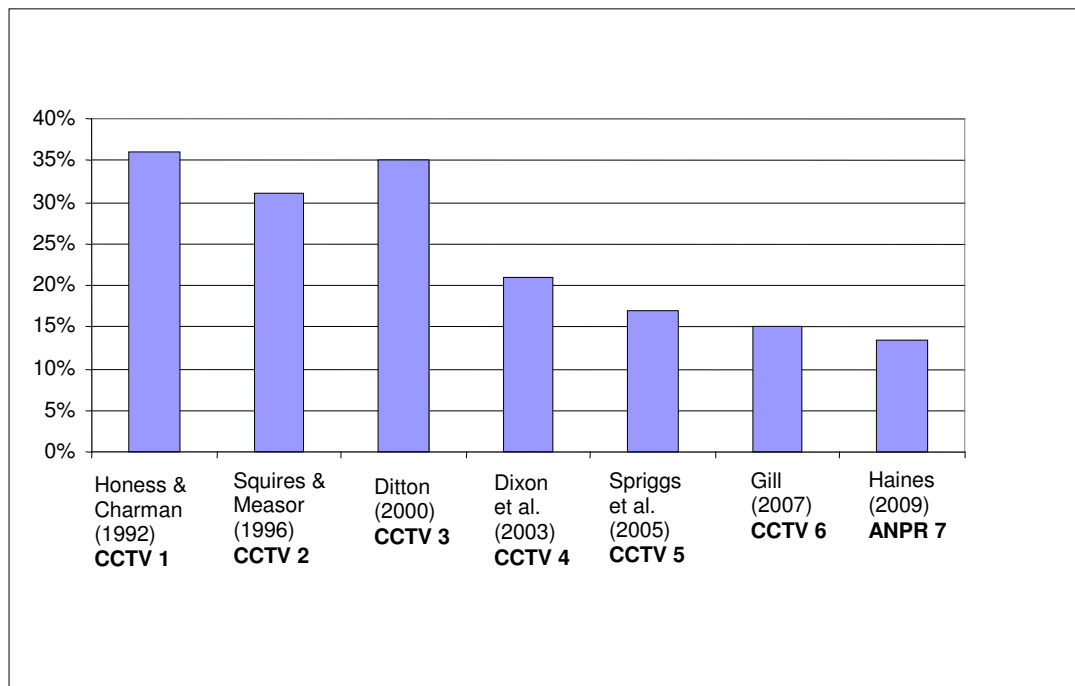
While only a minority (13.6%) think that ANPR does represent an infringement of their civil liberties, a higher percentage of respondents were unsure if this was the case (27.2%). These findings are slightly lower than those previously reported in studies exploring public views about CCTV (see Figure 5.2 below). For example, Spriggs et al. (2005) found that 17% of their sample agreed or strongly agreed that the introduction of CCTV would be an invasion of people's privacy, considerably lower than those found in Honess and Charman's (1992) and

²⁴⁹ Dixon et al. (2003).

²⁵⁰ Dixon et al. (2003). Ditton (2000) shown less support for this claim, with 53% of his sample agreeing that 'only criminals need to fear CCTV'.

Squires and Measor's studies (1996) (36% and 31% respectively²⁵¹) more than a decade earlier. This seems to indicate support to the hypothesis that over time the public has become less concerned about the impact of police cameras on their privacy.

Figure 5.2 Perceptions about CCTV's and ANPR's impact on privacy (1992-2008)*



*CCTV 1 - 36% respondents agreed that '*CCTV was an invasion of people's privacy*'

CCTV 2 – 31% respondents '*criticised CCTV on "civil liberties" grounds*'

CCTV 3 – 36% agreed that '*CCTV will erode civil liberties*'

CCTV 4 – 17% agreed and strongly agreed that '*CCTV cameras invade people's privacy*'

CCTV 5 – 17% agreed or strongly agreed that '*CCTV is an invasion of people's privacy*'

CCTV 6 – 16% agreed or strongly agreed that '*CCTV is an invasion of people's privacy*'

ANPR 7 – 13.6% agreed or strongly agreed that '*ANPR represent an infringement of civil liberties*'

However, findings emerging from the qualitative data, in particular the focus group discussions, highlighted the complexity of the issues involved in people's perceptions about

²⁵¹ Same year, Bennett and Gelthorpe (1996) found that 29% of their respondents were worried about the civil liberty implications of CCTV.

ANPR and civil liberties. They had greater concerns about ANPR's impact on their privacy. Some respondents indicate some unease at being watched or tracked while travelling in a car. Article 13 (1) of the Universal Declaration of Human Rights (1948) states that '*everyone has the right to freedom of movement and residence within the borders of each state*'. ANPR's ability to track cars around the country undoubtedly impacts on people's privacy (particularly their 'locational' privacy) and respondents picked up on this issue. Some perceive ANPR surveillance as a gradual erosion of civil liberties, a step further towards a 24/7 'surveillance society', a 'Big Brother' state. They seem to agree with ANPR, but they fear that 'next step', the boundaries and limits of such technologies. One young respondent from the group discussions argues:

'[ANPR] is just the start of it. We are already being watched, recorded, listened to... Next it will be implanted chips or barcodes, who knows? First of all, CCTV was only in shops and things like that, now it's everywhere. Then you realised they've put them on tops of roads and buildings. And we thought "Oh, my God, they are watching us all the time". Now we are so used to CCTV, I don't go down the road and think I am being watched anymore [...] It's sad that we got here and the government has to know where you are at all time. Nobody trusts you anymore.'

As discussed in the literature review, ANPR has the potential to bring us closer to a maximum surveillance society because of the expansion of blameworthiness to the entire population, the shift from individualisation to generalised suspicion²⁵². ANPR 'powers' surpass those of CCTV systems, as ANPR can collect information on individuals on the basis of possible associations with known offenders or suspects, hence interest and suspicion are attached to individuals without them even being aware of it or without having done anything wrong. This is where the public's views shift. They seem to agree with 'general' surveillance, being watched, even without being aware of it, but they have doubts regarding their details being stored on databases for no good reason. Of particular concern to participants is the accuracy, use, storage and security of this data. Respondents raise issues regarding data misuse, data storage, data loss, data sharing (particularly with agencies other than the police), with the greatest concern about the security of data held about them. This is unsurprising,

²⁵² Norris and McCahill (2006: 114).

given the recent highly publicised instances of data loss by government agencies which have put at risk the privacy and welfare of millions of law-abiding citizens. People have lost confidence in the government's ability to address the crime problem on the one hand, and respect and protect people's rights, on the other.

'I am worried that the information is misused. Lately sensitive information has been lost and personal information has got into the wrong hands. Mistakes happen and you could be put on a criminal list and have serious consequences.'

'I am concerned that we are moving towards a society where you have to prove your innocence rather than believed innocent until proven guilty. I would probably be unable to account for my presence in an area that I frequented two years ago.'

The opinion is almost equally divided when it comes to respondents' views about ANPR's potential to 'spy on people' (39% of respondents from the survey disagree, 31% neither agree nor disagree and 30% agree with this argument). This indicates yet again that people have reservation about the police use of ANPR and civil liberties issues; it could be either because they have limited knowledge about ANPR and its capabilities, or they have limited confidence in the police to use ANPR appropriately and with respect to the public. As will be argued next, it seems that the more people lack trust in the police and the government in general, the more likely they are to have concerns about ANPR and its impact on civil liberties.

5.7.6. Trust in the police

The issue of trust in the police appears to be the key to perceptions about ANPR. Although a high proportion of survey respondents think that the police can be trusted to safeguard information gathered from the cameras and use it properly (58%) or to ensure that innocent people are not placed on police records and wrongly accused (52.6%), the majority feel that the police need to be regulated and monitored by an independent body of control (68.7%). These concerns are also expressed by respondents in the group discussions, who refer to the need for strict and appropriate controls and regulations and independent monitoring of the use of ANPR data to avoid breaches of Human Rights and Data Protection:

'I support ANPR, but I think there should be an independent monitoring body/system in place to ensure that abuse of ANPR does not become a political football and that it remains for what it was designed, i.e. a crime prevention tool.'

Some respondents expressed further concerns about the potential misuse or abuse of the system, either for revenue purposes (43%) or in a discriminatory manner (22%). These worries are reflected in the group discussions, where some respondents felt that police officers might over-scrutinise particular groups, for example young people, ex-offenders, Asians or Black people without due cause and such a selection would be an infringement of civil liberties. There is consensus that *'ANPR should be used for the right purpose and not for easy return on revenue or easy targets!'* Respondents seem to agree with crime prevention initiatives which demonstrate improvement of a practical nature, but they do not favour money making or easy targets driven initiatives (i.e. congestion charging, speeding or minor traffic offences). The quotations below reflect some of these views:

'ANPR is just another way of getting more money out of motorists! You get a £60 fine and three points on your licence for being a day late to the post office to buy your tax disc? Ridiculous! Change your priorities!'

'Please don't use ANPR to prosecute the general public for minor traffic offences such as being into a box junction or turning left too early across a bus lane. This shouldn't happen in West Yorkshire, like in London.'

While people agree with ANPR, they argue that they should be informed about ANPR's purposes and exact use in order to counter any negativity towards the technology and mistrust in the police. They feel that the police need to be clear about their objectives whilst using ANPR. A common view is that at the moment information about such local initiatives is not being made available to the public. People just hear about crime and shootings going up at national level, but nothing very specific, particularly at local level, where it matters most for their communities. One respondent from the group sessions argues:

'I do not necessarily think there should be more scrutiny as to how the police are using their resources. Just an explanation of these things. I am only just thinking about this for the first time in my life. Nobody challenges you to think about these things. Ok, I do not agree with my information being stored if I am not a criminal, but if we have to go this way, then I would like to be confident that the way we are spending our money makes sense.'

Getting the message across to the public regarding the advantages and consequences of using ANPR cameras might improve feelings of safety and reassurance:

'If ANPR can have an impact on no insurance etc, yet there are so many cars without insurance nowadays, I would like to see more of these cars being stopped and impounded and make these drivers pay. I would like to see it working! This is the thing, you have got surveillance, but it has to come with action. It is a waste of money if you have all these systems and nothing happens!'

Findings emerging from the qualitative data indicate that respondents' level of confidence in the police is low. Respondents believe that due to this lack of trust in the police, they are more likely to feel that ANPR will not be effective or will invade their privacy. It seems that expectations of the police have changed over time. *'Whereas years ago my expectation was greater when the police were on the beat; I was expecting the crime to be solved, my expectation now is that it is highly unlikely that it is going to be solved'* argues a respondent in the group discussions. However, there is consensus that reassurance and trust could be improved if the police use ANPR (and any crime prevention technology) in a fair and (cost) effective manner, respecting and protecting people's rights. ANPR needs to 'prove' itself before the public. People need to be reassured by the police that ANPR is used for crime prevention and not for undeclared or inappropriate purposes. Some of these arguments are reflected in the following quotations:

'It is about how much we trust our government: all the whys, the whos, the whats are all about our trust in the police and government institutions'

'I would like assurance and evidence that ANPR is used for catching criminals and not low level traffic violations [...] you get suspicious that is more about raising revenue than anything else.'

As indicated above, people worry about the storage and security of personal data. It was said that faith could be restored if people knew that the data held on them was used solely for the purpose for which it was intended and was destroyed once no longer needed for that purpose. People would feel reassured if legislation was put in place to ensure an appropriate control and regulation of the use of ANPR.

Another driver of confidence seems to lie in the ability of the criminal justice system to deal appropriately with crime, to issue penalties which fit the crime. Findings indicate reduced public tolerance towards offenders and appear to resent paying the extra cost or be subject to various intrusions for the sake of a minority (i.e. the offenders):

'It is unfair that innocent people have to pay the bill for other criminals.'

Respondents call for 'fit for purpose' punishment and less tolerance towards offenders:

'Make the punishment fit the crime. Penalties are not harsh enough; need to have higher fines for repeat offenders. Take 'no insurance' for example. If the fine is less than the insurance, then it is not a deterrent; young people would rather risk getting caught and fined for no insurance' 'Get the cars crushed!'

Other respondents indicate that more emphasis should be placed on prolific offenders and a Criminal Justice System which focuses on crime prevention rather than crime detection would be more reassuring:

'Cameras do not deter criminal activity, as they do not punish.'

'Instead of dealing with crime by looking at the surface (cameras), the root of the problem needs to be tackled. Prevention is better than cure. People need to be made aware that each one of us is responsible in keeping crime down.'

Many respondents in the survey and focus groups felt the need for better community policing in order to develop a positive relationship with the police based on mutual trust. This is linked to the view mentioned above that the police should be perceived as an agency helping law abiding citizens as well as dealing with offenders. The public think that the police are too driven by the government's national agenda (i.e. to tackle terrorism) rather than by local circumstances and more focus should be placed on ensuring the safety of local communities. Respondents want to see a police force which is more locally orientated with more officers on the beat closely engaged with the communities. Cameras should be used in support of, not instead of police on the beat, which is the policing strategy most preferred by the public. More officers patrolling the streets need to be more available and in contact with the public to regain their trust.

'We need more police on the street, more contact with the community, more social integration and participation.'

'Community police would be seen more helpful if they were able to knock on residents' doors to find out what is going on on estates. Then residents would not be frightened to raise issues, name names and report crimes.'

'I would like to see more police presence on the streets to deter crime and reassure the public. I am not sure if cameras have the same impact when it comes to reassurance.'

Table 5.12 below summarises respondents' concerns with regards to the police use of ANPR. The table includes only responses from the postal survey.

Table 5.12 Most common concerns regarding the police use of ANPR (postal survey)

‘What is your view on each of the following statements?’	Agree or strongly agree	Neither Agree nor Disagree	Disagree or strongly disagree
People who have nothing to hide have nothing to fear from police cameras	88.9%	4.9%	6.2%
Criminals steal cars, number plates or find other means to avoid detection with ANPR cameras	82.9%	14.7%	2.4%
It’s ok for the police to use hidden cameras for crime prevention	81.2%	9.1%	9.7%
Offenders will still commit crimes, but will use different roads where there are no ANPR cameras	78.6%	16.1%	5.3%
The use of ANPR cameras needs to be regulated and monitored by an independent body of control	68.7%	21.2%	10.1%
ANPR can only make people feel safer if people know about them	67%	19.9%	13.1%
ANPR won’t help catch criminals if they know where these cameras are	64.1%	21.6%	14.3%
Evidence against criminals isn’t sufficient if ANPR captures just number plates	58.3%	29.8%	11.9%
The police can be trusted to safeguard information gathered from cameras and use it properly	58.1%	27.9%	13.9%
The police need to put up notices to advise the public about ANPR cameras	56.4%	15.3%	28.3%
The police can be trusted to ensure that innocent people are not placed on police records and wrongly accused	52.6%	30.5%	17.0%
ANPR cameras might be used to make money from penalty notices for minor driving offences, instead of focussing on crime	43.1%	27.7%	24.2%
ANPR cameras might be used to spy on people	30.0%	30.7%	39.3%
Evidence from ANPR cameras could be misleading	26.6%	47.2%	26.2%
ANPR cameras might be used to target specific minority groups within the community	21.9%	31.7%	46.4%
ANPR cameras represent an infringement of your civil liberties	13.6%	27.2%	59.2%

Source: Question ‘Below is a list of views or concerns people might have regarding ANPR, or police video cameras in general, some of which have appeared in newspapers or on TV. Do you agree or disagree with them?’

Total number of respondents is 1573

5.7.7. Who is more likely to have concerns about ANPR and why?

Previous research exploring public attitudes towards CCTV indicates that views about CCTV as an invasion of privacy are influenced by socio-demographic characteristics. For example, younger male respondents are more likely to be concerned about the impact of CCTV on individual rights²⁵³, findings mirrored in the current study. The analysis reveals weak, but statistically significant relationships between perceived concerns about ANPR and gender, age, ethnicity, employment, housing and respondents' residential area (ACORN category).

Female and older respondents (and unsurprisingly retired) appear less likely to be concerned about ANPR surveillance, whether overt or covert, and more likely to trust the police to use ANPR fairly and with respect to the public. In fact, older respondents were less likely to be concerned about ANPR's potential infringement to their liberties. This is not because older people do not know what ANPR is; results from the survey indicate that younger respondents were less likely to know about ANPR than respondents in the other age groups. On the contrary, male and younger respondents tend to disagree more with the argument '*nothing to hide, nothing to fear*' argument and with the police use of hidden cameras; they appear to have less confidence in the police and think that ANPR cameras might be used to spy on people. It seems that gender is a characteristic which consistently plays a role in shaping perceptions about ANPR. Results from both the survey and the group discussions indicate that there is a tendency for female respondents to be more confident in the police use of ANPR and its effectiveness in tackling crime and fear of crime, on the one hand, and less worried about ANPR's impact on civil liberties on the other - although the female participants in the group discussions had more reservations about these issues.

Women's support for CCTV or in this case ANPR may relate to a greater fear of crime, or more trust in technology generally. Contact with the police as a suspect probably inversely relates to trust in the police, thus as women are generally more law abiding than men, then trust should be higher. Similarly, contact or expectations of the police as a victim could have an impact on trust in the police, particularly as men tend to be those more likely to report having been a victim of crime. Unsurprisingly, the current study indicates that there is a slight tendency for those who have been victimised to be more likely to disagree with the use of

²⁵³ Ditton (2000), Dixon et al. (2003), Spriggs et al. (2005)

hidden cameras for crime prevention purposes and to trust the police that ANPR will be used fairly and no innocent people will be placed on police records and wrongly accused. Victims also appear to be less confident in ANPR's ability to reduce crime and fear of crime, which is in line with findings from studies looking at perceptions of CCTV showing that victims are generally more sceptical about the benefits of CCTV cameras²⁵⁴.

Some statistically significant differences in opinion (about ANPR's 'disbenefits') by ethnicity also emerged, although these were rather limited due to the small number of people in each category. It is worth mentioning, however, that Asian or Asian British respondents in particular appear more likely to strongly agree or agree that ANPR represents an infringement of their civil liberties (31.7%) or be neutral towards this argument (46.3%) than all other ethnic groups (e.g. 12.3% of White or White British respondents agree). These respondents are also slightly more likely to disagree with the '*nothing to hide, nothing to fear*' argument²⁵⁵. Similarly, the Asian or Black respondents appear to be those more likely to think that ANPR cameras might be used to target specific minority groups within the community or that evidence from ANPR could be misleading. These results are mirrored in the group discussions, where there is a tendency for ethnic minority participants to think that the police discriminate against these groups. They argue that ANPR is acceptable as long as the police use it fairly and with respect to all members of our communities irrespective of their age, ethnicity or background. This is not surprising, since the introduction of the new anti-terror laws (starting with the Terrorism Act 2000) brought forward the potential of 'racial profiling' against ethnic groups believed to be associated with Islam (i.e. Asians and people of Middle Eastern appearance), hence the likelihood of police disproportionately performing more stops and searches on these groups. Indeed evidence suggests that in 2002/2003 Black and Asian people were four times more likely than White people to be stopped under these powers²⁵⁶.

²⁵⁴ Honess and Charman (1992), Bennett and Gelsthorpe (1996), Ditton (2000), Dixon et al (2003).

²⁵⁵ These results are similar to those of Spriggs et al. (2005) indicating that non-White respondents appear more likely to perceive CCTV as an invasion of privacy (22% compared to 15%).

²⁵⁶ Cf. Section 95 *Statistics on Race and the Criminal Justice System – 2003* (Home Office, 2004e). After the London bombings and new anti-terror legislation, the ratio increased further – it is argued that in London Asian and Black people were 12 times more likely to be stopped and searched than White people (Vikram Dodd, 2005 *The Guardian*).

Following the London bombings in July 2005, the gap between the police and Muslim communities has widened even more. The introduction of new offences linked to terrorism, amended legislation increasing police stop and search powers and extending police powers to detain suspects after arrest for up to 28 days²⁵⁷ had widened the gap between Muslims and the police even more. Muslims might fear that the new ‘war on terror’ approach and the new powers given to the police would lead to more and more innocent Muslims being subject to more surveillance and police intervention because of a generalised suspicion of the entire Islamic population.

Some statistically significant differences in opinion by housing and ACORN category emerged as well, but as in the case of ethnicity they should be interpreted with caution as these differences did not correspond to large numbers of people in the sample. Those living in accommodation from the Council or the Housing Association appear to be more confident that the police would use ANPR data appropriately, safely and with respect to people’s rights. This is unsurprising, as this group of respondents also appeared to have greater expectations regarding ANPR’s impact on crime and fear of crime. Maybe because these respondents are also more likely to perceive crime as a problem in their neighbourhood and accept any crime prevention measures – even if they do not have any proof of their effectiveness - in order to increase neighbourhood safety. In contrast, respondents living in ‘Urban Prosperity’ ACORN area are those most likely to agree that ANPR is an infringement of their civil liberties. This group of respondents are also the least confident in ANPR’s potential to reduce the number of police stops and equally target all groups in the community. Although statistically significant, the relationships between these variables are weak, so the results should be interpreted with caution.

Perceived concerns about ANPR were correlated with perceptions about ANPR’s potential benefits. For example those who believed ANPR is an infringement of civil liberties were compared with those who responded to statements such as ‘With ANPR on the streets of Leeds, you will feel safer; crime will be reduced etc’. Low to moderate statistically

²⁵⁷ Detention periods have significantly changed in the last 8 years under new or amended anti-terrorism legislation - from the basic 48 hour detention (extendable to seven days with the permission of the courts) to 14 days in 2003 and 28 days in 2006. The proposition to extend this to 42 days was rejected.

significant correlations between these variables were found. Not surprisingly, those who perceived ANPR as an infringement to their civil liberties were those less likely to believe in ANPR's potential to reduce crime and fear of crime and reassure the victims of crime, findings in line with those of Honess and Charman (1992) who indicate that respondents with greater concerns about CCTV and civil liberties believed it was less effective in detecting and deterring crime. This group of respondents are, of course, those least confident in the police to use ANPR fairly and with respect to the public and more likely to be against the use of hidden cameras; they believe that ANPR should be clearly advertised to the public and the use of ANPR cameras should be regulated by an independent body of control.

As argued before, trust in the police is the main factor driving perceptions about police surveillance in general and ANPR in particular. Those respondents who agree with the '*nothing to hide, nothing to fear*' argument are less likely to think of ANPR as an infringement of their civil liberties and more likely to trust the police to use covert surveillance cameras and to use ANPR appropriately. Not surprisingly, respondents who accept surveillance on the basis of '*nothing to hide, nothing to fear*' are more likely to feel safe as a result of ANPR surveillance or to think that crime will be reduced through deterrence of offenders and more efficient and fair policing. This reinforces the argument above that, the more concerned about privacy people are, the least likely they are to trust the police and believe in ANPR's positive impact on crime and fear of crime. For a detailed account of correlation coefficients and significance, see Tables 5.13-5.17, Appendix 2.

5.8. Overall support for ANPR in Leeds

As a final measure of support for and acceptability of ANPR, all respondents were asked the degree to which they felt positive or negative about the introduction of ANPR cameras in Leeds. Similar to research looking into attitudes towards CCTV²⁵⁸, findings here show high levels of support for ANPR, as the majority of respondents from the survey (89%) were positive or very positive about the introduction of ANPR. Similar support is found in the group sessions, where around 85% of participants voted in favour of ANPR, although respondents here showed more reluctance towards ANPR, questioning certain aspects regarding the police use of these cameras and balancing issues regarding safety and privacy. The high level of support for ANPR amongst respondents from the survey (89%) and very low level of opposition (4.7%) influence the validity of statistical analysis looking at the impact of socio-demographic characteristics on respondents' views. The number of respondents with a negative or very negative attitude towards ANPR is very small (N=71) - even smaller than the number of those who expressed ambivalence towards ANPR (N=94), hence the statistical differences between the groups are not necessarily revealing. As shown in Table 5.18 below, it appears that female, older and retired respondents are slightly more supportive than their counterparts, although the differences are not statistically significant. These findings reinforce those highlighted before in that female respondents come out as more confident in the police use of ANPR and less concerned about ANPR's impact on civil liberties.

²⁵⁸ Ditton (2000), Spriggs et al. (2005).

Table 5.18 Overall support for ANPR by socio-demographic characteristics and victimisation*

Group	Support % (N) in descending order
Respondents aged 64+	93.2 (480)
Those who live in 'Comfortably Off' ACORN area	93.1 (394)
Those who live in 'Wealthy Achievers' ACORN area	92.8 (180)
Retired respondents	92.7 (581)
Those renting Council accommodation	91.2 (186)
Females	90.6 (701)
Those living in 'Urban Prosperity' ACORN area	90.6 (77)
Those living in 'Hard Pressed' ACORN area	90.2 (276)
White or White British respondents	89.7 (1241)
Those who own their property	89.7 (1021)
Non-victims	89.3 (940)
The unemployed	89.2 (33)
Respondents aged 45-64	88.0(486)
Those living in 'Hard Pressed' ACORN area	87.8 (108)
Males	87.0 (593)
Respondents aged 25-44	86.7 (319)
Employed respondents	86.1 (525)
Crime victims	86.1 (204)
Respondents aged 17-24	85.7 (36)
Students	85.2 (23)
Asian or Asian British respondents	85.0 (34)
Those renting private accommodation	78.4 (40)
Mixed or Mixed British respondents	77.8 (7)
Black or Black British respondents	73.7 (14)
The sample	89.1 (1347)

*The table indicates the proportion of respondents who are positive or very positive about the introduction of ANPR on the streets of Leeds

The overall support for ANPR was correlated with other variables, such as perceptions regarding ANPR ‘benefits’ and ‘disbenefits’. The analysis reveals a series of low to substantial statistically significant correlations between these variables (see Table 5.19, Appendix 2). Unsurprisingly, the strongest of these correlations indicate that, the more positive respondents feel about ANPR, the more likely they are to believe in ANPR’s benefits in reducing crime and improving feelings of safety. These respondents appear more likely to agree with the ‘nothing, to hide, nothing to fear’ argument and less likely to be concerned about the use of hidden cameras or any infringements to their civil liberties. Respondents with a positive attitude towards ANPR seem less doubtful about the ANPR outcomes and more confident in the police to use ANPR fairly and appropriately. No relationship was found between support for ANPR and victimisation or perceptions of crime in the neighbourhood. This could suggest that respondents’ overall attitude towards ANPR is more likely to be influenced by their level of trust in the police and their perceptions of safety, surveillance, privacy and policing in general rather than their personal experience of crime. However, as noted above, it would be unwise to make strong claims on the basis of these correlations because of the small number of people with negative opinions about ANPR.

5.9. Emerging issues

Similar to previous research into perceptions about CCTV²⁵⁹, findings here indicate that the public is highly supportive of ANPR, with the majority of respondents (89%) from both the postal survey and group discussions being positive about it. The more positive respondents felt about ANPR, the more likely they were to believe in ANPR's benefits in reducing crime and fear of crime. The value of ANPR is judged mainly in terms of better identification and detection of offenders in general and drivers without insurance in particular, findings in line with the theoretical assumptions about ANPR's effectiveness outlined in the Literature review and police perceptions and experience of ANPR presented in the previous chapters.

Relatively few respondents (13.5%) agreed or strongly agreed that ANPR represents an infringement of their civil liberties, lower than those previously reported in studies looking at perceptions about CCTV as an invasion of privacy. This could suggest that the more people have become accustomed to surveillance and are less likely to 'mind' it or be concerned about its impact on civil liberties. There is sufficient evidence to indicate that people prefer to give up their privacy in the name of security, although a false sense of security, as surveillance cameras do not necessarily make people safer or secure. The lack of significant opposition towards surveillance is likely to be influenced by the impression of a 'risk' society under constant threat, especially since the latest terrorist attacks on the Western world, with the government engaging in extensive surveillance and data mining²⁶⁰ in the name of national security and public safety.

However, findings emerging from the qualitative data highlight the complexity of the issues involved in people's perceptions about ANPR. Participants felt that on balance ANPR positives outweigh the negatives - although the latter are important and need to be considered. This ambivalence towards ANPR is also confirmed by the mixed response regarding the visibility of ANPR cameras. Responses are divided between those who do not mind the intrusion of hidden cameras for the sake of crime prevention and those who want the right to know if they are being watched²⁶¹.

²⁵⁹ Honess and Charman (1992), Skinns (2000), Spriggs et al. (2005).

²⁶⁰ Data mining involves analysing personal data to identify patterns of suspicious behaviour.

²⁶¹ Results similar to those found by Dixon et al. (2003) and Spriggs et al. (2005).

It was strongly felt that the pressure to demonstrate the effectiveness of ANPR may lead to police officers (mis)using ANPR for the purpose of revenue or hitting ‘easy targets’. People’s concern was that government targets and statistics will drive a culture of ‘let’s get them for anything’ so as to add another result or justify the money spent installing ANPR systems. One respondent from the postal survey argues:

‘It would be nice to think that ANPR cameras weren’t a modern day necessity, but sadly they are. My only major concern is that the police don’t use the information gathered sensibly. What I mean by that is that in the last decade the police and most government bodies seem to be managed around finances. If the cameras are used to catch and prosecute “proper criminals”, it’s great news, but if they are used to create revenue from working class people who have just by a small margin broke the law (i.e. forgot seat belt or did 34 mph in a 30 mph zone etc) then it is bad news!’

The potential misidentification and criminalisation of innocent people is perceived as one of the biggest disadvantages to ANPR, raising concerns whether the technology alone is sufficient not only to ensure offender detection but also to protect the innocent. There is additional concern whether the police will use ANPR correctly, fairly and with respect to the public. It appears these issues are related to the level of public confidence and trust in the police. Findings emerging from the qualitative data indicate that respondents’ level of confidence in the police is low. Due to this lack of trust in the police, respondents were more likely to have concerns about ANPR.

Respondents are concerned that, by increasingly relying on surveillance technologies, we fail to see the bigger picture, alternatives and long term consequences:

‘We want a society which is “social”, not “spied upon”. Police and community workers need to be out in the community, not watching screens. We want a sense of “belonging” to our community, caring, respecting and being involved; not let to “go to pot” until picked up for contravening some petty law or statute.’

5.9.1. Factors influencing perceptions about ANPR

Results show that perceptions about ANPR vary significantly by socio-demographic characteristics. Female older respondents for example appear more confident in ANPR's impact on crime and safety and less likely to be worried about civil liberties issues than their counterparts. As argued above, women's support for ANPR may relate to a greater fear of crime or trust in the police generally. As women are generally more law-abiding than men, there is less contact with the police as a suspect which could impact on levels of trust in the police. Similarly, contact with the police as a victim could influence trust in the police, particularly as men tend to be those more likely to report having been a victim of crime²⁶². The analysis confirms this assumption, as victims appear less confident in the police use of ANPR. These results are in line with findings from studies looking at perceptions of CCTV showing that male younger respondents and victims are generally more sceptical about the benefits of CCTV cameras²⁶³.

It has been shown that the level of acceptability of surveillance cameras, in particular CCTV, is also influenced by the methodology employed in the study, specifically the way questions are ordered in a survey. Ditton (1998) and Spriggs et al. (2005) argue that if questions about support for CCTV followed pro-CCTV statements or contextual questions about levels of crime in the area, the number of respondents in favour of CCTV can increase by as much as 20%. The current study aimed to avoid these limitations by asking about overall support for the introduction of ANPR in Leeds before crime and anti-social behaviour in the neighbourhood. A mixture of 'positive' and 'negative' statements preceded the question about support for ANPR, so that respondents would get a more comprehensive view about both benefits and concerns about ANPR before deciding how positive they would feel about the introduction of ANPR.

Previous research into attitudes towards CCTV also indicates that support for expected effects of CCTV diminishes after its installation²⁶⁴, so CCTV appears more appealing in theory than in practice. Given that this is the first study exploring perceptions about ANPR,

²⁶² The British Crime Survey suggests that men are more likely to be the victim of a crime and the offender in a crime. See for example Kershaw et al. (2008).

²⁶³ Honess and Charman (1992), Bennett and Gelsthorpe (1996), Ditton (2000), Dixon et al (2003).

²⁶⁴ Skinns (2000) and Gill (2007).

such a comparison is not feasible. It would be, however, interesting to conduct a similar study at a later date to investigate whether expectations about ANPR's impact on crime and safety have changed. As people become more aware of ANPR's capabilities and possible outcomes, they might change their view with regards to ANPR's effectiveness in crime prevention.

Previous studies show that public attitudes to crime and the criminal justice system are influenced by the level of knowledge about these issues²⁶⁵. More specifically, public acceptance of CCTV is based on limited and partly inaccurate knowledge about its functions and capabilities²⁶⁶. Findings in the current study indicate that, although the majority of people indicate awareness of ANPR (i.e. 66%), they seem to have inadequate understanding of the aims and consequences of ANPR surveillance to make reasonable judgements about ANPR's effectiveness in tackling crime.

²⁶⁵ Roberts (1992, 2002), Hough (1996) and Hutton (2005).

²⁶⁶ Honess and Charman (1992: 25).

5.10. Recommendations

As well as being asked about their knowledge and views regarding the police use of ANPR, participants in this study were encouraged to think of how the police might do things in the future to increase their confidence and sustain support for ANPR. A number of comments were useful and these were used to produce recommendations, which generally relate to how public perceptions can be changed through information provided by the police backed up by appropriate legislation and controls with regards to ANPR. Although the results reflect the views of the West Yorkshire public, the recommendations and implications for policy are transferrable to other police forces and ANPR nationally.

Interestingly, some of the issues and recommendations emerging from this public opinion study overlap with those identified through the consultation with the police, which were presented in the previous chapter. The common issues are mainly concerned with improving the quality of ANPR systems and the intelligence used in conjunction with ANPR. The public appears to be highly concerned regarding potential misidentifications caused by technological errors and out of date ANPR intelligence, which might link innocent people to crimes they have not committed. It is believed that the police should undertake regular reviews with a view to identify and rectify these errors in order to increase the effectiveness of stops and searches and minimise disruption of law abiding citizens. Similar to the police, the public believe that the Driver and Vehicle Licensing Agency (DVLA) could contribute to minimising these ‘errors’ by adopting robust security measures with regards to number plates and a more effective vehicle registration system in the UK.

Other recommendations emerging from the public consultation fall under the following three themes:

5.10.1. Improving ANPR’s legal status

It appears that the public will feel more confident in the police use of ANPR surveillance if the legislation with regards to ANPR were in line with latest developments and use. It would be beneficial if the government placed ANPR on a proper statutory basis, with clear regulations and an appropriate system of complaint aiming to protect both the public (from any infringement to their civil liberties) and the police or other crime prevention agencies

using ANPR technology (from malpractice which could undermine investigations and convictions). The ANPR regulations should be publicised in official government documents available to the public, making clear reference to purposes for ANPR use by the police and how citizens' privacy and civil rights are protected. Safeguards and restrictions on ANPR data handling need to be carefully monitored.

It is believed that the development of a clear ANPR Code of Practice would help ANPR users to understand their legal obligations and reassure the public about the safeguards in place. The ANPR Code of Practice would cover current practice, but also anticipate any arising issues due to the extension and development of ANPR systems in the UK. The Code would be subject to regular review (e.g. every 2 years) to include consultation with relevant parties (including the public) and new ANPR developments. It would be made public and clearly state its nature and objectives and the legislation that it complies with, while making clear reference to the extent of oversight of ANPR use in the UK (e.g. the Information Commissioner's Office). The ANPR Code would address issues around the operation of ANPR systems in the UK and responsibilities of all users and specifications and issues regarding ANPR technology. It would make clear reference to data recording, retention and disclosure and strict Data Protection regulations. Most importantly, the ANPR Code of Practice would clearly specify how to deal with breaches of the Code, how data subjects can access information or make complaints and the means by which the public could be made aware of the Code.

5.10.2. Increasing awareness and understanding of ANPR

This chapter has argued that public understanding of ANPR is poor. There appears to be a certain disjunction between reality (police practice) and public perceptions with regards to ANPR surveillance. For example, respondents to the public opinion survey and focus groups think that ANPR technology is mainly used for raising revenue, with a focus on traffic enforcement and congestion charging. The previous chapter indicated that, although ANPR could be used for those purposes, these are not necessarily linked to police enforcement and there is generally more emphasis on crime detection and crime prevention (of more serious nature). Hence dispelling the myths surrounding ANPR would be a good first step towards improving the public's perceptions about ANPR. More informed views about ANPR would

be beneficial to reassuring the public and improving confidence in the police use of such technologies.

An ANPR publicity campaign with both citizen and offender focus could help towards increasing public awareness and confidence in the police use of ANPR and potentially reduce crime through changing offenders' perceptions of risks and cost of crime. Positive messages regarding ANPR should be widely publicised, in particular local successes of ANPR, visible outcomes, for example ANPR helping towards reducing the number of uninsured drivers on the road, detecting serious/prolific offenders, stopping more criminals and less innocent people. Depending on feasibility and cost involved, this could be a targeted ANPR awareness campaign or could be part of a wider campaign of public reassurance with regards to the police²⁶⁷. Mechanisms would need to be put in place to evaluate the effects of the strategy.

Thus the public could be reassured that ANPR helps the police detect and convict offenders, while offenders could be deterred from committing crimes in the areas covered by ANPR²⁶⁸. The offenders could be deterred through information about the risks of apprehension or prosecution as a result of ANPR, leading to crime prevention. Results from this study also indicate that the public would feel reassured and safer if they knew that ANPR was used in an area. Physically advertising/signposting an area covered by ANPR cameras is believed to reassure the public and would deter potential offenders.

5.10.3. Empowering communities

This chapter indicated that the public appreciate being consulted and have an input in the crime prevention strategies employed in their communities. A suggestion would be for the police and the local authority to use Citizen Panels/Groups who will try to ensure that ANPR is being used fairly and with respect to the public. Any issues emerging from meeting these

²⁶⁷ While it is unclear whether improving satisfaction with the police use of ANPR will improve satisfaction with the police in general, additional resources put into an ANPR campaign should be carefully balanced against its benefits. However, previous research has shown that some crime prevention initiatives work better when there is more publicity about the initiative (Bowers and Johnson, 2005), hence an ANPR publicity campaign could help reduce crime through deterrence.

²⁶⁸ Crime rates could change because perceptions of risk change. The actual rates of detection do not need to increase, what is important is offenders' actual perceptions of the risk of detection. The use of the media to highlight successful ANPR cases could give a false but raised perception of risk, even if real rates are not changing.

groups would be made public possibly through an established partnership with the local media. It would be beneficial if this consultation would be backed up by a robust complaint mechanism which will allow citizens to make confidential complaints about the police use of ANPR surveillance or related issues. Any complaints for alleged misuse or technological errors at a level below the Information Commissioner's Office would be carefully investigated.

5.11. Concluding remarks

The findings from this public opinion study generated new knowledge about ANPR's image in the community and people's perceptions of its effectiveness or any interference with privacy and human rights they identified.

Results presented in this chapter indicate that the public are generally positive about the police use of ANPR, albeit with some reservations regarding privacy and data protection. The public can clearly see the short term and long term benefits from the police use of ANPR and they feel that on balance the positives outweigh the negatives, although this balance is important and needs careful monitoring.

Public opinion seems to be inconsistent, ambivalent and influenced by various factors such as media reporting, the socio-political context, knowledge and experience of the subject, socio-demographic characteristics of respondents or experience of crime and anti-social behaviour. All these factors are interconnected and impact on the way public opinion shifts from one side to another. Depending on where the emphasis lies, people's priorities change. The balance between security and privacy leans more on the security side if the introduction of surveillance systems or other crime prevention follows high profile cases such as murders or terrorist attacks. The public favour privacy over security when personal data are misplaced or lost by the same governing bodies promoting safety and security. This chapter highlighted that where the public lack confidence that the technology is being used fairly and correctly, support for ANPR will suffer.

Results presented in Chapters Four and Five reflected police and public perceptions about ANPR and explored ways in which ANPR could be improved as a policing and public reassurance tool. The following chapter goes beyond perceptions, experience and processes to investigate ANPR's impact on crime.

Chapter Six: Results (III)

(How) Can We Assess ANPR's Impact on Crime?

6.1. Introduction

The previous chapters have identified the main factors limiting ANPR's potential effectiveness as a policing tool and highlighted ways in which these limitations could be addressed so that police practice could be enhanced. Chapter Five argued that some of the identified ANPR limitations could inhibit public confidence in the police use of such surveillance technologies and careful consideration should be given to balance the need for privacy and safety in order to reassure the public. Surprisingly, however, there was strong public support for ANPR and expectations that it could bring significant benefits to policing, reduce crime and the fear of crime. Consultation with the police mirrors these findings and highlights high expectations about ANPR's potential to improve police effectiveness and its impact on crime reduction.

However, perceptions, knowledge and experience of ANPR do not necessarily demonstrate a link between any of the factors identified as benefits to policing and the actual effectiveness of ANPR, particularly with regards to its impact on crime. As highlighted previously, although ANPR is a crime prevention surveillance technology widely used in the UK, little is known about the extent to which it actually impacts on crime and criminal behaviour. Research regarding ANPR's effectiveness is limited to the measures based on the outputs of ANPR deployments with intercept teams (e.g. arrests, seizures, Fixed Penalty Notices). There is a clear need for a more in depth assessment regarding the impact of ANPR in disrupting criminal activity and reducing crime – and results from the consultation with the police confirm this. For example, there is a belief that the level of number plate theft in West Yorkshire has increased since the introduction of ANPR in the area. Similarly, there is a belief that ANPR had an important role in the overall reduction of vehicle theft, by improving the recovery of stolen vehicles. The whole rationale behind ANPR is to reduce crime, but to what extent is this true? The need for a thorough impact evaluation of ANPR is pressing, particularly given the current context of debates about the effectiveness or failure of the criminal justice system in dealing with crime and the increased demand for policy-related research aiming to identify 'what works' in crime prevention.

It was previously stated that the current study is not an impact evaluation of ANPR. The main objective of this thesis is not to answer whether ANPR reduces crime, rather to identify the processes underpinning the development of ANPR and identify both drivers and barriers to its effectiveness, with the aim to produce new and systematic knowledge which would have an impact on the improvement and development of ANPR. Indeed, the researcher has tried to reach beyond this purpose, exploring the extent to which traditional ways of measuring an intervention's impact on crime could be applicable to new surveillance technologies such as ANPR. The aim was to explore the *feasibility* of such an approach and identify possible avenues and techniques to employ which could potentially demonstrate ANPR's impact on crime and criminal behavior. Hence this chapter has two main objectives: to present the findings of a pilot study exploring changes in police recorded crime following the introduction of ANPR and to consider the extent to which these changes could be attributed to ANPR (by identifying the main challenges to the process of measuring ANPR's impact on crime).

6.2. Research rationale

The literature review argued that ‘opportunity’ theories provide some support for the hypotheses that ANPR has the potential to impact on crime by deterring/de-motivating potential offenders, or more likely by increasing the risks of detection to potential offenders. More specifically, ANPR *could* impact on crime by:

- Reducing certain types of crime (e.g. theft of motor vehicles) in areas covered by ANPR and the vicinity (the diffusion of benefits);
- Increasing certain types of crime as a result of avoidance techniques (e.g. theft of number plate) and
- Displacing crime (e.g. change of location and time of crime, target, method and type of crime).

The current study focused on the county of West Yorkshire, with particular emphasis on the district of Bradford, which comprised the most comprehensive ANPR system at the time, otherwise known as the ‘Big Fish’. The system was introduced in Bradford City Centre in the spring of 2004, pioneering the first network in the country (outside London) of fixed ANPR cameras linked into the existing CCTV network and placed strategically at locations around Bradford City Centre (aiming to create a ‘ring of steel’ effect). The cameras were enabled with ANPR software to capture all vehicles entering the City Centre of Bradford and instantaneously check the registration number against police databases. If a vehicle was wanted in connection with criminal activity, officers were immediately alerted²⁶⁹.

The rationale behind the introduction of ANPR in Bradford was to reduce serious and volume crime in Bradford, in particular crime associated with the use or theft of motor vehicles. The expectation was that ANPR would achieve this by leading to more arrests and vehicles recovered as a result of more effective police interventions and investigations. The stakeholders involved in the development of ANPR in Bradford believed that the system would be a powerful tool to enable the gathering of information on the majority of vehicles entering the city centre for both immediate (real-time) police interventions and post-incident

²⁶⁹ However, following the high number of alerts generated by the system within the first weeks of being active, it was decided to filter these alerts and bring to the attention of the police only vehicles currently recorded as stolen or those which are of significant interest to the police (i.e. vehicles linked to serious offence such as rape, abduction or murder).

investigations. The implementation of the ANPR system in Bradford was supported by media publicity, with the aim of deterring potential offenders and increasing public confidence²⁷⁰. West Yorkshire Police publicly stated the aims of the project and the benefits expected from the police use of ANPR in the area.

Some of the benefits emerging from the police use of ANPR in Bradford, West Yorkshire have already been mentioned in the previous chapters, particularly with regards to ANPR's input in serious crime enquiries, such as the investigation into the murder of PC Sharon Beshenivsky. But ANPR's potential to impact on levels of crime has not previously been explored.

Following the theoretical assumptions presented above and police strategy and practice with regards to ANPR in West Yorkshire, this pilot study aimed to assess whether there was a reduction in theft of motor vehicle, as originally intended, or an increase in the number of thefts of number plates, as rational choice theory and interviews with police officers would indicate. Proving a link between ANPR and any changes in crime rates is however not a straightforward process. As was previously argued, the methodology used to assign any of the changes in crime rates to ANPR is limited and raises further questions which future research into ANPR's effectiveness would need to address.

6.3. Crime data analysis in the current study

The study used a quasi-experimental design, with before and after measures of crime in geographical areas identified as being covered by ANPR cameras ('target' areas) and, to a certain extent, in comparison 'control' areas (non-ANPR areas). Depending on the level of analysis, changes in police recorded crimes which were expected to be linked to ANPR (e.g. theft of motor vehicle and theft of number plate) were measured for a period of 23 months prior and post ANPR implementation. A full account of the methodology used in this study and its limitations is presented in Chapter Three of the thesis. For clarity of understanding of

²⁷⁰ The *Big Fish* was one of the most publicised ANPR systems in the country and in particular in West Yorkshire because of the input in the investigation into the murder of PC Sharon Beshenivsky. Strong messages were used for deterrent benefits, such as: 'The bottom line is that if a stolen vehicle comes into Bradford City Centre, we will know about it (*West Yorkshire Police Press Release*, 5th May 2004).

the results, information on the crime data analysis and the types of statistical tests used is outlined in the following sections.

6.3.1. Types of crime

As previously mentioned, the offence of ‘theft of motor vehicle’ (TOMV) was chosen because it is one of the crimes most commonly targeted by ANPR technology, being highlighted within the specified aims and objectives of the ANPR project (i.e. the aim of the project was to impact on this offence). The actual number of offences per month was large enough to permit analysis and measure changes in theft of motor vehicles in the target area and control area (see below). Theft of number plate offence was thought to be relevant because of counter-measures and the rational offender. The limitations attached to the analysis of this particular offence were highlighted above, particularly in terms of accuracy of the recorded crime data for this offence. The study paid attention to any changes in counts of theft of number plate offences at county level, rather than at district level – where the ANPR cameras were installed. It was hypothesised that, if the rational offender decides to steal number plates to avoid the ANPR cameras in the Bradford South area (target area), then they would not necessarily steal these number plates from vehicles in the Bradford South area.

The difficulty of finding a suitable control for the target area and the limitations of police crime data used in the analysis acted as constraints in achieving a methodologically rigorous research design as defined by the Maryland Scientific Methods Scale. The intention was to take some steps to minimise the threats to internal validity by using ‘crime controls’ in addition to the ‘geographical controls’, e.g. crimes least expected to be influenced by ANPR like domestic violence and criminal damage. However, as will be shown later, no statistically significant percentage changes were identified between the target and control areas. Therefore the inclusion of ‘crime’ controls was no longer an option and the analysis was not included in the chapter.

6.3.2. Areas of analysis

As previously argued, identifying two entirely comparable areas or groups is an almost impossible task. This was the case in the current study, where it was difficult to identify a control area matching the target area. One of the limitations was that there was no official

record of the exact areas where ANPR was deployed in West Yorkshire or was there relevant information about the capacity of each system or the extent to which it was used at any particular time. It was very hard to collect evidence about the use of ANPR in practice – it appears that ANPR was present in all areas to varying extents, although there was an evident gap between the potential and the real use of ANPR. Results from the qualitative research presented in the previous chapters highlighted this problem. It was also difficult to compare the deployment of ANPR within different divisions, as they appeared to use different tactics and approaches to ANPR. For appropriate divisional comparisons, the research would have had to look beyond West Yorkshire and find comparable areas in other parts of England and Wales where ANPR was similarly implemented during the relevant period. The data was not available to the researcher and it was not therefore possible to identify such comparison areas for analysis – the previous chapters have highlighted inconsistencies in the implementation of ANPR within police forces in England and Wales and significant differences in infrastructure and approach to ANPR.

Following consultation with West Yorkshire Police and the exploration of in-force documents with regards to the development of ANPR in West Yorkshire, it emerged that ANPR was not consistently used throughout the county within the timeframe for analysis, making it very difficult to pinpoint distinct areas completely free of ANPR. There is some evidence indicating that ANPR has been undertaken in West Yorkshire since the beginning of October 2002, but this was limited to the deployment of mobile ANPR systems (in particular laptops) and ad-hoc divisional ANPR activity. Bradford South Division appears to be the only one able to use CCTV in conjunction with ANPR in 2004 (the first comprehensive fixed ANPR system in West Yorkshire), with a consistent approach to responding to and investigating crimes identified through the system. In 2005, Leeds and Wakefield also introduced fixed ANPR systems which they could place ordinary CCTV through – although in terms of capacity and use, these did not match the Bradford South system. The exact date of their implementation could not be identified and the extent of their use could not be quantified. All the data from deployments prior to January 2008 had not been retained by West Yorkshire Police, so no information could be collected regarding the use of ANPR in the rest of West Yorkshire during this period. Between 2004 and 2006 (period of investigation), the police argue that the *Big Fish* ANPR system (24/7 fixed ANPR linked to

CCTV) in Bradford was the most comprehensive and most frequently used ANPR system in West Yorkshire²⁷¹. Hence the area covered by these cameras was considered the most appropriate target area for a potential experiment. It was estimated that other ANPR deployments (in-car systems) were too sporadic/ad-hoc to have had a significant impact on crime. The target area was taken as the division/Basic Command Unit (BCU) boundary of the area covered by the *Big Fish* ANPR system, i.e. Bradford South Division. At district level, the target area was taken as the boundary of the entire district of Bradford. For the offence of theft of number plate, the county of West Yorkshire was considered the most appropriate target area in order to explore any changes in levels of crime in the period following the introduction of ANPR.

Therefore, the analysis was conducted at two main levels in order to explore changes in crime levels post-ANPR: district and county level. To further investigate the extent to which these changes could be attributed to ANPR, a divisional level analysis was included, where changes in crime rates before and after ANPR in the target area were compared against changes in a control area. Table 6.1 below illustrates these levels of analysis and their corresponding types of crime, areas and periods under consideration:

Table 6.1 Levels of analysis in the current study

Level of analysis	Type of crime	Target area	Control area	Baseline period	Post implementation period
Division	Theft of motor vehicle	Bradford South	Keighley	Feb 2002 – Jan 2004	Feb 2004 – Jan 2006
District	Theft of motor vehicle	Bradford		Feb 2002 – Jan 2004	Feb 2004 – Jan 2006
County	Theft of number plate	West Yorkshire		Feb 2002 – Jan 2004	Feb 2004 – Jan 2006

²⁷¹ The ANPR system in the Leeds City Centre appears to be the nearest in terms of comparison with the system in Bradford City Centre (with even bigger capacity), but as it was installed late 2007, it falls outside the scope of the current analysis.

6.3.3. Measuring change in crime rates

The baseline conditions and changes in the targeted offences after the implementation of ANPR were analysed by calculating monthly and overall crime counts and rates, as well as percentage change. The analysis included individual-level police recorded crime data provided by West Yorkshire Police²⁷² for theft of motor vehicle and theft of number plate in order to produce crime counts and identify temporal changes in the level of crime in the target and comparison areas. The crime counts were cross-checked against the 2001 Census, updated against the Office for National Statistics (ONS) mid-year population estimates²⁷³, to produce crime rates which were expressed as per 1000 population. Rates describe the number of crimes per target at risk. The question is, however, is the population the most appropriate denominator for vehicle theft or is it vehicles? There are of course limitations using residential populations to calculate crime rates, particularly when the crime under investigation is vehicle crime. Concentrations of vehicles could differ from concentrations of populations, but it is more problematic to produce estimates for vehicles. This study acknowledged this limitation and used residential population to generate crime rates for each area. This is the same methodology typically used in England and Wales crime statistics.

The mean/average was reported for each area and crime type. The mean is a measure of central location and is equal to the sum of the individual values divided by the total number of values. The mean was used in the study to represent the typical number of offences occurring each month during different time periods. Based on the calculated mean values during the period under investigation, simple percentage changes in the average number of offences per month by area and crime type were estimated. This calculation compared the number of offences in the 23 months before and after ANPR was implemented. Percentage change is based on the difference between average monthly post-implementation figures and

²⁷² Data used for the purpose of this analysis is that on which a crime was recorded onto the West Yorkshire crime system, comprising the 'date 1st crimed' for the specified offences, which is the official time recorded by the police for a crime; that means the incident was reported, it was recorded and was classified as a crime.

²⁷³ Mid-year estimates are the official set of population estimates for the UK and constituent countries, consisting of annual published estimates from 1981 onwards. Additional supporting data published with the population estimates provide information about population change between the reference year and previous Mid-Year Population Estimates. Figures presented show the number of moves and the volume of movement per 1000 population, both within the UK and internationally. Information available from: <http://www.ons.gov.uk/about-statistics/methodology-and-quality/quality/qual-info-economic-social-and-business/stats/quality-reports-for-social-statistics/mid-year-population-estimates--mye-.pdf>. A more recent update for 2007 has been published, but not yet implemented into West Yorkshire Police for population statistics.

average monthly baseline figures. Temporal trends in crime are shown via graphs indicating monthly change of crime counts for a period of 23 months prior to and following the installation of ANPR.

6.3.4. Statistical significance of change

The data were first analysed to establish whether there was a normal distribution. This was carried out using the Shapiro-Wilk test, as there were between 12 and 48 pairs within the sample²⁷⁴. Results indicate that Shapiro-Wilk is greater than 0.01, therefore variables are not normally distributed. As the crime rates differed from a normal distribution, a non-parametric test was selected for analysis of these data. The Wilcoxon matched pairs signed-rank test is the non-parametric version of the paired Comparison T-test and is used for data from repeated measures and matched pairs designs. The Wilcoxon test was selected due to the nature of the data being studied (ordinal level of measurement) and because the data were abnormally distributed. The Wilcoxon test was run to obtain information about the size of the difference between the two members of a pair – in this case, to establish whether changes in crime levels between the baseline and post implementation periods were statistically significant in the control and comparison area.

6.3.5. Measuring change relative to control area

Estimates of the number of theft of motor vehicle prevented as a result of ANPR can be produced by posing the counter-factual, that is, what would have happened if theft of motor vehicle change in an area subject to intensive ANPR intervention (Bradford *Big Fish* ANPR) followed the trends in comparable areas without intensive ANPR activity? This type of analysis is fairly widely practised in evaluation studies²⁷⁵. Under this approach the expected number of theft of motor vehicle is generated by applying the theft of motor vehicle rate in the comparison area and changes in this over the evaluation time period, to the action area. The number of theft of motor vehicle prevented can then be valued in terms of how much has been saved as a result of intensive ANPR (*Big Fish*).

²⁷⁴ Shapiro-Wilk test is generally used for samples < 50, whereas for samples 50+ the Kolmogorov-Smirnov test is typically used (de Vaus, 2002).

²⁷⁵ Tilley (2002); Johnson et al. (2004); Cummings (2006).

6.4. Results: theft of motor vehicle crime

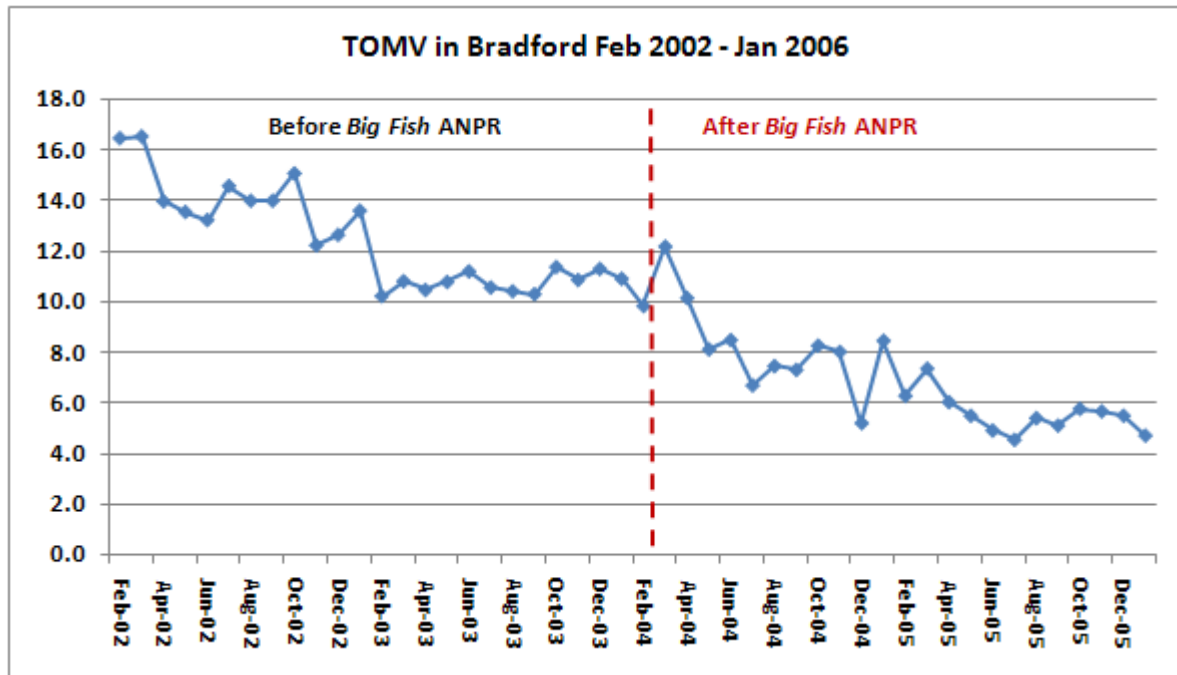
The research findings of this pilot study are broken down into two crimes - theft of motor vehicle and theft of number plate.

A key question is whether the introduction of ANPR led to a reduction in the level of theft of motor vehicle crime in Bradford, which was one of its key objectives. Therefore, the analysis focused mainly on the *Big Fish* ANPR system in Bradford and changes in levels of crime in the areas covered by it after its introduction. Hence the target areas in this instance were Bradford South Division and Bradford District. Where possible, control areas have been identified in order to eliminate as far as possible other potential explanations of the effect.

6.4.1. How has crime changed in the target area during the period of interest?

As Figure 6.1 shows, there was a steep reduction in theft of motor vehicles in the period following the introduction of ANPR. When the data is aggregated across the entire district of Bradford, a reduction of 44% can be identified in the rates of theft of motor vehicles from the baseline to the post-implementation period. At divisional level, similar reductions were identified, with 39% fewer motor vehicle thefts in the two years after ANPR in Bradford. Thus the implementation of *Big Fish* ANPR coincided with an overall decrease in theft of motor vehicles in Bradford. But, as will be explained below, this reduction forms part of a longer term trend, thus is unlikely to be attributed to ANPR alone.

Figure 6.1 Theft of motor vehicle rate in Bradford District before and after the implementation of *Big Fish* ANPR System (rate per 10,000 population)



6.4.2. How significant is the change?

As a change has been identified, the next step is to explore whether the difference between these two periods shows a statistically significant reduction in crime rate. Two different techniques could be used to check this. Firstly, the direction of correlation - time vs. crime trend - to explore whether levels of crime change in association with time. Secondly, Wilcoxon test using average monthly rates for the period before vs. period after ANPR.

The results indicate that there is a marked reduction in theft of motor vehicle crime over the entire period under investigation in Bradford South division. The correlation²⁷⁶ is negative indicating that, as time passes, crime goes down. The correlation is significant at the 0.01 level (2-tailed). Wilcoxon Signed ranks statistical test indicate that the rate after the introduction of ANPR is significantly lower than before ANPR ($p < .002$). For more information regarding the results from statistical tests, see Appendix 3.

²⁷⁶ In order to choose the appropriate type of statistical tests to be used, a normality test was first conducted using Shapiro-Wilk to explore whether there was a normal distribution. The test indicates that the distribution was not normal ($p > .01$), hence a bivariate correlation was used (Spearman's Rho) and the Wilcoxon Signed ranks statistical test.

6.4.3. To what extent could these changes be attributed to ANPR?

But what does the change tell us? The data indicate that crime is decreasing significantly, but it is unknown if ANPR have had any impact. There are a number of confounding factors that could have contributed to the identified changes in crime rates, regardless of ANPR. Moreover, as there is a clear indication that the trend started before ANPR, it could be the case that the changes are due to a factor other than ANPR. No matter how one looks at the data (from different time points), there is a continuation of an established trend. Given these considerations, the first option would be to stop the analysis here. However, the following section explores the challenges of investigating this further, assuming that the findings from part one of the analysis were different. In other words, what would be required to conduct such an analysis and what the likely challenges would be?

First, we would have to investigate the counterfactual inference, which is what would have happened without the intervention, in this case, ANPR. In order to do this, a control area needs to be selected in order to compare change within an area which is expected to have received the intervention with change in a non-intervention area. As indicated in the methodology chapter of the thesis, this area has to be similar in all relevant respects to the target area (e.g. size, layout, socio-demographics, crime problems etc), with the exception of the presence of ANPR.

However, identifying a comparable area was a difficult task. After the exploration of numerous options, it was estimated that the best pair for analysis would be Bradford South Division (target area) and Keighley Division (control area). The control area lay within the same district as the target area and exhibited similar characteristics to the target area. For the purpose of the experiment, the difference between the two areas was that the area covered by Bradford South division comprised a comprehensive 24/7 monitored ANPR-CCTV system (the *Big Fish*), while the area covered by Keighley division was estimated to be free of ANPR or having experienced very limited or ad-hoc mobile ANPR deployment within the timeframe of analysis²⁷⁷.

²⁷⁷ Other options were also explored, for example using Bradford City Ward as a target area and Keighley Central Ward as the control area. But similar limitations were identified.

In order to check whether Keighley was a good control area for analysis, crime levels in Keighley divisions before ANPR were compared with crime levels in Bradford South division before ANPR. Wilcoxon²⁷⁸ Signed ranks statistical test indicate that Bradford South (target area) and Keighley divisions (control area) had significantly different crime rates before the introduction of *Big Fish* ANPR ($p < .002$). This highlights a further caveat to this analysis, as the control area is not as comparable with the target area as initially assumed.

Table 6.2 below indicates that the average rate for theft of motor vehicle in the baseline period in the target area (Bradford South division) is 17.5, while in the post-implementation period this is 10.6. In the control area (Keighley division), the average rate for theft of motor vehicle in the baseline period is 7.7 and in the post-implementation period 4.5. When comparing the data from the target areas with data from the control areas, it emerges that there was a 39% reduction between the average baseline and post-implementation period in the target area (Bradford South Division), while there was a 41% reduction in the control area (Keighley Division).

Table 6.2 Changes in theft of motor vehicle rates after the introduction of *Big Fish* ANPR

Target area (Bradford South Division)			Control area (Keighley Division)		
Baseline	Post-implementation	Change in Target	Baseline	Post-implementation	Change in Control
17.5	10.6	-39%	7.7	4.5	-41%

The Wilcoxon Signed ranks statistical test indicates that crime in the Bradford Division area is significantly lower after ANPR compared to before ($p < .002$), but this is also the case in the Keighley Division area ($p < .002$). This, combined with the fact that the decline in the control area was greater than in the target area, makes it unlikely that the decline in Bradford was due to ANPR.

²⁷⁸ Shapiro-Wilk test for normality indicated that Bradford was not normal ($p > .01$) and Keighley was normal ($p < .01$), but because there was a mixture, a non-parametric test i.e. Wilcoxon was used (de Vaus, 2002).

This suggests that, if ANPR is having an impact, it is not reflected in the figures. That is probably because ANPR is but one small factor in the crime prevention landscape. More pronounced (than expected) changes in the control area could indicate that some other factor/variable influenced the change in both the control and target area or that there was a diffusion of benefits to areas outside the target area, including the control area. This could also be a result of the fact that the control area was not completely free of ANPR, and the effectiveness of the ANPR system in Bradford South (*Big Fish*) was not more effective than any (potential) mobile ANPR deployed within the control area (e.g. Keighley) within this timeframe. Also, as the trends appears to have already started before ANPR, it could be an indication that something else has generated the change, but ANPR could have had an influence only in sustaining the change.

Therefore, the analysis has its limitations. The level of contamination was unknown and the differences between the two areas which could have had an impact on crime during the period under investigation were not taken into account. Not only that, but there is an indication that crime levels were significantly lower in the area covered by Keighley division than those in the Bradford South area before the implementation of ANPR, showing that the control area did not perfectly match the target area from a crime level position. However, these impediments are not specific to Bradford; the same would be encountered in other areas in West Yorkshire or in the UK. Ideally, there should be numerous control and target areas, but it was not feasible in this case.

6.4.4. Measuring change relative to the control area

To overcome these limitations, the best option would be to compare change in the target area relative to the control area. Firstly, the ratio of changes in the comparison area is calculated for the periods before and after ANPR. If the ratio is '1', it means that crime is the same before and after the intervention (i.e. ANPR) in the control area (i.e. Keighley Division); if the ratio > '1', it means that crime is going up, and of course if the ratio is < '1', crime is going down. The ratio change here is 0.59, which shows that theft of motor vehicle crime is going down in the comparison area.

But what happens if the target area changes at the same pace as the control area (assuming that there was no ANPR in the first place)? In order to find out, there is a need to apply the ratio of change (0.59) to the total number of crimes in Bradford South division before ANPR. That gives the total number of expected crime of 2563. From here, there is a need to compare the number of crimes that actually happened (N=2658) to the expected number of crimes (N=2563). This results in 95 crimes more than would be expected (see Table 6.3 below).

Table 6.3 Change relative to control area

Keighley Before	Keighley After	Ratio of Change	Bradford Before	Bradford Expected	Bradford Observed	Difference/Crime "Created"*
2864	1683	0.5876	4361	2563	2658	95

*Created as opposed to reduced

Therefore the analysis points to no crimes being ‘prevented’ as a result of ANPR. Although, given the problems with the comparison group and the number of potential factors that could have impacted on crime levels, these results are inconclusive and should be treated with caution.

6.4.5. Detections of theft of motor vehicle crime

It could also be argued that the decrease in theft of motor vehicle crime is likely to be a result of more efficient policing, in terms of increased detection rates. Detection rates for theft of motor vehicle in Bradford South and Keighley for the two years before and after the implementation of ANPR were therefore analysed (February 2002 – January 2006). Non parametric correlations²⁷⁹ (Spearman’s rho) indicate that there is a low to moderate reduction over time in detection rates for theft of motor vehicle. Results indicate that, before ANPR, detection was going down²⁸⁰; after ANPR, detection rates are slightly increasing²⁸¹. Wilcoxon Signed ranks test indicates that the change in detection rates in Bradford South Division after the introduction of ANPR is not significant, the same for Keighley Division. Therefore the results are inconclusive. Although it appears to be a slight upward trend in detection rates

²⁷⁹ A test of normality indicated that data were not normally distributed, hence non parametric correlations (Spearman’s rho) and Wilcoxon Signed ranks tests were used to explore changes in detection rates over time and their statistical significance. Emerging tables are presented in Appendix 3.

²⁸⁰ Moderate to substantial correlation, statistically significant at the 0.05 level, 2-tailed.

²⁸¹ Low correlation, but not statistically significant.

after the introduction of ANPR, there are lots of fluctuations and the identified increase is not statistically significant and the timing does not appear to coincide with the introduction of Big Fish ANPR in Bradford.

6.5. Results: theft of number plate crime

Another key question is whether the introduction of ANPR has coincided with a change to the level of theft of number plate offences, as one of the assumptions was that, due to the rational offender taking counter-measures, there might be an increase in this type of crime not only on Bradford, where ANPR was introduced at the time, but within the entire county of West Yorkshire.

Table 6.4 below shows changes in the levels of theft of number plate offences in West Yorkshire two years after the introduction of *Big Fish* ANPR system in Bradford (February 2004).

Table 6.4 Theft of number plate offences following the introduction of *Big Fish* ANPR West Yorkshire County²⁸²

Month	Average baseline		Average Post-implementation		Change
	Crime count	Rate per 10,000 vehicles*	Crime count	Rate per 10,000 vehicles	
Feb	138	1.36	123	1.27	-11%
Mar	156	1.52	157	1.67	1%
Apr	153	1.52	135	1.61	-12%
May	136	1.35	136	1.48	0%
Jun	129	1.27	127	1.25	-2%
Jul	129	1.26	121	1.23	-6%
Aug	159	1.57	137	1.58	-14%
Sept	137	1.35	148	1.44	8%
Oct	167	1.61	164	1.65	-2%
Nov	148	1.44	154	1.45	4%
Dec	146	1.42	145	1.26	-1%
Jan	147	1.42	138	1.30	-6%

*There were 1,055,000 vehicles registered in West Yorkshire in 2006

Surprisingly, there was a small non-significant²⁸³ overall reduction of theft of number plate offences (3%) in West Yorkshire in the two years following the implementation of *Big Fish*

²⁸² As Theft of Number Plate is not a Home Office recordable offence, the figures were extracted by conducting a property search on West Yorkshire's crime system (Corvus) in Property Sub Type. Duplicate reference numbers were removed and only 'stolen' plates were counted.

²⁸³ Wilcoxon Asymp.Sig (2-tailed) = .100 (p > .05).

ANPR, results which contradict the assumption that the introduction of ANPR in West Yorkshire has generated high rates of number plate theft.

Interestingly, these results do not reflect the national trend showing an increase in rates for theft of number plate offence. British Crime Survey (BCS) data indicates that, nationally, the number of plate thefts has increased from 3 in every 10,000 motor vehicle owners interviewed in 2002/2003 to 10 in every 10,000 vehicle owners in 2004/05²⁸⁴. The results of a survey conducted by DVLA of 17 police forces in Great Britain indicate that the recorded crime estimate is even higher than that derived from the BCS - 15 recorded number plate thefts per 10,000 registered cars. This is unexpected as recorded police crime figures tend to underestimate crime victimisation because of under-reporting and recording, but it could be because police recorded crime data include theft from commercial vehicles, which are not covered by the BCS. This could also be the case as the police data include false reports or because the data are unreliable (difficulty of retrieving records of number plate thefts could under or over-estimate the problem²⁸⁵) or they might be recorded as something else (e.g. criminal damage, theft from motor vehicle etc). These results highlight the need for further research looking at theft of number plate incidents in West Yorkshire, but also nationally, to explore the difference between the emerging trends.

²⁸⁴ Webb and Raykos (2006).

²⁸⁵ Consultation with West Yorkshire Police confirms this, highlighting that theft of number plate is an offence not easily identified in their crime recording systems.

6.6. Emerging issues and limitations

This chapter provided the results of an analysis exploring changes in levels of crime after the implementation of ANPR in West Yorkshire, with particular emphasis on the district of Bradford. Results indicate that the introduction of *Big Fish* ANPR system in Bradford coincided with statistically significant reduction in theft of motor vehicle crime at division, district and county level. This is not to say, however, that ANPR was the drive behind these changes. When looked at more closely, changes in theft of motor vehicle crime were consistent across both target and control areas which provides support to the hypothesis that these changes were due to factors other than ANPR.

The challenges involved in measuring the impact of ANPR on crime have been discussed in the introductory section of this chapter and at greater length in Chapter Three of the thesis. The main difficulty has been the inability to find adequate control groups. This has been compounded by the inability to collect comprehensive information on the timeline and capacity of ANPR projects within West Yorkshire, and the inability to explore and identify geographical areas outside West Yorkshire. The previous chapters of the thesis indicate that there is little understanding on how to use ANPR effectively and there is an ad-hoc approach to ANPR both in development and response (i.e. there are different ANPR systems developed and implemented at different times and locations). There is inconsistent data collection and the monitoring system in place to assess its outcomes is limited and irrelevant. All these factors make it difficult to be meaningful when it comes to effectiveness.

It was also difficult to gather data on how the areas covered or targeted by ANPR compared to each other in terms of aims, objectives, funding levels and timing. It proved to be difficult to gather such data retrospectively. There were contradictions regarding the actual dates for the implementation of ANPR and little or no information regarding the extent to which ANPR was actually used in the timeframe for analysis. It was estimated that the most comprehensive ANPR system used within this timeframe was the '*Big Fish*' ANPR implemented in Bradford in 2004, hence the choice to use Bradford as a control area within the study. It was highlighted that the comparison areas might have been 'contaminated', although the extent to which this was the case was unknown. As argued above, to minimise such validity threats, this pilot study adopted additional approaches, such as examining

change at different levels (intra divisions and within district) and employing statistics to explore the significance of these changes.

But what does a change in crime rates tell us? An additional major difficulty faced by this research – and most studies exploring the impact on crime – is the ability to attribute change to the intervention under investigation. It would be inappropriate to attribute the identified changes in recorded crime figures to the implementation of ANPR. Questions about why crime trends are changing are very important, but also very hard to answer. In addition to the limitations to the experiment (e.g. the contaminated or inappropriate comparison areas), to fluctuations in recording crime, there are a variety of other factors that might cause changes in crime rates. All areas under investigation showed a statistically significant reduction in the levels of theft of motor vehicle crime, but not a greater reduction in the target areas than in the control areas. Hence it is unlikely that any impact was produced by ANPR alone and the reduction of crime could be attributed to other confounding factors, as would be suggested by the fact that the control and target areas experienced similar reductions in crime and that a downward trend in levels of theft of motor vehicle began before ANPR was installed both in Bradford and West Yorkshire.

Changes in crime rates over time may be due to factors other than the introduction of ANPR. The crime reduction outcomes for example may have benefited from the contribution of concurrent high visibility operations including police officers or Police Community Support Officers (PCSOs), which would have occurred regardless of the deployment or use of ANPR technology. It could have been an effect of designing out crime interventions, changes in policies, changes in number of intake or release of prisoners. Many of these factors could lie beyond police interventions or even policing more broadly defined, for example non-crime orientated policy interventions such as urban regeneration (improved lighting in the city centre of Bradford for example²⁸⁶), socio-economic factors which could be local specific or national/international, such as the current recession (higher prices for petrol, high unemployment rates etc), changes in legislation regarding the number plates and number plates providers which are believed to have impacted on the level of theft of number plate offences and the number of cloned vehicles; improved security measures for vehicles, which

²⁸⁶ Crawford et al. (2004).

is believed to have decreased the opportunities for theft of motor vehicle and have fuelled the increase of a new type of burglary (Hanoi-style) where, as a result of new vehicle designs, offenders have decided to break into people's homes to steal the keys before making off in their vehicle.

One can also argue that decreasing or increasing crime rates are linked to the efficiency of the criminal justice system in dealing with these crimes. For example, increased crime rates might have something to do with detection or conviction rates; if these are falling, offenders might be more willing to take criminal opportunities, as they perceive the risks of being caught and punished are lessened. However, results regarding the detection rates for theft of motor vehicle crime in Bradford are very inconclusive. The current study cannot establish to what extent the reduction in theft of motor vehicle crime is due to deterrence, detection rates or other factors. Further research and analysis will be needed to make such a correlation.

6.7. Concluding remarks

This chapter argued that establishing a link between ANPR and crime is not a straightforward process. Not only because it is generally hard to establish such causal relationships (as argued above), but also because ANPR cannot be singled out as sole intervention in a given time-frame or area. ANPR is a tool used in conjunction with other police interventions and is generally deployed as part of a wider crime reduction initiative; hence isolating the relative contribution of all individual factors is intrinsically problematic. Whilst unclear regarding which intervention contributed to which reduction, it would be more appropriate and practical to focus on how any such impact might have or could have been produced. As Pawson and Tilley (1997) would put it, which crime reduction mechanisms in operation through the deployment of ANPR might have triggered the specific beneficial outcomes?’

It is important to measure ANPR’s impact on society and crime reduction, however the difficulties highlighted in this chapter reflect that this is a very difficult process and numbers do not necessarily tell us everything. This brings to light the strength of the qualitative data presented in the previous chapters; perceptions, experience, implementation and business processes are equally important in assessing the effectiveness of a crime prevention initiative. The experimental/quantitative approach tends to produce ‘descriptions of outcomes, rather than explanations of why programs work (or fail)²⁸⁷. A thorough evaluation needs to take into account the *whys* and *hows* of outcomes, the *macro* and *micro* social forces that influence outcomes, a *context-mechanism-outcome* pattern configuration (*CMO configuration*) which would enhance understanding of *what works, for whom and in what circumstances* and develop transferable lessons from research to policy and practice²⁸⁸. Many crime reduction initiatives have a short life cycle. Although there may be a substantial reduction in crime to begin with, this can fade over time, therefore sustaining the effect is the key element²⁸⁹.

Although limited, the analysis included in this chapter is useful, as it contributed to knowledge into an area which has not been explored before. Links in the causal chain between the intervention and the outcome need to be further investigated²⁹⁰. There is

²⁸⁷ Pawson and Tilley (1997: 30).

²⁸⁸ Pawson and Tilley (1997: 214-220); Sherman et al. (2002).

²⁸⁹ Tilley and Laycock (2002).

²⁹⁰ Farrington (2003: 54).

certainly a need for a more thorough examination of this subject, but such an analysis falls beyond the scope of this thesis. Further questions emerge such as:

- How can ANPR's impact on crime be measured? Measured against what? Is the experimental design an appropriate approach? Do we ask the right questions?
- How do we detect change? What does it mean? To what extent can any identified changes in crime rates be attributed to ANPR? What else could account for these changes?
- Is the change related to deterrence or detection or both?
- What do offenders think of ANPR? Are they aware of it? Do they perceive ANPR as a threat? Does ANPR impact on offenders' behaviour, modus operandi and journey to crime?
- To what extent is crime displaced as a result of ANPR (e.g. geographical, temporal, tactical and functional displacement)?

The message from this Chapter is that understanding the role and impact of new technologies such as ANPR goes far beyond the analysis of crime statistics. It requires a range of approaches to uncover the wider implications of its use including how ANPR is perceived by the police and local communities. In the final chapter these perspectives are brought together and directions for further research are discussed.

Chapter Seven: Conclusions

7.1. Introduction

This thesis was improvement oriented. It sought to explore the benefits and limitations to Automatic Number Plate Recognition (ANPR) technology as perceived by the police and the public with a view to provide a clearer understanding of its role and use as a policing tool and inform existing practice and future policies. Although additional analysis was conducted to measure ANPR's impact on crime, it should be noted that the intention of this research was not to conduct an outcome evaluation. Research findings presented in this thesis reflect police perceptions, knowledge and experience of ANPR, but do not necessarily demonstrate a link between any of the factors identified in the research process and the effectiveness of ANPR in reducing crime.

7.2. Emerging issues

The results presented in this thesis suggest that ANPR is a valuable policing tool. However, there is a strong indication that ANPR's real potential is far from being realised in practice. Results point to a range of technical, organisational, political and cultural factors which appear to have led to recurrent disappointments in what has been delivered on the ground. The thesis illustrates the ad hoc way in which policy is often made especially when there are so many stakeholders and changing priorities. It has shown how complex is the process of putting policy into practice, particularly when it is not clear who owns the policy – local level, county force level, Home Office. There is an indication that there is top-down policy making with pressures to roll out ANPR and at the same time there is ad hoc local policy being generated from the mix of technology and local priorities.

Given the strong case for ANPR argued in this thesis and the intrinsic limitations, what is then realistically possible?

Following research into the views of the police and the public, the thesis has proposed ways in which ANPR could be improved both as a policing and a public reassurance tool. This research suggests that if police forces consider the recommendations presented in this thesis, ANPR would become a more efficient policing tool through a strong strategic approach from the 'top' which would influence motivation and commitment at the 'bottom', through more knowledge about ANPR's potential and effectiveness and through information sharing and effective partnership work. Chapter Four argued that it would be beneficial if police forces shifted focus from developing the technology and the infrastructure - which appear to have improved in the last couple of years in terms of better coverage and functionality – to developing business processes and systems to enable ANPR to become an effective mainstream policing tool. In the context of the current economic climate there are, of course, political issues at stake in deciding which problems are priorities and what crime prevention tools should be used to address these problems with already overstretched resources. The thesis highlighted how complex it is to put policy into practice and the difficulty the police have, particularly at local level, to decide where to commit resources, at times of constantly shifting objectives and priorities dictated by the government.

Chapter Five argued that the public strongly support the police in using ANPR technology, but it also highlighted that, due to lack of knowledge and understanding of ANPR, public expectations with regards to ANPR effectiveness tend to be unrealistic. If the public expect ANPR to be so effective in catching criminals and reducing crime, then there is pressure for the police to meet these expectations. Thus it was argued that the public would benefit from better understanding of the technology and its capabilities. The thesis also highlighted that people are as much concerned about privacy as they are about safety and security. It was believed that support for ANPR would suffer if the public lacked confidence that the technology was being used correctly and with respect to their rights. Incorporating appropriate privacy protection within ANPR's legal framework could be one way to boost public confidence; tangibly demonstrating that ANPR is effective in reducing crime and fit for purpose could be another.

Finally, Chapter Six highlighted the difficulties in evaluating ANPR's impact on crime. ANPR is not a usual crime prevention initiative and it is hard to isolate its impact. The discussion pointed to theoretical, methodological and policy obstacles to conducting a rigorous outcome evaluation with this regard. Nevertheless, the links in the causal chain between the ANPR and the stated outcomes need to be further investigated. The need for a thorough impact evaluation of ANPR is pressing, particularly given the current context of debates about the effectiveness or failure of the criminal justice system in dealing with crime and the increased demand for policy-related research aiming to identify 'what works' in crime prevention.

Considering the gaps identified in the literature review, the thesis sought to explore in depth ANPR's role and use as an investigative tool. Evidence emerging from the current research indicates that ANPR is a source of intelligence that has the potential to add considerable value to both post-incident investigations and proactive intelligence operations. Examples of operations where ANPR had a valuable input were presented in the thesis. It was argued that the police have a good appreciation of some of the benefits of ANPR in post-incident investigations, particularly in terms of its capability to:

- Start new lines of enquiry and bring in new evidence into an investigation;

- Corroborate or challenge existing evidence and more specifically, alibis; undertake queries and searches which were not possible before, particularly in terms of tracing vehicles by exact location, time, date and sometimes direction of travel;
- Narrow down the number of queries, suspects and witnesses; and
- Save time in an investigation and facilitate the recovery and use of additional evidence (e.g. fingerprints, DNA, CCTV etc) crucial to the identification, arrest and prosecution of offenders.

Specific benefits to proactive investigations and intelligence development were also identified, particularly in terms of ANPR's potential to profile a suspect or a crime problem, facilitate a more efficient and cost effective deployment of officers and provide intelligence to enable the prediction of crime and early identification of threats.

However, the thesis highlighted that police perceptions about ANPR's role as an investigative tool are more likely to be based on their judgement about the *potential* rather than the *realised* benefits of ANPR. It was argued that the gap between ANPR's perceived potential and current police practice is explained by the significant obstacles which need to be overcome before ANPR's role as an investigative tool could be fulfilled. These include:

- A focus on number plates and vehicles rather than individuals, which ultimately renders ANPR evidence disputable in a court of law;
- A fragile and limited ANPR technology;
- A reliance upon the accuracy of intelligence used in conjunction with ANPR (which was proved to be inadequate and out of date);
- Limited or incompatible infrastructure and information technology;
- Little understanding and expertise of ANPR;
- Lack of commitment (both rank and file);
- Lack of funding and resources;
- ANPR labelled as a 'traffic' policing tool and
- Limited information sharing and partnership work.

These are recurrent themes which appear to act as impediments to the effective use of ANPR within investigations and as a policing tool in general.

The thesis suggests that implementing ‘non-traditional’ ways of policing is a challenging and slow process²⁹¹. Improving ANPR’s effectiveness within crime investigations and intelligence development would necessitate cultural and operational changes within policing. For example, policy makers and practitioners alike need to have the right attitude and skills to enable the analysts to conduct extensive and exploratory data analysis and to enable a more ‘proactive’ approach within policing. Police analysts typically produce patterns of crime to inform targeted enforcement and contribute to strategic tasking and coordination. It was argued that the full potential of ANPR in intelligence operations and investigations can only be achieved if ANPR intelligence is layered with other sources of intelligence, analysis which could help towards better understanding criminal behaviour and crime patterns. Inferences need to be drawn from all available intelligence (including ANPR) in order to inform tactical operations, in terms of ‘what’, ‘where’, ‘when’ and ‘who’ to target. The literature review has highlighted a series of theories relating to offending patterns, the role of opportunity in crime, displacement etc. ANPR intelligence could be used to test or develop these theories. ANPR evidence is just a piece of a puzzle, a small but significant contribution to the ‘who’, the ‘where’, the ‘when’, the ‘why’, the ‘what’ and the ‘how’ of an investigation. ANPR intelligence could be the missing link in the bigger picture of policing.

However, implementing new ways to improve ANPR’s effectiveness as an investigative and an intelligence policing tool takes ANPR beyond its ‘stated’ and ‘legal’ intent. The thesis argued that, for ANPR to produce valuable evidence in post-incident investigations, there is a need for a more certain link between the number plate, the vehicle and the driver. The image of the vehicle and its occupants could be very important in the investigation of a kidnapping for example. But if this is extended to the entire driving population (which is assumed ‘suspect’ in an investigation until proven otherwise), the journeys of possibly innocent people are analysed for the purpose of the investigation. While there is value of the image helping in crime investigations, capturing the image of drivers and passengers in a vehicle could also be

²⁹¹ This is in line with research conducted by Bullock, Erol and Tilley (2006), which argue that shifting from a reactive to a proactive approach within policing is a difficult process.

seen as very intrusive. This raises issues around the infringement of civil liberties particularly of those individuals whose vehicles do not generate ANPR hits, hence are, for what we know, law abiding citizens. Gathering, storing and analysing information on movements of innocent people could have significant value in a future investigation, the potential to solve undetected crime or identify unknown criminals, but is it the right thing to do?

The impact on people's privacy will be affected by the location of processing (local versus central), what information is stored and for how long, who has access to it and for what purpose. With the development of the National ANPR Data Centre (NADC) it is estimated that the journey of millions of motorists across Britain will be recorded every day, as they drive on motorways, main arterial roads or within city centres. The records of the number plates are to be kept for two years and the capacity could be extended to allow the data to be stored for up to five years. The aim is to generate intelligence for the police and MI5 to build up a picture of the movements of *suspects* or identify cars that *could* be connected to a crime. But this is in contrast with what the police typically say about ANPR. The tagline '*ANPR tracks vehicles not people*' is not entirely accurate given the interest in linking the driver to the registered owner or persons wanted by the police and particularly where the image of the vehicle comprises the driver and the passengers. Storing the movements of innocent members of the public for up to five years could be perceived by many as an invasion of privacy.

This is where ANPR moves a step forward. As argued in the Literature Review, ANPR has the potential to bring us closer to a 'maximum surveillance' society. ANPR is no longer about vehicles and number plates, but about individuals, their offending history or potential 'associates'. If such a scenario extends to the entire population, which then becomes subject to ANPR surveillance, strong concerns about infringement of civil liberties might be raised. As discussed in the literature review, a shift towards the management of risk (through enhanced surveillance, intelligence gathering, data collection and dissemination) has become an important function of the modern police. In this context, populations are seen as particular bearers of risks and surveillance systems gather information on the whole population rather than on suspects or known offenders. Everybody is a suspect; everybody is assumed guilty until proven otherwise. ANPR surveillance is such an example, as it collects and stores information on the entire driving population without any evidence of offending. ANPR

systems can collect information on individuals on the basis of possible association with known offenders or suspects; hence interest and suspicion are attached to individuals without them even being aware of it or without having done anything wrong. This discussion appears to be similar to the debate around the collection and storage of DNA samples for the entire population. If this is becoming a common trend within policing, are the necessary safeguards in place to protect citizens' rights? Have the government, the police and the legislators considered the wider implications of such an approach?

The data produced by the ANPR systems can, under the provision of the Data Protection Act 1998, only be used for the purpose for which it was collected. The thesis argued that, if ANPR's use expands beyond the initial stated objectives, then there is a need for new regulations and legislation. This is due to a so called 'policy creep'. The policy 'creeps' partly as it is realised what the technology can do and partly as government/police priorities change. A centralised system such as the National ANPR Data Centre (NADC) invites new users and uses. If NADC become fully operational and effective in tracking people's journeys across the country, there is more of a need for strong legislation to regulate such extended use. Although there are currently strict rules about who has access to what, the overall intrusiveness of the process does not diminish. As with most surveillance technologies, ANPR has developed at a faster pace than the legislation regulating its use. There are aspects that are still vague in particular with regards to the purpose of collecting information on entire driving populations or ways to notify the public of being under ANPR surveillance. Ensuring that the use of ANPR intelligence is strictly regulated is a first step towards legitimising ANPR and ensuring the protection of people's rights. The legislation needs to be in line with the latest developments in the ANPR arena and its use by the police or partners.

Further consultation with the public is also critical. People might be less supportive of ANPR if ANPR surveillance surpassed its stated intents and the information that has been collected for one limited purpose was gradually allowed to be used for other purposes. The thesis highlighted that people are currently happy about the police use of ANPR, but would they hold the same views if the situation changed? Results emerging from focus groups with the public and qualitative analysis indicate that people are as concerned about their privacy as they are about their security. There are concerns about the security of personal information

and the proportionality of its use. Recent examples of loss of ANPR data²⁹² point to the need for great care in decisions about collecting information about the entire driving population.

It *might* be possible to protect people's safety and privacy without compromising one or another, as long as all stakeholders – the government, the police, technology providers, legislators and regulators – work together to ensure the technology fulfils this dual purpose. This process needs to incorporate appropriate legislation, extensive public consultation and outcome evaluation regarding ANPR to provide evidence that the technology is effective in reducing crime and fear of crime, fit for purpose and compliant with key privacy and data protection requirements.

But is the loss of civil rights matched by the gains in catching criminals? The public argue that the loss of privacy might be acceptable worth if the use of such technologies would indeed be effective. The thesis argued that there is limited evidence regarding ANPR's effectiveness in reducing crime. The question is, however, is reducing crime the only social good that we aspire for? At what cost are the public prepared to accept these measures? There is little emphasis on the deficits of such approaches, both in terms of privacy and the expenditure of public money. If an ANPR cost-benefit study is to be conducted, it needs to consider the costs to the community, including loss of privacy, as well as the benefits, although it should be acknowledged that both costs and benefits could be intangible and therefore difficult to quantify. Future evaluations need to consider ANPR's impact on crime, fear of crime, as well as the wider socio-political and ethical implications of ANPR surveillance.

²⁹² IPCC (2008).

7.3. Research limitations and methodological reflections

As with the majority of academic study, this research inevitably suffered from some methodological difficulties. Although the main research limitations have been highlighted within relevant sections of the thesis, three interesting points emerge. Firstly, it is important to highlight that the research presented in this thesis was undertaken against a backdrop of significant developments within the ANPR arena, both with regards to policy and practice. The methods utilised within the three years subject to investigation had to be adapted to cater for these changes. When the research commenced in early 2006, the police use of ANPR was very much ad-hoc and scattered across the UK and there was little information about ANPR's role within policing. The early findings from the research were new and valuable, but three years and many interviews later, the situation changed. Some of the information emerging from the initial interviews became outdated. To overcome this limitation, additional hours were spent in the field and a systematic review of emerging documents was conducted to gather additional information about any emerging issues and developments. Moreover, a follow up electronic survey and a small number of interviews were conducted in 2009 to capture some of these changes and inform the research. The electronic survey had its limitations, as it was quantitative in nature and did not generate the depth of knowledge and understanding emerging from the initial set of face to face interviews.

The thesis was largely qualitative in nature, exploring perceptions about ANPR's role and usefulness as a policing tool and as a public reassurance tool. However, perceptions, knowledge and experience of ANPR do not necessarily demonstrate a link between any of the factors identified as benefits to policing and the effectiveness of ANPR in reducing crime, for example. To compensate for this gap, additional quantitative analysis was included to explore ANPR's impact on crime - although it was made clear it was not intended to conduct an evaluation of ANPR's impact on crime. The most appropriate available tool for such an analysis was found to be the quasi-experiment. It was concluded, however, that there were too many obstacles to obtaining a suitable comparison group that a quasi-experiment would not be feasible. Thus no definitive could be drawn regarding the effect of ANPR on crime, or its effect on displacement, and as there is no evidence of crime reduction, there is no point in measuring displacement. The analysis in Chapter Six demonstrated just how difficult it would

be to evaluate the impact of ANPR on crime rates in a methodologically rigorous way. It was argued that more consideration needs to be given to the methods used in the evaluation of crime prevention measures, particularly when the measures are not necessarily theoretically driven, as was the case with ANPR. The conclusion is, if we do try to analyse the benefits of ANPR in reducing crime, more research into what would be the right measurement tools and the right questions to ask is necessary.

Finally, it could be argued that the overwhelming public support for ANPR questions the validity of results emerging from the public opinion survey. While a vast majority of respondents to the postal survey appear positive about ANPR (89%) with no worries about its potential impact on civil liberties (86%), the focus groups highlight the fragility of people's views about this issue, showing that people are much more concerned about their rights than the postal survey appear to indicate. The lack of knowledge about this new emerging technology could have rendered people unrealistic or too positive about ANPR's effectiveness in improving crime detection and crime reduction within their communities. Although the use of the postal survey provided some validity to the study particularly with regards to the generalisability of findings, the researcher believes that using a self-completion questionnaire dominated by closed questions was probably not the best way to assess this topic. This puts in perspective the validity of certain research methods when measuring public opinion, particularly when it comes to new topics or the debate about privacy vs. security. With hindsight, the researcher would have used more qualitative data to generate the main results in this section.

7.4. Contributions to knowledge

This research provides a baseline on how ANPR is used and how it is perceived by the police and the public in the first decade of the 21st Century.

The current research was ‘exploratory’ as it aimed to develop understanding in an area which was under-researched and little understood. It was ‘descriptive’ as it sought to use this information to provide a more accurate picture of ANPR both locally and nationally, looking in detail at the police and the public’s view about its effectiveness in enhancing police activity and reassuring the public. It was, to some extent, ‘explanatory’ as it used and tested hypotheses (in light of the existing literature and the theory) to examine whether ANPR can have an impact on certain types of crime. The research could also be considered ‘emancipatory’ as it had an ‘action’ perspective to it, looking at promoting change and improvement in the ANPR arena.

The thesis has contributed to knowledge about the investigative potential of ANPR. Ways in which ANPR becomes a valuable tool in proactive and reactive investigations were highlighted, particularly ANPR’s potential as an inductive tool for identifying patterns of crime and criminal behaviour. This research is important for, not only, did it explore how police practice could be improved, but also, it flagged up some of the issues surrounding the measurement of ANPR’s impact on crime, pointing out the difficulties of conducting a rigorous outcome study. The analysis exploring ANPR’s impact on crime contributed to knowledge into an area which has not been explored before and highlighted important questions and areas for further work. Additionally, the thesis has brought significant contributions in the area of public perceptions of ANPR surveillance. The first of its kind, the public opinion study filled a gap in our understanding of the public’s view of ANPR cameras and surveillance and privacy issues in general. Bringing together police and public perceptions about ANPR, the thesis generated more understanding of the debate around privacy vs. security. One can argue that the debate in this thesis about how to effectively deliver crime prevention strategies while protecting people’s rights is transferrable to other policing tools. The findings of this research have relevance to other crime prevention and crime detection tools such as CCTV, facial recognition and DNA.

Given its 'real world enquiry' nature, this PhD study not only aimed to produce new knowledge, but also to have an applied use in relation to policy and practice. The policy implications of this thesis are important to note, as often researchers will concentrate on the criminological theory side, not realising that the added value of the work may be less about crime theory than about the policy/practice process. The practical contributions of the research are significant. Interim results were already used to inform ANPR practice and strategies at local and national policing level. For example, the police, ACPO and NPIA were provided with a systematic report reflecting the public's views about ANPR. Papers were written in practitioners' journals such as *Jane's Police Review* and the National Community Safety Network (NCSN) News to disseminate results and emerging recommendations at national level. Emerging results influenced national ANPR stakeholders and policy makers to include more public consultation on this matter, as well as to decide against a proposal to use ANPR in conjunction with cameras for speed enforcement purposes.

In addition to the applied nature of the research, this thesis also offers new theoretical insights into travelling distance to offending and intelligence-led policing – approaches which were highlighted in the literature review. The thesis argued that criminals appear to travel longer distances than initially thought, although more research is needed to explore the validity of this evidence. Crime does not have geographical boundaries, police forces do. Criminals travel in cars on roads which cross forces' borders. The implications for policing practice are significant. The thesis highlighted a gap in linking up crime intelligence between police forces. Linking and analysing intelligence on criminals who travel beyond force boundaries would help the police solve more crime and possibly detect repeat or serious offenders. The use of ANPR intelligence would be very useful to track the movements of these 'travelling' criminals. However, this is not a straightforward process. Establishing an effective 'proactive' inter-forces approach challenges established policing practice and requires a cultural change, effective information sharing and partnership work, as well as new systems and resources in place, which is a slow and expensive process.

7.5. Areas of further research

As previously argued, the police use of ANPR is an area that has been under researched within the field of criminology. This thesis has attempted to address some of the gaps identified, focusing on ANPR's role as an investigative policing tool and a public reassurance tool. Through the course of this thesis a number of potential avenues for future research, both for academics and practitioners (the police) have become apparent.

It was argued, for example, that one evident direction of future research is an impact evaluation of ANPR. The thesis highlighted the importance of demonstrating ANPR's effectiveness in reducing crime and fear of crime, but argued that evaluators need to be aware of the impediments to measuring such an initiative. Future research has to acknowledge methodological and cultural limitations. Studies aimed at answering difficult questions about ANPR's effectiveness as a policing or crime prevention tool do not fit easily with the police's culture to place primary importance on the achievement of narrow targets, measured by basic statistical indicators. The research tradition within British policing is not strong²⁹³, as policing is typically rooted in common sense and experience. Evidence-based policing is typically perceived by officers as an academic, non-practical exercise. Of course that in depth research and analysis can appear slow and difficult compared with short term targets and time scales required in operational policing. But it would be beneficial if the police were more open about research and analysis to identify and investigate crime issues as they emerge²⁹⁴.

In an uncharted area of academic study, this thesis provides a starting point for further research into ANPR's potential impact on offender behaviour (e.g. *modus operandi*, journey to crime, types of crime) and displacement. The researcher has already started a collaborative study with West Yorkshire Police, exploring further avenues to measure ANPR's impact on crime (including displacement) and criminal behaviour (changes amongst persistent offenders).

²⁹³ Bullock, Erol and Tilley (2006).

²⁹⁴ It was also argued that the police would benefit from further research in order to measure the nature and extent of the inaccuracies on ANPR hotlists and to identify best ways to improve the quality of intelligence placed on these hotlists.

The thesis also argued that future research should recognise and further investigate public perceptions about ANPR and the emergence of more ‘intrusive’ surveillance technologies. Further research that builds upon the current study should be commissioned in West Yorkshire and beyond to understand what the public considers to be legitimate levels of surveillance and the factors that drive up public confidence. The aim would be not only to improve understanding of public’s perceptions about ANPR surveillance and address gaps in research, but also to determine if levels of confidence in the police use of ANPR change over time²⁹⁵. The thesis argued that it would be beneficial if these studies were more qualitative in nature, involving public forums, focus groups and interviews. Emphasis should be placed on including victims of crime, offenders, ethnic minority groups (particularly Islamic communities), young people and people living in Urban Prosperity ACORN areas – as these groups appear to be less likely to participate in research or more likely to have divergent views.

²⁹⁵ Research indicates that when public perceptions before and after the installation of CCTV systems are measured, support for effects of CCTV tends to diminish after its installation (Skinns, 2000; Gill, 2007).

7.6. Final comments

Despite the cautious tone of some of these conclusions, it is important not to forget the benefits found from the police use of ANPR and that some of its elements have not only produced useful research results but spawned new thinking and new practice initiatives. Not all policing tools can necessarily cover all aspects of crime reduction and community safety, so maybe would it be more beneficial to concentrate on a specific area where there is evidence of effectiveness? ANPR's investigative potential is its key strength and the police should concentrate on improving ANPR in this area as a primary objective and reflect this in future ANPR strategies. Maybe the national policing strategy for ANPR should place less emphasis on 'general crime reduction' and more on the use of ANPR in investigations and solving crimes.

The limitations identified throughout this thesis (some of which limited the validity of identified inferences from the results) does not mean the original objectives of the study have been unmet. Indeed, these were satisfied as the research provided exploratory value and contribution to the understanding of ANPR's role as a policing and public reassurance tool and the implications for policy and practice. The study objectives have been addressed and further areas of study have been identified.

The thesis throws a new light on the impact of a new technology and the associated development of policy and practice. In some ways the research presented here could probably be used to develop some more general points about this in other policing departments like Forensics or within fields outside the police, like Health.

The area of contemporary debate about liberty and security is a key element of this research. It is in the context of this debate that policy is made and adapted and practice is initiated and evolves. This thesis started with a note of concern about the wider implications of ANPR surveillance and the impact on civil liberties. It has been argued that ANPR has the potential to bring us closer to a 'maximum surveillance' society. However, whilst these concerns remain we should not yet be resigned to technological determinism. A myriad of technical, operational, governance and institutional problems hamper its realisation. The potential,

however, is ever-present in the technology and if function creep does occur, ANPR will fulfil this potential.

Word count

82,520 (Excluding references and appendices, but including footnotes and endnotes)

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Abbreviations

ABI	Association of British Insurers
ACPO	Association of Chief Police Officers
ANPR	Automatic Number Plate Recognition
APA	Association of Police Authority
APACS	Assessment of Policing and Community Safety
ASB	Anti-social Behaviour
BCS	British Crime Survey
BCU	Basic Command Unit
BOF	Back Office Facility
BPS	British Psychological Society
BSC	British Society of Criminology
CCTV	Closed Circuit Television
CID	Criminal Investigations Department
CDRP	Crime and Disorder Reduction Partnership
CMPG	Central Motorway Police Group
CPTED	Crime Prevention Through Environmental Design
DPA	Data Protection Act 1998
DfT	Department for Transport
DVLA	Driver and Vehicle Licensing Agency
DVR	Digital Video Recording
DWP	Department of Work and Pensions
ECHR	European Convention of Human Rights
EVI	Electronic Vehicle Identification
FPN	Fixed Penalty Notice
GIS	Geographical Information Systems
GPS	Global Positioning System
HMIC	Her Majesty's Inspectorate of Constabulary
HMRC	Her Majesty's Revenue and Customs
ICO	Information Commissioner's Office
IOM	Integrated Offender Management
IT	Information Technology
LAAP	Local Area Agreeing Plan
LCC	Leeds City Council
LMD	Leeds Metropolitan District
LSP	Local Strategic Partnership
MIDAS	Motor Insurance Database Application System
MIB	Motor Insurance Bureau
MOT	Ministry of Transport Test
NADC	National ANPR Data Centre
NCSN	National Community Safety Network
NJU	National Joint Unit
NIM	National Intelligence Model

NPIA	National Policing Improvement Agency
NPT	Neighbourhood Policing Team
OBtJ	Offences Brought to Justice
OCR	Optical Character Recognition
ONS	Office for National Statistics
OS	Ordnance Survey
PAF	Postcode Address File
PAPP	Police Authority Policing Plan
PC	Police Constable
PCSO	Police Community Support Officer
PII	Public Interest Immunity
PNC	Police National Computer
POP	Problem Oriented Policing
PPO	Prolific and Priority Offender
PSU	Police Standards Unit
RCT	Randomised Control Trials
RIPA	Regulation of Investigatory Powers Act 2000
RFID	Radio Frequency Identification
SIO	Senior Investigating Officer
SMS	(Maryland) Scientific Methods Scale
SPSS	Statistical Package for the Social Sciences
TfL	Transport for London
TIC PR	Taken into Consideration Previously Recorded
TOMV	Theft of Motor Vehicle
TONP	Theft of Number Plates
TWOC	Taking Without the Owner's Consent (i.e. vehicle theft)
UK	United Kingdom
VED	Vehicle Excise Duty
VEL	Vehicle Excise Licence
VCRAT	Vehicle Crime Reduction Action Team
VRM	Vehicle Registration Mark
WYYA	West Yorkshire Youth Association

Appendices

Appendix 1 – Correspondence and research tools (Chapter Three)

Appendix 2 – Additional tables and figures (Chapter Five)

Appendix 3 – Statistical results (Chapter Six)

Appendix 1 – Correspondence and research tools (Chapter Three)

Invitation to Interview (Police officers and staff)

Dear Sir/Madam,

12.01.07

ANPR and Policing: The Role of ANPR in Post-incident Investigations

Invite Letter to Interview

I am a PhD student from the Applied Criminology Centre at the University of Huddersfield. My studentship was awarded in April 2006 by the University of Huddersfield in partnership with West Yorkshire Police.

I would like to invite you to take part in an interview as part of my PhD research on Automatic Number Plate Recognition Systems (ANPR) and their role in post-incident investigations. Before you decide whether to get involved in the study, I would like to explain why this survey is being carried out and what the interview will involve.

Purpose of the survey: *This interview will ask you about your opinions concerning ANPR technology and its use by the police, with particular emphasis on ANPR's role and potential in post-incident investigations. From this study I hope to identify not only the current benefits of using ANPR as a policing tool, but also potential future uses of the technology which are currently not being exploited (i.e. missed opportunities). Hopefully, the results from the research will identify best practice and inform policy to enhance police effectiveness in crime detection and prevention. For more information on this project, please see the document attached at the end of this letter.*

Why have you been chosen? *You have been selected because I am interested in the views of all Police Officers who have been nominated ANPR champions for each force in the UK.*

Do you have to take part? *The participation in this research study is not compulsory. However, if you agree to take part, you are free to end the interview at any point without giving any reason. If you do take part, you will be asked to sign an agreement form giving your consent for the interview to take place (see below).*

What does the study involve? *The study involves a one off interview with me. The interview should last about 30 minutes. I would ideally like to tape record the interview to be able to reflect your views and experiences more accurately, but if you would prefer otherwise, I would be happy to take notes instead. You can refuse to answer any sensitive questions and you can bring up new subjects during the interview that you think are relevant.*

Confidentiality: *I would like to reassure you that your answers will be treated in the strictest confidence, i.e. your name and address will not be recorded or disclosed to any third party – any information you provide will not be traced back to you. I guarantee that only I will see and hear your answers. Your agreement form will be kept in a locked cabinet. The audio tape will be destroyed once the transcriptions are completed.*

*If you decide to be interviewed, **Thank You** in advance for your help. Your assistance is very much appreciated and useful. I believe that consulting you on this matter is of great importance and I hope*

that the results of this study will play a role in informing future policies regarding ANPR and its use by the police.

Please let me know if you are interested in taking part. If you do, I would appreciate if you could send me the dates and times which would be most suitable for you (between January and August 2007).

If you have any questions about this research study, please feel free to contact me.

*Yours sincerely,
Alina Haines
Contact details ...*

Information Sheet: background information research study

The Role of ANPR in Post-Incident Investigations

A three year' research studentship was awarded in April 2006 by the University of Huddersfield in partnership with West Yorkshire Police. The research sets out to assess ANPR's potential to enhance police effectiveness, with particular emphasis on the impact that ANPR systems can have in post-incident investigations.

Importance of ANPR research

Previous research indicates that ANPR is an effective policing tool (PA Consulting, 2004). The use of ANPR technology, combined with conventional policing, has proven to have noteworthy advantages in dealing with crime by increasing detection and conviction rates, raising the number of offences brought to justice, improving safety on the road, tackling volume crime and deterring terrorism. ANPR is also considered to be a useful means of collecting information and improving police intelligence on known criminals and monitoring potentially risky populations. ANPR is already seen by the police as a unique and valuable tool with the ability 'to impact positively in an intelligence led and proactive basis on every key area of police business' (ACPO, 2005).

However, a major gap in our understanding of the value of ANPR systems is in relation to their role in post-incident investigations. Existing research is limited to ANPR systems deployed with intercept teams as an immediate response to previously undetected criminal activity. But not enough is known about the effectiveness of ANPR in preventing, responding to and investigating crime. Although promising, the positive results regarding ANPR originate from the one published evaluation or other police reports which mention ANPR's benefits. These studies do not shed light on the *mechanisms* through which ANPR intelligence influences the *outcomes* of post-incident investigations.

While ANPR could become an invaluable policing tool in the cost-effective and timely investigation of crimes, more research is needed to inform good practice within police forces. The need for research and evaluation is also in line with the government's demands for evidence-based policies. The 'what works' approach (Cabinet Office, 1999; Blunkett, 2000) involves making 'better use of evidence and research in policy making and better focus on policies that will deliver long term goals'.

This study will examine the role of ANPR systems in Post-incident Investigations, the ethical implications of the use of ANPR and the public's perceptions about what it does and how it is deployed.

Aims and objectives of the study

The overall aim of the study is to generate new knowledge about the ways in which ANPR is used by the police, with particular emphasis on ANPR's impact in post-incident investigations.

More specific objectives include:

- A. Identifying the opportunities presented by ANPR;
- B. Examining how the police use ANPR in post incident investigations;
- C. Investigating the extent to which opportunities presented by ANPR data are fully exploited;
- D. Assessing the impact of ANPR on investigations and other policing activities;
- E. Exploring the public's perceptions of ANPR;
- F. Exploring the ethical implications of ANPR;
- G. Exploring the future direction of ANPR within policing.

Methodology

In order to explore these objectives, a variety of methods will be employed:

- **Literature review** of research and theory concerning policing, CCTV and ANPR. This also involves Police literature, HMIC reviews and ACPO documents. Literature on ethics of ANPR and public attitudes towards policing will also be reviewed.
- **Research Observation.** This involves shadowing ANPR practitioners, attending workshops, conferences and seminars on ANPR and related topics.
- **Face to face Interviews** with police officers and police staff involved with ANPR both at an

operational and a strategic level. This survey will explore existing use of ANPR, perceptions about its potential use and any associated obstacles to realising its full potential. Particular attention will be paid to ANPR's role in post-incident investigations.

- **Thematic Focus Groups.** These will be convened to explore the use of ANPR in the investigation of different category of incidents.
- **Case Studies.** A number of case studies of investigations that have utilised ANPR technology will be analysed to identify advantages and opportunities presented by ANPR in the investigation and detection of serious offenders.
- **Documentary analysis** of police records and other relevant material. The analysis will identify the impact that ANPR has in detecting and convicting offenders.
- **Statistical Analysis** of ANPR generated data. Same as above this analysis will identify the extent to which ANPR has an impact on detection rates.
- **Public Opinion Survey.** The survey will be undertaken to elicit the community's views of the efficacy of ANPR systems and their acceptability.
- **Research Synthesis (Triangulation).** This process involves bringing together the various strands of the study to identify the role of ANPR in post-incident investigations and to produce recommendations for its more effective use in the future.
- **Focus Groups (Distillation of policy recommendations).** This comprises an analysis of the action implications of the research findings through interaction and consultation with practitioners and policy makers from West Yorkshire Police. The purpose is to produce 'realistic' recommendations for future ANPR through a thorough analysis of the actual feasibility of change.

The intended outcomes of this study are:

- The production of a PhD thesis extending knowledge about the role of ANPR data in post-incident investigations;
- Recommendations and guidelines for the wider use of ANPR systems in post-incident investigations;
- Conference presentations and dissemination of results;
- A minimum of three peer reviewed publications and
- An external funding application for further exploration of themes identified in research.

Collaborative Studentship and other links

This research studentship will be undertaken in collaboration with West Yorkshire Police but will involve establishing links with a number of national bodies including the Home Office, Police Standards Unit, ACPO and the Narrowing the Justice Gap Action Team. Regional and local links will include the crime reduction team at Government Office Yorkshire and Humberside, Crime and Disorder Reduction Partnerships, and Local Criminal Justice Boards.

ANPR National Profile

An important part of this research involves a comparative study between police practice in West Yorkshire and other British forces. It is hoped that this comparative analysis will complement the main focus of this research study, through identifying new perspectives and generating valuable knowledge for the police regarding its effectiveness.

If you would like further details or wish to participate in this research, please contact Alina Haines at address below [...]

Consent Form: Interviews police officers and staff



Consent Form

Title of the project: ANPR and Policing: The Role of ANPR in Post-incident Investigations

1. I agree to be interviewed and take part in the study ☐
2. The purpose of the research has been explained to me and I have had the opportunity to ask questions ☐
3. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason ☐
4. I understand that information from the interview will be treated confidentially ☐
5. I agree that quotes from the interview may be used in the dissemination of the results of this study, as long as these are anonymised ☐

Date:
Name:
Police Force:
Title:
Signature:

Indicative Interview Schedule



ANPR and Policing: The Role of ANPR in Post-incident Investigations

Note for interviewer: Prior to interview, reiterate nature and purpose of research; briefly explain the structure of the interview and questions; ensure confidentiality; make sure consent form is completed and signed before the interview starts.

Note for interviewer/interviewee: Questions are indicative. Respondent's role in relation to ANPR will influence the way in which the following questions are addressed

1. Could you please briefly describe what you do? [e.g. What is your title, what are your responsibilities and your role in relation to ANPR? How long have you been involved with ANPR?]

....

2. Could you briefly describe the development and use of ANPR in your force? [e.g. What was ANPR used for to start with? How is ANPR used at present? What ANPR sites do you have? What are the advantages/disadvantages of mobile over fixed sites? What type of offences do you target when you deploy ANPR? Why? How do you prioritise responses to ANPR hits?]

....

3. Could you tell me about how ANPR is used in post incident investigations? [e.g. To what extent do you use ANPR as a reactive tool in the crime investigation process? Are investigating officers in your force aware of ANPR and its potential? How were investigations conducted before ANPR? What does ANPR bring to the investigation? What are the advantages? What are the limitations at this stage?]

4. Could you please give me an example of when ANPR was used in a post incident investigation? [e.g. How did you use ANPR? How effective was ANPR in solving the case? Why?]

...

5. If you do not use ANPR in post-incident investigations at this stage, could you please tell me your opinions about ANPR's potential to be used as an investigative tool? [e.g. What are the advantages? Limitations?]

....

6. Does your force use ANPR evidence in court proceedings? If yes, do you think the ANPR evidence is conclusive? Does it help in clearing up offences? Does it influence the police interrogation of suspects? How? Is ANPR evidence disclosed to suspects?]

....

7. Do you think ANPR represents a cost effective use of police resources? [e.g. Does it increase clear up rates? Why do you think that?]

....

8. What do you think are the main impediments to the use of ANPR? [e.g. technological drawbacks; resources; political issues] What do you think can be done to tackle this problem?

....

9. What do you think can be done to improve ANPR's effectiveness in the investigation of crime? And as a policing tool in general?

....

10. Do you think ANPR has any undesirable consequences/impact on police practice? What?

....

11. Is there resistance from the police (the rank and file) to embrace ANPR technology?

....

12. How do you think ANPR will be used in 5 years' time/in the future? [both the local and the national picture] Will new technologies render ANPR obsolete?

....

13. Is there anything else you would like to say about ANPR that I haven't covered in the interview?

....

Thank you!

Invitation to Electronic Survey (West Yorkshire Police) and Completion Instructions

ANPR IN CRIME INVESTIGATIONS SURVEY (OCT 2007)

On behalf of Chief Superintendent ...

We are presently working with Huddersfield University to research the potential benefits of ANPR to criminal investigations with a view to identify areas for improvement regarding the use of ANPR within West Yorkshire Police. I know that use of ANPR varies across the Force and in its use as an investigation tool, and this survey is looking to assess where we presently stand.

We are seeking your opinions about the use of Automatic Number Plate Recognition Systems (ANPR) within West Yorkshire and the role of this technology in crime investigations. The ANPR questionnaire is being distributed to relevant police officers and police staff within the force who are, or could be, using ANPR at an operational, strategic or analytical level.

No specialist knowledge is required to complete this questionnaire. We are interested only in collecting your views about ANPR, not testing your knowledge on this subject. We assure you that **the questionnaire is completely anonymous**. The answers you give cannot be traced back to you.

Your assistance is very much appreciated and useful. We acknowledge the importance of consulting you on this matter and we aim to use the results from this survey to inform future policies and developments regarding ANPR and enhance police effectiveness in West Yorkshire.

Instructions for completion can be found below.

Thank you for taking the time to complete this questionnaire.

Completion Instructions

Click on the ANPR Questionnaire link below to access the questionnaire. You can use the mouse or the tab key to move to the next question. Use arrow keys to move between choices in the same question. Use space bar or the mouse to check or uncheck a box.

The Questionnaire will be available for completion between 15th October and 26th October 2007.

There is a combination of closed and open questions. With the closed questions you just select the answer it suits you best. If you prefer not to answer a particular question please leave it blank. With the open questions, please feel free to express your opinions by typing them in the space provided next to the question.

Finally, please press the submit button to complete the process.

Contact Details

If you have any questions about this survey, please contact **Alina Haines** [...]

Link to ANPR Questionnaire: [...]

Electronic Survey Questionnaire (West Yorkshire Police)

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EXCEL
where excellence begins...

ANPR IN CRIME INVESTIGATIONS October 2007

Please take a few minutes to complete this survey. Your answers will help us identify areas for improvement and development regarding Automatic Number Plate Recognition System (ANPR) within the Force.

This questionnaire is confidential. The answers you give cannot be traced back to you or your e-mail.

Please select your division/department

Please select your role

Please select your rank or grade

1) Do you know what ANPR is? ☐ Yes ☐ No
(If you answer no to this question please go straight to question 15)

2) Are you aware that West Yorkshire Police uses ANPR? ☐ Yes ☐ No

3) How did you first find out about ANPR?

4) When did you last receive updates regarding ANPR developments within the Force?

5) How often do you consider using ANPR in an investigation?

6) How often in practice do you use ANPR data?

7) For what purpose do you use it? (Please specify)

8) How well integrated is ANPR in your division / department?

9) How useful do you find ANPR in a crime investigation?
(Whether proactive or reactive)

10) For which types of crime are you most likely to use ANPR? (Please grade the three most likely types of crime)

Most likely	2nd most likely	3rd most likely
<input type="text"/>	<input type="text"/>	<input type="text"/>

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11) Could you give an example of an investigation / operation where you have used ANPR? ☐ Yes ☐ No
(If yes, briefly explain how you used ANPR in the process. If not please go straight to question 13)

12) What are the main advantages of using ANPR in a criminal investigation and policing in general?
(as opposed to not using it)

13) In your opinion what are the main limitations of ANPR ?

14) Are there any ways in which you think ANPR can be used more effectively?

15) Do you think you have enough knowledge about the potential use of ANPR within policing?
☐ Yes ☐ No

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15) Do you think you have enough knowledge about the potential use of ANPR within policing?
☐ Yes ☐ No

16) If you think you don't, would you like to receive further training or information regarding ANPR ?
☐ Yes ☐ No

17) Anything else you would like to add?

Thank you for taking the time to complete this questionnaire. Your views are very important and will help towards identifying areas of improvement for ANPR and the crime investigation process.

Please press submit only once.

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Public Opinion Survey: the Questionnaire



ANPR Police Cameras: A Public Opinion Survey in Leeds, West Yorkshire

We want to find out what you think about the police use of Automatic Number Plate Recognition (ANPR) Systems. ANPR cameras relate to vehicle registration numbers and are different to the usual CCTV cameras found in shops, banks etc. These cameras read number plates and take pictures of every passing car and automatically flag up vehicles or people wanted by the police. Please complete the questionnaire below by ticking the relevant boxes. Remember, the questionnaire is strictly confidential. Your opinions matter to ensure a safe but fair approach to community safety and crime prevention in West Yorkshire. Please read the information provided in the enclosed letter before completing the questionnaire.

1. Were you aware of ANPR cameras before receiving this questionnaire?

Yes ☐ No ☐ [If no, go to question 3]

2. If you already knew about ANPR, where did you first find out about it?

Billboard <input type="checkbox"/>	Merchandise (e.g. key rings) <input type="checkbox"/>	Posters/leaflets <input type="checkbox"/>
Internet <input type="checkbox"/>	Newspaper – national/local <input type="checkbox"/>	Other notices (parking, petrol stations) <input type="checkbox"/>
Radio <input type="checkbox"/>		Peers, friends, family etc <input type="checkbox"/>
TV <input type="checkbox"/>	Police notices (marked cars or vans) <input type="checkbox"/>	
Other <input type="checkbox"/> [Specify]		

3. Do you agree or disagree with the following statements?

With ANPR cameras on the streets of Leeds:	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
You will feel safer	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Crime will be reduced	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Offenders will be afraid to commit crimes in the area covered by ANPR cameras	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Offenders will still commit crimes, but will use different roads where there are no ANPR cameras	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Police will respond more quickly to crimes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Police will be better equipped to track and identify criminals that use the roads	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Police will get helpful evidence for criminal investigations and convictions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Road traffic casualties will be reduced	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The possibility of police discriminating against minority ethnic groups will be reduced	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Victims of crime will feel more reassured	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The police will be less likely to stop innocent people	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

4. Below is a list of views or concerns people might have regarding ANPR or police video cameras in general, some of which have appeared in newspapers or on TV. Do you agree or disagree with them?

What is your view on each of the following statements?	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
People who have nothing to hide have nothing to fear from police cameras	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
It's ok for the police to use hidden cameras for crime prevention	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The police can be trusted to safeguard information gathered from cameras and use it properly	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The police can be trusted to ensure that innocent people are not placed on police records and wrongly accused	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The police need to put up notices to advise the public about ANPR cameras	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
It is important that ANPR cameras are used to catch drivers without a licence, insurance, tax or valid MOT	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The use of ANPR cameras needs to be regulated and monitored by an independent body of control	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Some concerns ...					
ANPR can only make people feel safer if people know about them	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ANPR won't help catch criminals if they know where these cameras are	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Evidence from ANPR cameras could be misleading	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Evidence against criminals isn't sufficient if ANPR captures just number plates	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Criminals steal cars, number plates or find other means to avoid detection with ANPR cameras	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ANPR cameras might be used to target specific minority groups within the community	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ANPR cameras might be used to make money from penalty notices for minor driving offences, instead of focussing on crime	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ANPR cameras might be used to spy on people	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ANPR cameras represents an infringement of your civil liberties	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

5. In general, would you say you are more worried about invasion of your privacy or being a victim of crime?

Invasion of privacy <input type="checkbox"/>	Crime victimisation <input type="checkbox"/>	Both privacy and victimisation <input type="checkbox"/>	Neither <input type="checkbox"/>
--	--	---	----------------------------------

6. Do you have other concerns about the police use of ANPR cameras?

Yes ☐ No ☐ Don't know ☐

[If yes, please write them below]

--

7. Overall, what is your attitude to the presence of ANPR cameras on the streets of Leeds?

Very positive <input type="checkbox"/>	Positive <input type="checkbox"/>	No opinion <input type="checkbox"/>	Negative <input type="checkbox"/>	Very negative <input type="checkbox"/>
--	-----------------------------------	-------------------------------------	-----------------------------------	--

8. In general, would you say that crime is common place in your neighbourhood?

Strongly agree <input type="checkbox"/>	Agree <input type="checkbox"/>	Neither agree nor disagree <input type="checkbox"/>	Disagree <input type="checkbox"/>	Strongly disagree <input type="checkbox"/>
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9. In general, would you say that anti-social behaviour is common place in your neighbourhood?

Strongly agree <input type="checkbox"/>	Agree <input type="checkbox"/>	Neither agree nor disagree <input type="checkbox"/>	Disagree <input type="checkbox"/>	Strongly disagree <input type="checkbox"/>
---	--------------------------------	---	-----------------------------------	--

10. Are you aware of any of these crimes and/or incidents taking place in your neighbourhood over the past 12 months?

Yes ☐ No ☐ **[If no, go to question 12]**

11. What do you think are the three biggest problems in your neighbourhood?	Tick up to 3 boxes	12. Have you been a victim of crime in the last 12 months? Yes <input type="checkbox"/> No <input type="checkbox"/> If yes, of which of the following have you been a victim? [Tick as many boxes as apply]
Anti-social behaviour	<input type="checkbox"/>	<input type="checkbox"/>
Burglary	<input type="checkbox"/>	<input type="checkbox"/>
Criminal damage	<input type="checkbox"/>	<input type="checkbox"/>
Drug use and drug dealing	<input type="checkbox"/>	
Fraud or identify theft	<input type="checkbox"/>	<input type="checkbox"/>
Other kinds of theft	<input type="checkbox"/>	<input type="checkbox"/>
Robbery	<input type="checkbox"/>	<input type="checkbox"/>
Sexual assault	<input type="checkbox"/>	<input type="checkbox"/>
Theft of vehicle	<input type="checkbox"/>	<input type="checkbox"/>
Theft from vehicle (including stolen plates)	<input type="checkbox"/>	<input type="checkbox"/>
Violence/assault	<input type="checkbox"/>	<input type="checkbox"/>
Other crime/incident	<input type="checkbox"/>	
[please specify]	<input type="checkbox"/>	

13. What is your view on each of the following statements?

My neighbourhood needs:	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
More patrols by marked police vehicles	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
More foot patrols by police officers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
More foot patrols by Police Community Support Officers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
More Police cameras (CCTV and ANPR)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
More street lighting	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
More Community Wardens	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
More burglar alarms, locks or other security systems	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other [Please specify] :	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

About you ...

Please note that this information will NOT be used to identify you as an individual, but to monitor differences in opinion between groups of people

Are you ...? Male ☐ Female ☐

How old are you? 17-24 ☐ 25-44 ☐ 45-64 ☐ 65+ ☐

Which ethnic group would you say you belong to?

Asian or Asian British <input type="checkbox"/>	Black or Black British <input type="checkbox"/>	Mixed or Mixed British <input type="checkbox"/>
White or White British <input type="checkbox"/>	Other Ethnic Group <input type="checkbox"/>	

What is your employment status?

Employed <input type="checkbox"/>	Self-employed <input type="checkbox"/>	Unemployed <input type="checkbox"/>	Retired <input type="checkbox"/>
Student <input type="checkbox"/>	Domestic manager (e.g. housewife) <input type="checkbox"/>	Voluntary worker <input type="checkbox"/>	Other <input type="checkbox"/>

What is your residential status/housing tenure?

Owner <input type="checkbox"/>	Renting Council House <input type="checkbox"/>	Renting Housing Association <input type="checkbox"/>
Renting Private <input type="checkbox"/>	Shared accommodation <input type="checkbox"/>	Other <input type="checkbox"/>

About your driving ...

Please indicate whether you own and/or drive a vehicle [Tick all that apply]

I drive a car or vehicle that I own <input type="checkbox"/>	I drive a company or hired car/vehicle <input type="checkbox"/>
I drive a car/vehicle belonging to someone I know <input type="checkbox"/>	I don't drive <input type="checkbox"/>

If you have further comments or suggestions about the police use of ANPR in general, please write them below:

THANK YOU for taking the time to complete this questionnaire! Please now return it using the pre paid envelope provided. No stamp is required.

Covering letter to the Public Opinion Survey



ANPR POLICE CAMERAS: HAVE YOUR SAY!



Tell us what you think and you enter a FREE PRIZE DRAW!

1st PRIZE: iPod Nano or £100 M&S vouchers

2nd Prize: iPod Shuffle or £50 M&S vouchers - **3rd Prize:** £20 M&S vouchers

This is an independent survey carried out by the University of Huddersfield and West Yorkshire Police regarding the police use of Automatic Number Plate Recognition Systems (ANPR). We want to know what the people of Leeds think of these cameras, so we would be very grateful if you could complete the enclosed questionnaire.

Did you know ...

... what ANPR is?

- ANPR is a surveillance technology that reads a vehicle's number plate and then checks it automatically against police information to identify vehicles and people wanted by the police.

... how it works?

- ANPR systems work with cameras which can be placed in police vehicles or could be fixed to existing CCTV cameras
- Unlike usual CCTV, ANPR cameras are placed on roads where vehicles can be monitored through their number plate
- ANPR cameras are not speed cameras
- Pictures of both the number plate and the car are taken

... what do the police use ANPR for?

- The police say that they use ANPR to reduce vehicle thefts, burglary and crime in general, but also to identify drivers without a licence and vehicles that are unregistered, untaxed, uninsured or without a valid MOT
- The police also use ANPR for more serious crimes, such as terrorism, murder, kidnapping and violent offences

... what do the police do with ANPR information?

- Track vehicle movements identifying wanted cars or known offenders
- Collect evidence for criminal investigations
- Store the information from 90 days for images to 2 years for number plates

... anything about ANPR in West Yorkshire?

- West Yorkshire Police have used ANPR since the late 90's across the whole county
- The biggest systems of fixed ANPR cameras in West Yorkshire are in Leeds (recently installed, 2007) and Bradford City Centre (since 2004)

Your name and address have been selected at random to take part in this survey, as it is important that we hear from all sections of the community. We would like to reassure you that your answers will be treated confidentially, i.e. your name and address will not be recorded or disclosed to any third party.

This questionnaire should take no longer than 10 minutes to complete. If you send it by 24th February 2008, you will be entered into the free prize draw. If you wish to be entered in the free prize draw please complete the separate sheet enclosed including your choice of prize and your name and address and send it back with the completed questionnaire – so that we can contact you if you win. Once received, this will be separated from the questionnaire so no link between yourself and the questionnaire can be made. If you don't wish to be entered into the prize draw, please send the questionnaire no later than 28th February.

Please return the completed questionnaire in the prepaid envelope provided. There is no need to attach a stamp!

Thank you in advance for your help. Your assistance is very much appreciated and useful. It is important to consult the public on crime prevention and policing matters and we hope that the results of this survey will play a role in the policing and well being of your community. The results of the survey will be made public and published in relevant journals.

If you have any questions about this survey, please feel free to contact me.

Yours sincerely,

A handwritten signature in black ink, appearing to read 'Alina Haines', followed by a long, sweeping horizontal line that extends to the right.

Alina Haines [...]

Free Prize Draw Entry and Data Protection Statement



FREE PRIZE DRAW!

Please tick the box corresponding to the prize of your choice:

iPod ☐

M&S vouchers ☐

YOUR NAME AND ADDRESS – STRICTLY CONFIDENTIAL

If you are interested in entering the free prize draw, we need your contact details in order to be able to award the prizes.

Data Protection Statement: All information will be treated in strict confidence and used only on this occasion for the purpose of the prize draw. This sheet will be separated from the questionnaire the moment the envelope is opened and will be kept separately. No connection between your name and your questionnaire will be possible. Once the prize has been awarded, this paper will be shredded immediately.

Please complete in capitals:

YOUR NAME:

ADDRESS:

POSTCODE:

Indicative Script for Focus Groups with the Public

NOTE: This script provides a guide for the focus group and wherever possible the moderator will seek to keep questions in order. However, feedback from the audience may require them to adjust the nature of the questions and the sequence of questioning.

Section 1 Introduction 5 mins

- Welcome, thanks and introductions.
- Some information about focus group sessions:
 - Everything you say is confidential
 - There are no right or wrong answers
 - Please do not talk over each other – but feel free to make comments or opinions in response to other people's points
 - **I would like to record this – any objections?**
 - The group should last for 90 minutes.
 - You have the right to leave at any time.
 - *Mention refreshments/ toilets etc.*

Section 2 Attitudes to surveillance and Awareness of ANPR 10 mins

1. What do you understand the term 'surveillance' to mean?

PROMPT: CAMERAS, BIG BROTHER ETC...

Why? How safe do you generally feel in your local area?

2. How does this make you feel?

MODERATOR TO ENCOURAGE BOTH SIDES OF ARGUMENT. E.G. FEELINGS OF BIG BROTHER SOCIETY VS. FEELINGS OF SAFETY.

3. Have you ever heard of the term ANPR – Automatic Number Plate Recognition?

4. What do you think this is?

MODERATOR TO EXPLORE REACTION TO ANPR

MODERATOR TO EXPLAIN ANPR IN MORE DETAIL:

Explain the topic – ANPR - general description of police use of ANPR, nothing specific; i.e. video cameras used for crime prevention purposes; cameras can read vehicle number plates etc;

5. Now that we know a bit more about the background of ANPR, how do you feel about it and its potential use? Are you in favour or against it? (Get a show of hands to compare against the end)

Why? Anyone else?

Section 3 Use of ANPR 20 mins

6. What do you think the police use ANPR for? [*identify main uses*]

7. What do you think it should be used for?

Positives / Negatives

[prompt: For minor offences such as no insurance, tax, licence, MOT; speeding? For more serious crimes such as burglary, robbery, murder etc? For all crimes/everything?]

[prompt: if the answer is 'no insurance' for example, ask 'Do you think that's the best policing method to tackle it?']

8. Some people might have issues around trusting the police to only use ANPR for this purpose. What would your thoughts be on this issue?

[prompt: What sort of thing they might use it for that you don't approve of/not happy with? Why?]

[prompt: trust the police to use this information correctly and appropriately? Do you trust the technology?]

Section 4 Invasions of privacy & ANPR 20 mins

9. What do you think the term invasion of privacy means? Give me some examples.

10. Would you consider ANPR to be an invasion of privacy, or not?
Why? Reasons, what do other people think?

[Identify concerns, if any]

11. To what extent do you agree or disagree with the Police using ANPR for crime prevention purposes?

12. What are your thoughts about the visibility of the cameras? Do you think you should be able to see them openly or should they be covered?

[prompt: Should the cameras be overt or covert? Why?]

13. So thinking overall, do the positives of ANPR outweigh the negatives or vice versa?

[outweigh negatives vs. positives]

Section 5 Discrimination and ANPR 10 mins

14. Some people might be concerned that ANPR could be used unfairly against certain sections of society, or different groups?

Why do you think this might be?

If anyone agrees this is an issue, ask Which groups might be targeted and why?

[prompt: ethnic minorities, young people, ex-offenders, drivers] [Why?]

Section 6 Overall opinion about the police use of ANPR 15 mins

15. Now we had the chance to discuss some of the issues regarding the police use of ANPR, I'd like to ask you again whether you are in favour or against ANPR? (Test from Q5) – get a show of hands for numbers.

[prompt: if opinion changed, why?]

- a. Why are you opposed to its use?

[prompt: is it a 'civil liberties' or 'privacy' issue or incompetence/preference for other policing method?]

- b. Why do you feel that it is a good thing?

[prompt: Reassurance, safety]

Section 7

FINALLY...

10 mins

MODERATOR TO SUM UP ARGUMENTS SO FAR...

We are now at the end of our time, is there anything else anyone would like to add?

Thank, reassure about confidentiality and Close.

Invitation to Focus Groups (Police officers and staff West Yorkshire Police)

Letter

On behalf of Chiefs Superintendents ...

Re: ANPR's Role within West Yorkshire Police: Intelligence, Investigation and Response

We are presently working with the University of Huddersfield to research the potential benefits of ANPR in intelligence gathering, crime investigations and response to criminality with a view to identify impediments and areas for improvement. Alina Haines, who is the PhD candidate working with us, is being supported by the force to organise three focus groups/workshops to explore these issues. We aim to use the results from these focus groups to inform future policies and developments regarding ANPR and enhance police effectiveness.

The workshops will have specific focus and will be conducted as follows:

1. **'Response to ANPR'** - 20th June (10am-1pm), Carr Gate, OSD, Wakefield
2. **'ANPR in Crime Investigations'** - 23rd June (10.30am - 2pm) Carr Gate, OSD, Wakefield
3. **'ANPR Intelligence'** - 25th June (9am -12) - Headquarters, Admin 4, Floor 6, Conference Room, Wakefield.

The groups will involve 12-14 respondents representing a mixture of police officers and staff of different ranks and from different divisions/departments within the force.

Aim of the focus groups: Explore ANPR's current position and role within West Yorkshire Police and the way forward. More specific **objectives:**

- Assess the potential benefits presented by ANPR in intelligence gathering, crime investigations and response
- Identify actions to achieve the full potential of ANPR
- Identify impediments in achieving these actions
- Formulate a realistic action plan (i.e. identify actions and outcomes to be taken to ensure benefits are realised)

Please note that the group discussions will be confidential in that your name will not be mentioned in the results or disclosed to any third party. There is no need to prepare for these group sessions. It is about sharing your opinions and suggestions on the subject. It should be an interesting and enjoyable experience. Refreshments and lunch will be provided.

If you are not available on this day, I would really appreciate if you could suggest somebody else that could take your place.

Regards,

Alina Haines

Contact details [...]

Example of Focus Group Script (West Yorkshire Police)

‘ANPR in Crime Investigations’ Focus Group

This script provides a guide for the focus group and wherever possible the moderator will seek to keep questions in order. However, feedback from the audience may require him/her to adjust the nature of the questions and the sequence of questioning.

Section 1 Introduction & housekeeping [15 min]

Alina: Welcome & thank you all for attending. Explain rationale for workshop: West Yorkshire Police are presently working with the University of Huddersfield to research the potential benefits of ANPR in intelligence gathering, crime investigations and response to criminality with a view to identify impediments and areas for improvement.

I am being supported by the force to consult with WY police officers and police staff on ANPR role and potential within WY Police. This is not about your knowledge of ANPR, rather your opinions about how it is used and how it should be used more effectively. The results from these focus groups will be used to produce recommendations which will inform the force strategy and future developments regarding ANPR's within West Yorkshire Police (Via WYP ANPR Steering Group, Command Team Paper).

Introduce other moderators and explain focus groups as above.

1. First of all, can we go around the group and briefly introduce yourselves?

Section 2 ANPR in Crime Investigations: the current picture [20 - 30 min]

1. Do you currently use ANPR in your area of work? Is yes, how do you use it? [To what extent is it used? Are investigators aware of it and know how to use it?]

2. What do you think are the current benefits of using ANPR in this way? [As opposed to not using it; **Prompt:** Identify the way in which ANPR helped in key investigations (make note of main benefits); explore how investigators would have done it differently, looking back, before ANPR; moderator to keep discussion to current benefits that are achieved at present, NOT achievable]

Section 3 Achieving ANPR's full potential [30 - 40 min]

1. What do you think are the main factors that limit ANPR's potential in the crime investigation process? [**Prompt:** e.g. limited resources, technological issues, system too complicated to operate; poor quality of intelligence on databases/hotlists; training needs] Moderator to make a list of main impediments and rank

2. What changes would you suggest to make the most out of ANPR? (both in terms of how investigations are conducted and what ANPR can provide investigators with)

[**Prompt:** Refer to limitations identified above, i.e. if technological issues were identified, then ask 'In your opinion, what improvements can be made in terms of quality of ANPR systems?' Include both ANPR kit and back office (VENOM); what would they like the system to provide them with in terms of capabilities, searching, identification etc]

[**Prompt other:** if other issues identified, explore further, as above – ask their opinion about what would they do to make it better etc]

BREAKLUNCH 12 noon [30 min]

Section 4 Realistic Action Plan [30 min]

Which REALISTIC actions can be taken in order to achieve ANPR's full potential? [Moderator to refer to existing and possible benefits identified above; reiterate that they need to be feasible/realistic]

Section 5 Other issues [20-30 min]

1. In your opinion, what is the best way to tackle cross-border crime?

[**Prompt:** Think of a case scenario where investigation crosses division border, force border, organisation boundaries etc. Moderator to explore any partnership work and information sharing protocols, i.e. within the force, i.e. between divisions/ departments; with the local authority, the private sector; other police forces etc. What is current practice? Is it effective? Why? What should be done to improve this?]

2. What is your opinion regarding the use of ANPR evidence in courts?

[**Prompt:** Have you used ANPR evidence in courts? What was the outcome? Are you aware of any national or force guidelines regarding evidence and disclosure procedures? If there is such guidance, what do you think about it? Can it be improved?]

3. What is your view on the future of ANPR within West Yorkshire Police? [**Prompt:** Which division/department should ANPR be part of? Why? Who should be responsible for ANPR within the force? What do you think it could be done to boost ANPR's image at force level?]

Section 6 Finally [10-15 min]

MODERATOR TO SUM UP ARGUMENTS SO FAR ...

Does anyone have anything more they would like to add?

Session closure; thanks and highlight expected benefits from the study

Example of Interview Schedule ANPR Stakeholders

Interview ACPO ANPR

Purpose of interview: This interview will ask you about your opinions concerning ANPR's role and use within policing, with particular emphasis on national ANPR developments, guidelines and regulations, strategies and policies and ACPO's role in the process. I believe that consulting you on this matter is of great importance and I hope that the results of this study will play a role in informing future policies regarding ANPR and its use by the police.

Duration, confidentiality and consent: The interview should last no longer than an hour. I would ideally like to tape record the interview to be able to reflect your views and experiences more accurately, but if you would prefer otherwise, I would be happy to take notes instead. You can refuse to answer any questions and you can bring up new subjects during the interview that you think are relevant. I would also like to reassure you that your answers will be treated in the strictest confidence, i.e. your name will not be recorded or disclosed to any third party and any information you provide will not be traced back to you.

Consent form (attached): to be signed before the interview

1. Could you please briefly describe your current role in relation to ANPR?

2. *Last year, I conducted interviews in various police forces in the UK and identified some of the main limitations to the effective use of ANPR within policing. The technology around ANPR was viewed as the main drawback, both in terms of ANPR kit (which doesn't always 'do what it says on the tin') and the versions of the BOF (i.e. not working properly, not user friendly etc). What is your view on this? Are you aware of any national guidelines that providers of ANPR technology need to comply with? Have the difficulties with the BOF 2 been resolved?*

3 *From my interviews I gathered that there are significant differences in the regulation and working practices of ANPR across England and Wales. What can you tell me about the current national regulations of the use of ANPR within policing? Aside from the formal controls established by the Data Protection Act, what other controls, whether formal or informal (codes of practice) are in place with regards to ANPR? Who is responsible for their development?*

4 *It also appears that there is some confusion regarding the use of ANPR evidence in courts, disclosure procedures etc. What is being done nationally to ensure that ANPR evidence is accepted by the courts in order to secure convictions? Are there nationally recognised guidelines that all police forces adhere to? If there is such guidance, could you tell me more about it? Can it be improved? Who is responsible for it?*

5. *Most interviewees have expressed their concerns that ANPR is not taken seriously by senior police officers and it is not part of mainstream policing or central infrastructure, hence there are financial concerns about its sustainability. What do you think it could be done nationally to boost ANPR's image at force level?*

6. *Part of my study was to explore the public's perceptions of ANPR, including their support for the introduction of ANPR, their views on its effectiveness as a crime prevention tool and any concerns about civil liberties and breaches of human rights. Results from my research indicate that the public are concerned about data misuse, technological errors and in particular Data protection. The public wants to be reassured that the data is safe and they need to know how it's used and what it's used for ('Fit for purpose'). Similar concerns have been expressed by the Information Commissioner's Office and civil liberties interests groups. Could you please tell me what safeguards are in place nationally to ensure that ANPR complies with ethical and legal norms? Do you think there is a need for further regulation? Is there anything that could be done nationally to increase the public's confidence in the use of technologies such as ANPR?*

7. *The ANPR Strategy for the Police Service 2007-2010 speaks of primary aims of reducing crime and terrorism, increasing the number of OBTJ, reducing road traffic casualties, making the public feel safer and more confident in the police service, making more efficient use of police resources. Are you aware of any evaluations or monitoring which assesses the impact of ANPR on these targets?*

8. One of the key developments was the development of the NADC (National ANPR Centre) to enable the storage of data nationally and enable analysis for intelligence and crime investigation purposes. Has this proved to be a useful development in practice? If yes, details. If not, why not? You previously talked about challenges regarding the future NADC sustainability, do you have ideas on how to positively deal with this?

9. What is NADC's role to make sense of all the information that it stores? Is it for forces individually to help with investigating serious crimes or does it have a national role as well? (i.e. national picture, criminal networks, links with terrorism, SOCA etc) Is there an analyst role within the centre exploring and linking the data nationally?

10. What role do you think the Home Office, NPIA or other government bodies should have with regards to ANPR? Who is responsible for ANPR nationally?

11. In your opinion, how has the national ANPR picture changed compared to 2 years ago? How do you see future developments of ANPR in 2 years time and beyond?

Anything else? THANK YOU!!!

Appendix 2 – Additional tables and figures (Chapter Five)

Table 5.1 Socio-demographic characteristics of respondents from the postal survey

Gender		Frequency	% Sample	% Leeds 2001 Census*
	Male	712	47.0	48.3
	Female	802	53.0	51.7
Age		Frequency	% Sample	% Leeds Population
	17-24	47	28.1	42.7**
	25-44	384		
	45-64	567	36.9	22
	65+	537	35.0	15.3
Ethnicity		Frequency	% Sample	% Leeds Population
	Asian or Asian British	41	2.6	4.5
	Black or Black British	22	1.4	1.4
	Mixed or Mixed British	10	0.6	1.3
	White or White British	1435	91.2	91.8
	Other Ethnic Group	13	0.8	0.8
Employment		Frequency	% Sample	% Leeds Population
	Employed	633	40.2	58.9
	Self-Employed	95	6.0	
	Unemployed	40	2.5	3.3
	Retired	655	41.6	13.2
	Student	30	1.9	10.7
	Domestic Manager	44	2.8	5.5
	Voluntary Worker	7	0.4	No comparison
	Other	34	2.2	8.4
Housing		Frequency	% Sample	% Leeds Households****
	Owner	1184	75.3	62
	Renting - Council House	209	13.3	25
	Renting - Housing Association	49	3.1	
	Renting - Private	52	3.3	10
	Shared Accommodation	13	0.8	1
	Other	37	2.4	No comparison
Vehicle ownership		Frequency	% Sample	Households*****
	Vehicle owner	1018	64.7	65.5

* As not all demographic criteria are the same, comparisons were made where appropriate

** Percentage includes 16 year olds as well

*** Leeds households were estimated at 301,614 in 2001 (Census)

**** Percentage of households in Leeds with one or more cars or vans

Table 5.2 Respondents from postal survey per ward (Leeds district)*

No	Wards	Frequency	%Sample	%Leeds Households	%Difference
1	Adel and Wharfedale	43	3.7	2.8	-0.9
2	Alwoodley	44	3.8	3.2	-0.6
3	Ardsley and Robin Hood	44	3.8	2.8	-1.0
4	Armley	39	3.4	3.5	0.2
5	Beeston and Holbeck	39	3.4	3.4	0.0
6	Bramley and Stanningley	2	0.2	3.1	2.9**
7	Burmantofts and Richmond Hill	26	2.2	3.4	1.1
8	Calverley and Farsley	61	5.3	3.1	-2.2**
9	Chapel Allerton	29	2.5	3.0	0.5
10	City and Hunslet	17	1.5	3.4	1.9**
11	Crossgates and Whinmoor	50	4.3	3.2	-1.1
12	Farnley and Wortley	53	4.6	3.2	-1.4
13	Garforth and Swillington	38	3.3	2.7	-0.6
14	Gipton and Harehills	32	2.8	3.5	0.8
15	Guiseley and Rawdon	37	3.2	2.9	-0.3
16	Harewood	38	3.3	2.4	-0.8
17	Headingley	5	0.4	2.5	2.1**
18	Horsforth	34	2.9	2.9	0.0
19	Hyde Park and Woodhouse	14	1.2	3.0	1.8**
20	Killingbeck and Seacroft	40	3.5	3.4	0.0
21	Kippax and Methley	44	3.8	2.7	-1.1
22	Kirkstall	30	2.6	3.0	0.4
23	Middleton Park	43	3.7	3.4	-0.4
24	Moortown	35	3.0	3.0	0.0
25	Morley North	32	2.8	2.9	0.2
26	Morley South	42	3.6	2.9	-0.8
27	Otley and Yeadon	34	2.9	3.2	0.3
28	Pudsey	43	3.7	3.0	-0.7
29	Rothwell	42	3.6	2.8	-0.8
30	Roundhay	31	2.7	3.0	0.3
31	Temple Newsam	37	3.2	2.9	-0.3
32	Weetwood	28	2.4	3.2	0.7
33	Wetherby	30	2.6	2.6	0.0
	Total	1156	100	100	

*Table comprises all respondents who have provided correct information regarding their address (postcode). These account for 1,156 Leeds addresses

**Although these appear to be unrepresentative, the difference is not significant (Sample t-test)

Figure 5.1 Geographical representation of respondents Leeds district

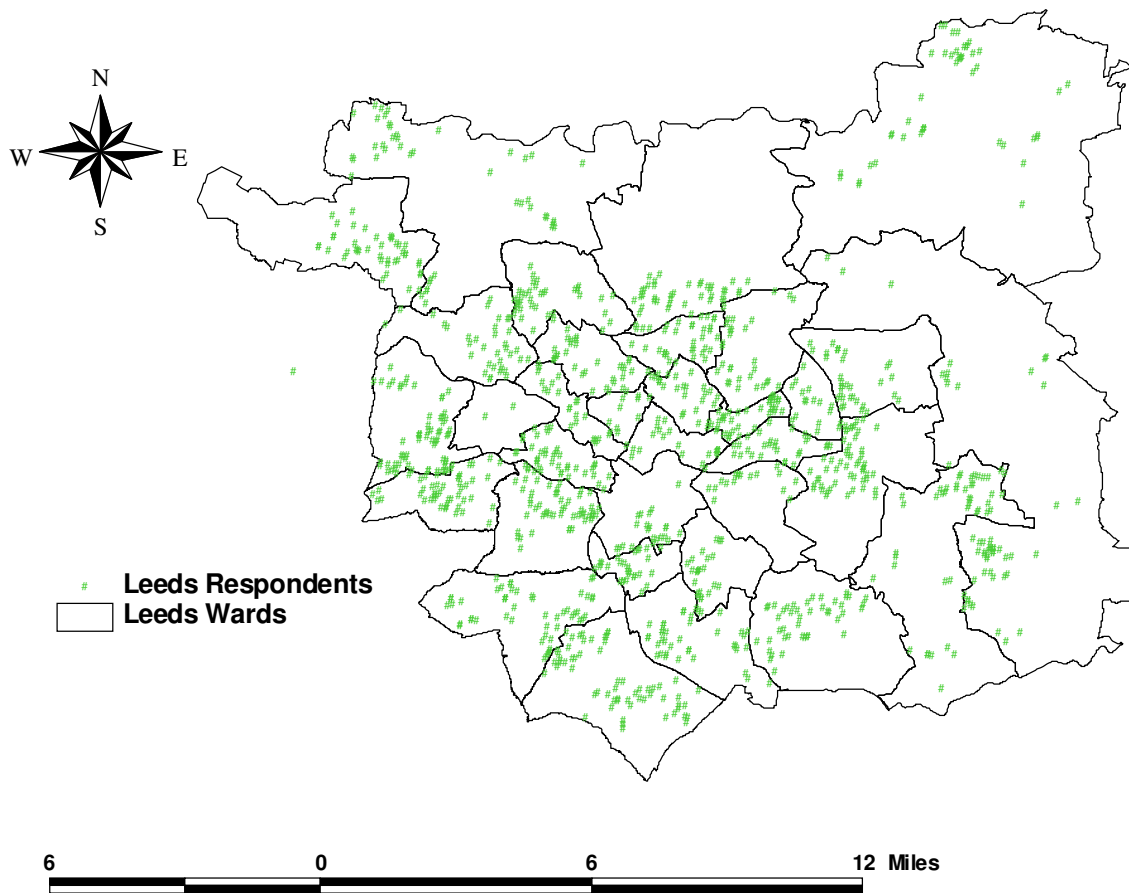


Table 5.3 The ACORN distribution of respondents' postcodes from postal survey against the ACORN distribution of Leeds population

ACORN Category		N (%) Survey	% Leeds	ACORN Group		N (%) Survey	% Leeds
1	Wealthy Achievers	199 (12.7)	15.4	A	Wealthy Executives	64 (4.1)	6.3
				B	Affluent Greys	40 (2.5)	1.8
				C	Flourishing Families	95 (6.0)	7.3
2	Urban Prosperity	88 (5.6)	13.3	D	Prosperous Professionals	48 (3.1)	4.0
				E	Educated Urbanities	18 (1.1)	4.0
				F	Aspiring Singles	22 (1.4)	5.3
3	Comfortably Off	436 (27.7)	28.5	G	Starting Out	41 (2.6)	3.4
				H	Secure Families	255 (16.2)	17.3
				I	Settled Suburbia	100 (6.4)	5.6
				J	Prudent Pensioners	40 (2.5)	2.2
4	Moderate Means	135 (8.6)	13.9	K	Asian Communities	13 (0.8)	2.2
				L	Post-Industrial Families	27 (1.7)	3.0
				M	Blue-collar Roots	95 (6.0)	8.7
5	Hard Pressed	313 (19.9)	28.3	N	Struggling Families	183 (11.6)	17.4
				O	Burdened Singles	89 (5.7)	7.4
				P	High-Rise Hardship	36 (2.3)	2.9
				Q	Inner City Adversity	5 (0.3)	0.7
	Unclassified	4 (0.3)	0.8	U	Unclassified	4 (0.3)	0.8
	Missing	398 (25.3)	-		Missing	398 (25.3)	-
	Total	1573 (100)	100*		Total	1573 (100)	100*

*Figures have been rounded to one decimal place; therefore not all totals equal 100%

Table 5.4 Socio-demographic characteristics of respondents from the focus groups

Characteristics		Frequency		
		Mixed Group 1	Mixed Group 2	Young People's Group*
Gender				
	Male	3	4	3
	Female	6	7	7
Age				
	<16	n/a	n/a	3
	16-24	3	2	7
	25-44	2	3	n/a
	45-64	2	3	n/a
	65+	2	3	n/a
Ethnicity				
	Asian or Asian British	1	1	Various
	Black or Black British	1	1	
	Mixed or Mixed British	-	-	
	White or White British	7	9	
	Other Ethnic Group	-	-	
	Other	-	-	
Total		9	11	10

*Full demographics of young people's group were not available

Table 5.6 Victimization by socio-demographic characteristics

Socio-demographics		Victims		Non victims		% of Total
		% within category	% of Total	% within victimisation	% of Total	
Gender	Male	20.3 (N=125)	9.7	79.7 (N=491)	38.3	100.0 (N=616)
	Female	16.2 (N=108)	8.4	83.8 (N=559)	43.6	100.0 (N=667)
Age	17-24	24.3 (N=9)	0.7	75.7 (N=28)	2.1	100.0 (N=37)
	25-44	27.4 (N=90)	6.9	72.6 (N=238)	18.3	100.0 (N=328)
	45-64	19.6 (N=96)	7.4	80.4 (N=394)	30.2	100.0 (N=490)
	65+	9.2 (N=41)	3.1	90.8 (N=407)	31.2	100.0 (N=448)
Ethnicity	Asian or Asian British	20.0 (N=6)	0.4	80.0 (N=24)	1.8	100.0 (N=30)
	Black or Black British	16.7 (N=3)	0.2	83.3 (N=15)	1.1	100.0 (N=18)
	Mixed or Mixed British	44.4 (N=4)	0.3	55.6 (N=5)	0.4	100.0 (N=9)
	White or White British	17.8 (N=219)	16.4	82.2 (N=1011)	75.7	100.0 (N=1230)
	Other Ethnic Group	37.5 (N=3)	0.2	62.5 (N=5)	0.4	100.0 (N=8)
Employment	Employed	23.0 (N=125)	9.4	77.0 (N=418)	31.3	100.0 (N=543)
	Self-Employed	24.7 (N=20)	1.5	75.3 (N=61)	4.6	100.0 (N=81)
	Unemployed	22.2 (N=8)	0.6	77.8 (N=28)	2.1	100.0 (N=36)
	Retired	10.6 (N=59)	4.4	89.4 (N=496)	37.2	100.0 (N=555)
	Student	20.0 (N=5)	0.4	80.0 (N=20)	1.5	100.0 (N=25)
	Domestic Manager	26.3 (N=10)	0.7	73.7 (N=28)	2.1	100.0 (N=38)
	Other	36.0 (N=9)	0.7	64.0 (N=16)	1.2	100.0 (N=25)
Housing	Owner	16.1 (N=163)	12.2	83.9 (N=850)	63.7	100.0 (N=1013)
	Renting - Council House	30.3 (N=50)	3.7	69.7 (N=115)	8.6	100.0 (N=165)
	Renting - Housing Association	15.2 (N=7)	0.5	84.8 (N=39)	2.9	100.0 (N=46)
	Renting - Private	22.0 (N=11)	0.8	78.0 (N=39)	2.9	100.0 (N=50)
	Shared Accommodation	27.3 (N=3)	0.2	72.7 (N=8)	0.6	100.0 (N=11)
	Other	17.9 (N=5)	0.4	82.1 (N=23)	1.7	100.0 (N=28)
ACORN Category	Comfortably Off	16.5 (N=61)	4.6	83.5 (N=308)	23.1	100.0 (N=37)
	Hard Pressed	22.6 (N=58)	4.3	77.4 (N=199)	14.9	100.0 (N=257)
	Modest Means	21.6 (N=25)	01.97	78.4 (N=91)	6.8	100.0 (N=116)
	Urban Prosperity	23.4 (N=18)	1.3	76.6 (N=59)	4.4	100.0 (N=77)
	Wealthy Achievers	13.1 (N=23)	1.7	86.9 (N=152)	18.3	100.0 (N=175)
Total (without missing values, N=238)		N=242	15.4	N=1093	69.5	84.9 (N=1335)
Total (valid percent)		n/a	18.1	n/a	81.9	100 (N=1573)

Table 5.8 Correlations: Concerns about crime in the neighbourhood against perceptions regarding ANPR benefits*

			CrimeConcern	FeelSafer
Spearman's rho	Crime is a concern	Correlation Coefficient	1.000	-.083(**)
		Sig. (2-tailed)	.	.001
	ANPR will improve feelings of safety	N	1506	1482
		Correlation Coefficient	-.083(**)	1.000
		Sig. (2-tailed)	.001	.
		N	1482	1549
			CrimeConcern	ReduceCrime
Spearman's rho	Crime is a concern	Correlation Coefficient	1.000	-.073(**)
		Sig. (2-tailed)	.	.005
	ANPR will reduce crime	N	1506	1480
		Correlation Coefficient	-.073(**)	1.000
		Sig. (2-tailed)	.005	.
		N	1480	1546
			CrimeConcern	DisplaceCrime
Spearman's rho	Crime is a concern	Correlation Coefficient	1.000	.069(**)
		Sig. (2-tailed)	.	.008
	ANPR will displace crime	N	1506	1465
		Correlation Coefficient	.069(**)	1.000
		Sig. (2-tailed)	.008	.
		N	1465	1528
			CrimeConcern	RTC
Spearman's rho	Crime is a concern	Correlation Coefficient	1.000	-.096(**)
		Sig. (2-tailed)	.	.000
	ANPR will reduce RTC***	N	1506	1470
		Correlation Coefficient	-.096(**)	1.000
		Sig. (2-tailed)	.000	.
		N	1470	1533
			CrimeConcern	Discrimination
Spearman's rho	Crime is a concern	Correlation Coefficient	1.000	-.092(**)
		Sig. (2-tailed)	.	.000
	Less discrimination	N	1506	1468
		Correlation Coefficient	-.092(**)	1.000
		Sig. (2-tailed)	.000	.
		N	1468	1533

* Table above shows weak or very weak correlations between perceptions of crime in the neighbourhood and perceptions about ANPR's potential benefits

(**) Correlation is significant at the 0.01 level (2-tailed)

*** RTC stands for Road Traffic Casualties

Table 5.9 Perceived benefits of ANPR by victimisation

ANPR Benefit		Victimisation		
		No	Yes	Total
Improve feelings of safety	Disagree (% , n)	5.6 (60)	10.1 (24)**	6.4 (84)
	Neutral (% , n)	20.2 (218)	24.5 (58)	21.0 (276)
	Agree (% , n)	74.3 (802)	65.4 (155)	72.7 (957)
	Total (% , n)	100.0 (1080)	100.0 (237)	100.0 (1317)
Reduce crime	Disagree (% , n)	7.4 (80)	13.0 (31)*	8.5 (111)
	Neutral (% , n)	17.7 (190)	19.7 (47)	18.1 (237)
	Agree (% , n)	74.9 (805)	67.2 (160)	73.5 (965)
	Total (% , n)	100.0 (1075)	100.0 (238)	100.0 (1313)
Improve offender tracking and identification	Disagree (% , n)	2.2 (23)	6.3 (15)**	2.9 (38)
	Neutral (% , n)	5.2 (55)	5.0 (12)	5.1 (67)
	Agree (% , n)	92.7 (989)	88.7 (211)	92.0 (1200)
	Total (% , n)	100.0 (1067)	100.0 (238)	100.0 (1305)
Provide useful evidence	Disagree (% , n)	1.5 (16)	5.0 (12)**	2.1 (28)
	Neutral (% , n)	7.6 (81)	6.3 (15)	7.3 (96)
	Agree (% , n)	90.9 (974)	88.7 (211)	90.5 (1185)
	Total (% , n)	100.0 (1071)	100.0 (238)	100.0 (1309)
Improve road safety	Disagree (% , n)	20.8 (221)	30.3 (72)**	22.5 (293)
	Neutral (% , n)	38.6 (411)	34.9 (83)	37.9 (494)
	Agree (% , n)	40.7 (433)	34.9 (83)	39.6 (516)
	Total (% , n)	100.0 (1065)	100.0 (238)	100.0 (1303)

*Significant at the .01 level

**Significant at the .001 level

Table 5.10 Perceived benefits of ANPR by Age

Potential ANPR's benefits	Age of respondents who agreed or strongly agreed with benefits (% , n)					Relationship (Cramer's V)
	17-24	25-44	45-64	65+	Total	
Improve offender tracking and identification	85.1 (40)	88.8 (334)	90.1 (501)	97.1 (508)	92.1 (1383)	.104 (**)
Provide useful criminal evidence	86.7 (39)	89.1 (335)	89.4 (498)	93.2 (490)	90.6 (1362)	ns
Displace crime	73.3 (33)	75.5 (284)	77.3 (428)	82.8 (428)	78.6 (1173)	ns
Reduce crime	65.2 (30)	65.7 (251)	74.6 (418)	82.0 (428)	74.6 (1127)	.110 (**)
Increase feelings of safety	63.8 (30)	59.7 (228)	71.5 (401)	86.4 (452)	73.4 (1111)	.169 (**)
Reassure victims	59.6 (28)	48.0 (181)	58.1 (319)	70.5 (368)	59.9 (896)	.128 (**)
Reduce number of police stops	42.6 (20)	47.6 (179)	59.1 (329)	70.6 (367)	59.7 (895)	.144 (**)
Deter offenders	55.3 (26)	51.5 (194)	55.3 (307)	68.2 (358)	58.8 (885)	.112 (**)
Improve police response time	45.7 (21)	46.1 (173)	49.2 (273)	63.2 (327)	53.2 (794)	.113 (**)
Reduce likelihood of discrimination	38.3 (18)	30.4 (115)	42.2 (233)	50.0 (260)	41.8 (626)	.125 (**)
Improve road safety	33.3 (15)	28.4 (106)	34.6 (193)	54.1 (283)	39.9 (597)	.169 (**)

The coefficient indicates the strength of the relationship

All relationships are weak, but statistically significant

*Significant at the .01 level

**Significant at the .001 level

ns = not significant

Table 5.11 Perceived benefits of ANPR by Gender

Potential ANPR's benefits	Sex of respondents who agreed or strongly agreed with benefits (% , n)			Relationship (Cramer's V)
	Male	Female	Total	
Improve offender tracking and identification	90.7 (637)	93.1 (726)	92.0 (1363)	ns
Provide useful criminal evidence	89.3 (624)	91.3 (718)	90.4 (1342)	ns
Displace crime	77.4 (539)	79.9 (621)	78.8 (1160)	ns
Reduce crime	73.8 (519)	74.7 (589)	74.3 (1108)	ns
Increase feelings of safety	68.9 (484)	76.7 (606)	73.1 (1090)	.093 (**)
Reassure victims	52.9 (368)	65.1 (508)	59.4 (876)	.145 (**)
Reduce number of police stops	54.4 (378)	64.2 (503)	59.6 (881)	.120 (**)
Deter offenders	57.3 (398)	60.3 (475)	58.9 (873)	ns
Improve police response time	47.8 (331)	57.5 (449)	53.0 (780)	.121 (**)
Reduce likelihood of discrimination	39.1 (272)	43.7 (341)	41.5 (613)	.093 (**)
Improve road safety	35.7 (249)	42.7 (333)	39.4 (582)	.134 (**)

The coefficient indicates the strength of the relationship

All relationships are weak, but statistically significant

*Significant at the .01 level

**Significant at the .001 level

ns = not significant

Table 5.13 Perceived concerns about ANPR by Gender

Potential concerns	Sex of respondents who agreed or strongly agreed with arguments (% , n)			Relationship (Cramer's V)
	Male	Female	Total	
Nothing to hide, nothing to fear	85.5 (597)	91.6 (722)	88.8 (1319)	.105**
Covert surveillance	78.0 (545)	84.0 (653)	81.2 (1198)	.080**
Police can be trusted to handle ANPR data	53.5 (375)	62.2 (479)	58.1 (854)	.142**
Police can be trusted to protect innocent people's rights	47.8 (332)	56.3 (437)	52.3 (769)	.130**
ANPR should be advertised to the public	51.6 (356)	60.2 (468)	56.2 (824)	.102**
Independent monitoring	66.5 (462)	70.3 (543)	68.5 (1005)	ns
Awareness of ANPR cameras helps fear of crime	63.5 (441)	69.4 (540)	66.6 (981)	ns
Awareness of ANPR cameras doesn't help offender detection	62.3 (433)	65.0 (504)	63.7 (937)	ns
ANPR evidence, misleading	26.2 (183)	26.6 (205)	26.4 (388)	ns
Number plates are insufficient evidence	60.1 (420)	57.1 (444)	58.5 (864)	ns
Counter-measures	84.8 (587)	81.1 (625)	82.8 (1212)	ns
ANPR discrimination	21.1 (148)	22.1 (169)	21.6 (317)	ns
ANPR, a revenue making tool	52.1 (362)	45.0 (349)	48.3 (711)	ns
ANPR, a spying tool	34.4 (241)	26.0 (202)	30.0 (443)	.091**
ANPR, an infringement of civil liberties	16.1 (112)	11.5 (89)	13.7 (201)	.ns

The coefficient indicates the strength of the relationship.

All relationships are weak or very weak, but statistically significant

*Significant at the .01 level

**Significant at the .001 level

ns = not significant

Table 5.14 Perceived concerns about ANPR by Age

Potential ANPR's benefits	Age of respondents who agreed or strongly agreed with benefits (% , n)					Relationship (Cramer's V)
	17-24	25-44	45-64	65+	Total	
Nothing to hide, nothing to fear	87.0 (40)	83.2 (311)	87.5 (491)	94.7 (498)	88.9 (1340)	.108 (**)
Covert surveillance	65.2 (30)	76.3 (287)	79.6 (440)	88.9 (464)	81.6 (1221)	.126 (**)
Police can be trusted to handle ANPR data	54.3 (25)	56.9 (214)	54.3 (300)	64.4 (334)	58.5 (873)	.108 (**)
Police can be trusted to protect innocent people's rights	37.8 (17)	47.9 (181)	52.2 (292)	58.7 (299)	52.9 (789)	.110 (**)
ANPR should be advertised to the public	82.6 (38)	57.8 (216)	56.1 (312)	52.4 (269)	56.1 (835)	.088 (**)
Independent monitoring	76.1 (35)	73.2 (271)	67.9 (376)	66.0 (339)	68.8 (1021)	ns
Awareness of ANPR cameras helps fear of crime	73.9 (34)	64.1 (241)	65.4 (359)	70.5 (366)	67.1 (1000)	ns
Awareness of ANPR cameras doesn't help offender detection	61.4 (27)	62.8 (238)	61.7 (338)	68.0 (351)	64.2 (954)	ns
ANPR evidence, misleading	37.0 (17)	25.1 (94)	27.8 (154)	25.0 (128)	26.4 (393)	ns
Number plates are insufficient evidence	43.2 (19)	55.9 (212)	59.2 (327)	61.2 (317)	58.6 (875)	ns
Counter-measures	77.8 (35)	78.6 (297)	84.1 (459)	85.7 (438)	83.0 (1229)	ns
ANPR discrimination	24.4 (11)	16.0 (60)	20.2 (111)	26.8 (138)	21.5 (320)	.084 (**)
ANPR, a revenue making tool	52.3 (23)	55.2 (207)	47.5 (263)	42.8 (222)	47.9 (715)	ns
ANPR, a spying tool	28.3 (13)	31.7 (120)	30.2 (168)	28.0 (145)	29.8 (446)	ns
ANPR, an infringement of civil liberties	28.3 (13)	16.4 (62)	12.3 (68)	10.7 (55)	13.3 (198)	.085 (**)

The coefficient indicates the strength of the relationship

All relationships are weak or very weak, but statistically significant

*Significant at the .01 level

**Significant at the .001 level

ns = not significant

Table 5.15 Perceived concerns about ANPR by Victimization

Potential ANPR's benefits	Respondents who agreed or strongly agreed with benefits (% , n)			Relationship (Cramer's V)
	Victims	Non-victims	Total	
Nothing to hide, nothing to fear	85.7 (203)	89.6 (960)	88.8 (1163)	ns
Covert surveillance	78.3 (184)	82.0 (876)	81.4 (1060)	.092 (**)
Police can be trusted to handle ANPR data	52.7 (125)	59.5 (629)	58.2 (754)	ns
Police can be trusted to protect innocent people's rights	45.8 (109)	54.1 (572)	52.5 (681)	.088 (**)
ANPR should be advertised to the public	54.0 (128)	56.0 (592)	55.6 (720)	ns
Independent monitoring	74.4 (177)	68.2 (719)	69.3 (896)	ns
Awareness of ANPR cameras helps fear of crime	65.5 (156)	66.8 (706)	66.6 (862)	ns
Awareness of ANPR cameras doesn't help offender detection	64.4 (152)	63.6 (671)	63.7 (823)	ns
ANPR evidence, misleading	29.2 (70)	26.5 (278)	27.0 (348)	ns
Number plates are insufficient evidence	63.8 (152)	57.3 (605)	58.4 (757)	ns
Counter-measures	85.5 (201)	82.2 (861)	82.8 (1062)	ns
ANPR discrimination	21.3 (50)	21.8 (230)	21.7 (280)	ns
ANPR, a revenue making tool	54.2 (130)	46.9 (497)	48.2 (627)	ns
ANPR, a spying tool	32.2 (77)	28.8 (308)	29.4 (385)	ns
ANPR, an infringement of civil liberties	12.7 (30)	13.5 (143)	13.3 (173)	ns

The coefficient indicates the strength of the relationship

All relationships are weak, but statistically significant

*Significant at the .01 level

**Significant at the .001 level

ns = not significant

Table 16 Correlations: ANPR as an infringement of civil liberties against perceptions about ANPR's benefits and disbenefits

			Infringement	Feel safer
Spearman's rho	Infringement	Correlation Coefficient Sig. (2-tailed) N	1.000 . 1528	.243(**) .000 1504
	Feel safer	Correlation Coefficient Sig. (2-tailed) N	.243(**) .000 1504	1.000 . 1549
			Infringement	Reduce crime
Spearman's rho	Infringement	Correlation Coefficient Sig. (2-tailed) N	1.000 . 1528	.248(**) .000 1505
	Reduce crime	Correlation Coefficient Sig. (2-tailed) N	.248(**) .000 1505	1.000 . 1546
			Infringement	Less discrimination
Spearman's rho	Infringement	Correlation Coefficient Sig. (2-tailed) N	1.000 . 1528	.159(**) .000 1493
	Less discrimination	Correlation Coefficient Sig. (2-tailed) N	.159(**) .000 1493	1.000 . 1533
			Infringement	Victim reassurance
Spearman's rho	Infringement	Correlation Coefficient Sig. (2-tailed) N	1.000 . 1528	.178(**) .000 1491
	Victim reassurance	Correlation Coefficient Sig. (2-tailed) N	.178(**) .000 1491	1.000 . 1531
			Infringement	Less stops
Spearman's rho	Infringement	Correlation Coefficient Sig. (2-tailed) N	1.000 . 1528	.235(**) .000 1498
	Less stops	Correlation Coefficient Sig. (2-tailed) N	.235(**) .000 1498	1.000 . 1536
			Infringement	Covert surveillance
Spearman's rho	Infringement	Correlation Coefficient Sig. (2-tailed) N	1.000 . 1528	.312(**) .000 1497
	Covert surveillance	Correlation Coefficient Sig. (2-tailed) N	.312(**) .000 1497	1.000 . 1533
			Infringement	Trust police data
Spearman's rho	Infringement	Correlation Coefficient Sig. (2-tailed) N	1.000 . 1528	.302(**) .000 1492
	Trust police data	Correlation Coefficient Sig. (2-tailed) N	.302(**) .000 1492	1.000 . 1528
			Infringement	Trust police fair
Spearman's rho	Infringement	Correlation Coefficient Sig. (2-tailed) N	1.000 . 1528	.262(**) .000 1492
	Trust police fair	Correlation Coefficient Sig. (2-tailed) N	.262(**) .000 1492	1.000 . 1527
			Infringement	ANPR public
Spearman's rho	Infringement	Correlation Coefficient Sig. (2-tailed) N	1.000 . 1528	-.237(**) .000 1489
	ANPR public	Correlation Coefficient Sig. (2-tailed) N	-.237(**) .000 1489	1.000 . 1523
			Infringement	Independent control
Spearman's rho	Infringement	Correlation Coefficient Sig. (2-tailed) N	1.000 . 1528	-.219(**) .000 1488
	Independent control	Correlation Coefficient Sig. (2-tailed) N	-.219(**) .000 1488	1.000 . 1521
			Infringement	Covert surveillance

(**) Correlation is significant at the 0.01 level (2-tailed)

Table 5.16 Correlations: ‘Nothing to hide, nothing to fear’ against perceptions about ANPR’s benefits

			Nothing to hide	Feel safer
Spearman's rho	Nothing to hide	Correlation Coefficient Sig. (2-tailed) N	1.000 . 1543	.397(**) .000 1521
	Feel safer	Correlation Coefficient Sig. (2-tailed) N	.397(**) .000 1521	1.000 . 1549
			Nothing to hide	Reduce crime
Spearman's rho	Nothing to hide	Correlation Coefficient Sig. (2-tailed) N	1.000 . 1543	.293(**) .000 1518
	Reduce crime	Correlation Coefficient Sig. (2-tailed) N	.293(**) .000 1518	1.000 . 1546
			Nothing to hide	Deterrence
Spearman's rho	Nothing to hide	Correlation Coefficient Sig. (2-tailed) N	1.000 . 1543	.245(**) .000 1511
	Deterrence	Correlation Coefficient Sig. (2-tailed) N	.245(**) .000 1511	1.000 . 1539
			Nothing to hide	Quicker police
Spearman's rho	Nothing to hide	Correlation Coefficient Sig. (2-tailed) N	1.000 . 1543	.297(**) .000 1499
	Quicker police	Correlation Coefficient Sig. (2-tailed) N	.297(**) .000 1499	1.000 . 1528
			Nothing to hide	Better tracking
Spearman's rho	Nothing to hide	Correlation Coefficient Sig. (2-tailed) N	1.000 . 1543	.290(**) .000 1508
	Better tracking	Correlation Coefficient Sig. (2-tailed) N	.290(**) .000 1508	1.000 . 1538
			Nothing to hide	Useful evidence
Spearman's rho	Nothing to hide	Correlation Coefficient Sig. (2-tailed) N	1.000 . 1543	.299(**) .000 1513
	Useful evidence	Correlation Coefficient Sig. (2-tailed) N	.299(**) .000 1513	1.000 . 1542
			Nothing to hide	Road safety
Spearman's rho	Nothing to hide	Correlation Coefficient Sig. (2-tailed) N	1.000 . 1543	.280(**) .000 1503
	Road safety	Correlation Coefficient Sig. (2-tailed) N	.280(**) .000 1503	1.000 . 1533
			Nothing to hide	Trust police fair
Spearman's rho	Nothing to hide	Correlation Coefficient Sig. (2-tailed) N	1.000 . 1528	.262(**) .000 1492
	Trust police fair	Correlation Coefficient Sig. (2-tailed) N	.262(**) .000 1492	1.000 . 1527
			Nothing to hide	Less discrimination
Spearman's rho	Nothing to hide	Correlation Coefficient Sig. (2-tailed) N	1.000 . 1543	.257(**) .000 1504
	Less discrimination	Correlation Coefficient Sig. (2-tailed) N	.257(**) .000 1504	1.000 . 1533
			Nothing to hide	Victim reassurance
Spearman's rho	Nothing to hide	Correlation Coefficient Sig. (2-tailed) N	1.000 . 1543	.322(**) .000 1502
	Victim reassurance	Correlation Coefficient Sig. (2-tailed) N	.322(**) .000 1502	1.000 . 1531
			Infringement	Covert surveillance
			Nothing to hide	Less stops
Spearman's rho	Nothing to hide	Correlation Coefficient Sig. (2-tailed) N	1.000 . 1543	.353(**) .000 1509
	Less stops	Correlation Coefficient Sig. (2-tailed) N	.353(**) .000 1509	1.000 . 1536

(**) Correlation is significant at the 0.01 level (2-tailed)

Table 5.17 Correlations: ‘Nothing to hide, nothing to fear’ against concerns about ANPR

			Nothing to hide	Covert surveillance
Spearman's rho	Nothing to hide	Correlation Coefficient	1.000	.408(**)
		Sig. (2-tailed)	.	.000
		N	1543	1509
	Covert surveillance	Correlation Coefficient	.408(**)	1.000
		Sig. (2-tailed)	.000	.
		N	1509	1533
			Nothing to hide	Trust police data
Spearman's rho	Nothing to hide	Correlation Coefficient	1.000	.412(**)
		Sig. (2-tailed)	.	.000
		N	1543	1502
	Trust police data	Correlation Coefficient	.412(**)	1.000
		Sig. (2-tailed)	.000	.
		N	1502	1528
			Nothing to hide	Trust police fair
Spearman's rho	Nothing to hide	Correlation Coefficient	1.000	.382(**)
		Sig. (2-tailed)	.	.000
		N	1543	1501
	Trust police fair	Correlation Coefficient	.382(**)	1.000
		Sig. (2-tailed)	.000	.
		N	1501	1527
			Nothing to hide	Independent control
Spearman's rho	Nothing to hide	Correlation Coefficient	1.000	-.123(**)
		Sig. (2-tailed)	.	.000
		N	1543	1496
	Independent control	Correlation Coefficient	-.123(**)	1.000
		Sig. (2-tailed)	.000	.
		N	1496	1521
			Nothing to hide	Spy people
Spearman's rho	Nothing to hide	Correlation Coefficient	1.000	.261(**)
		Sig. (2-tailed)	.	.000
		N	1543	1505
	Spy people	Correlation Coefficient	.261(**)	1.000
		Sig. (2-tailed)	.000	.
		N	1505	1532
			Nothing to hide	Infringement
Spearman's rho	Nothing to hide	Correlation Coefficient	1.000	.327(**)
		Sig. (2-tailed)	.	.000
		N	1543	1501
	Infringement	Correlation Coefficient	.327(**)	1.000
		Sig. (2-tailed)	.000	.
		N	1528	1542

(**) Correlation is significant at the 0.01 level (2-tailed)

Table 5.19 Correlations: Overall support for ANPR against other perceptions about ANPR

			Support	Nothing to hide
Spearman's rho	Support	Correlation Coefficient Sig. (2-tailed) N	1.000 . 1512	.443(**) .000 1487
	Nothing to hide	Correlation Coefficient Sig. (2-tailed) N	.443(**) .000 1487	1.000 . 1543
			Support	Feel safer
Spearman's rho	Support	Correlation Coefficient Sig. (2-tailed) N	1.000 . 1512	.435(**) .000 1489
	Feel safer	Correlation Coefficient Sig. (2-tailed) N	.435(**) .000 1489	1.000 . 1549
			Support	Covert surveillance
Spearman's rho	Support	Correlation Coefficient Sig. (2-tailed) N	1.000 . 1512	.406(**) .000 1477
	Covert surveillance	Correlation Coefficient Sig. (2-tailed) N	.406(**) .000 1477	1.000 . 1533
			Support	Reduce crime
Spearman's rho	Support	Correlation Coefficient Sig. (2-tailed) N	1.000 . 1512	.395(**) .000 1489
	Reduce crime	Correlation Coefficient Sig. (2-tailed) N	.395(**) .000 1489	1.000 . 1546
			Support	Infringement
Spearman's rho	Support	Correlation Coefficient Sig. (2-tailed) N	1.000 . 1512	.378(**) .000 1470
	Infringement	Correlation Coefficient Sig. (2-tailed) N	.378(**) .000 1470	1.000 . 1528
			Support	Better tracking
Spearman's rho	Support	Correlation Coefficient Sig. (2-tailed) N	1.000 . 1512	.350(**) .000 1479
	Better tracking	Correlation Coefficient Sig. (2-tailed) N	.350(**) .000 1479	1.000 . 1538
			Nothing to hide	Trust police data
Spearman's rho	Nothing to hide	Correlation Coefficient Sig. (2-tailed) N	1.000 . 1512	.335(**) .000 1473
	Trust police data	Correlation Coefficient Sig. (2-tailed) N	.335(**) .000 1473	1.000 . 1528
			Nothing to hide	Victim reassurance
Spearman's rho	Nothing to hide	Correlation Coefficient Sig. (2-tailed) N	1.000 . 1512	.330(**) .000 1473
	Victim reassurance	Correlation Coefficient Sig. (2-tailed) N	.330(**) .000 1473	1.000 . 1531
			Nothing to hide	Less stops
Spearman's rho	Nothing to hide	Correlation Coefficient Sig. (2-tailed) N	1.000 . 1512	.322(**) .000 1478
	Less stops	Correlation Coefficient Sig. (2-tailed) N	.322(**) .000 1478	1.000 . 1536
			Nothing to hide	Trust police fair
Spearman's rho	Nothing to hide	Correlation Coefficient Sig. (2-tailed) N	1.000 . 1512	.298(**) .000 1470
	Trust police fair	Correlation Coefficient Sig. (2-tailed) N	.298(**) .000 1470	1.000 . 1527

			Nothing to hide	Quicker police
Spearman's rho	Nothing to hide	Correlation Coefficient	1.000	.278(**)
		Sig. (2-tailed)	.	.000
		N	1512	1469
	Quicker police	Correlation Coefficient	.278(**)	1.000
		Sig. (2-tailed)	.000	.
		N	1469	1528
			Nothing to hide	Less discrimination
Spearman's rho	Nothing to hide	Correlation Coefficient	1.000	.264(**)
		Sig. (2-tailed)	.	.000
		N	1512	1476
	Less discrimination	Correlation Coefficient	.264(**)	1.000
		Sig. (2-tailed)	.000	.
		N	1476	1533
			Nothing to hide	Deterrence
Spearman's rho	Nothing to hide	Correlation Coefficient	1.000	.263(**)
		Sig. (2-tailed)	.	.000
		N	1512	1478
	Deterrence	Correlation Coefficient	.263(**)	1.000
		Sig. (2-tailed)	.000	.
		N	1478	1539

(**) Correlation is significant at the 0.01 level (2-tailed)

Appendix 3 – Statistical results (Chapter Six)

Theft of motor vehicle offence

Test for normality: Are data normally distributed?

The test shows that Bradford South (target area) is not ‘normal’, while Keighley (control area) is ‘normal’. As there is mixture, use non-parametric test i.e. Wilcoxon

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
bradford_south_before	12	85.7%	2	14.3%	14	100.0%
bradford_south_after	12	85.7%	2	14.3%	14	100.0%
keighley_before	12	85.7%	2	14.3%	14	100.0%
keighley_after	12	85.7%	2	14.3%	14	100.0%

Tests of Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
bradford_south_before	.206	12	.170	.931	12	.386
bradford_south_after	.263	12	.021	.869	12	.064
keighley_before	.323	12	.001	.780	12	.006
keighley_after	.354	12	.000	.732	12	.002

a. Lilliefors Significance Correction

Wilcoxon Signed Ranks Test: Do Bradford South (target area) and Keighley (control area) have similar crime rates before ANPR?

No, they are significantly different

Ranks

		N	Mean Rank	Sum of Ranks
keighley_before -	Negative Ranks	12 ^a	6.50	78.00
bradford_south_before	Positive Ranks	0 ^b	.00	.00
	Ties	0 ^c		
	Total	12		

a. keighley_before < bradford_south_before

b. keighley_before > bradford_south_before

c. keighley_before = bradford_south_before

Test Statistics^b

	keighley_before - bradford_south_ before
Z	-3.077 ^a
Asymp. Sig. (2-tailed)	.002

a. Based on positive ranks.

b. Wilcoxon Signed Ranks Test

Wilcoxon Signed Ranks Test: Is crime significantly lower in Bradford South (target area) after ANPR?

Yes

Ranks

		N	Mean Rank	Sum of Ranks
bradford_south_after -	Negative Ranks	12 ^a	6.50	78.00
bradford_south_before	Positive Ranks	0 ^b	.00	.00
	Ties	0 ^c		
	Total	12		

a. bradford_south_after < bradford_south_before

b. bradford_south_after > bradford_south_before

c. bradford_south_after = bradford_south_before

Test Statistics^b

	bradford_south_ after - bradford_south_ before
Z	-3.075 ^a
Asymp. Sig. (2-tailed)	.002

a. Based on positive ranks.

b. Wilcoxon Signed Ranks Test

Wilcoxon Signed Ranks Test: Is crime significantly lower in Keighley (control area)?

Yes

Ranks

		N	Mean Rank	Sum of Ranks
keighley_after -	Negative Ranks	12 ^a	6.50	78.00
keighley_before	Positive Ranks	0 ^b	.00	.00
	Ties	0 ^c		
	Total	12		

a. keighley_after < keighley_before

b. keighley_after > keighley_before

c. keighley_after = keighley_before

Test Statistics^b

	keighley_after - keighley_before
Z	-3.108 ^a
Asymp. Sig. (2-tailed)	.002

a. Based on positive ranks.

b. Wilcoxon Signed Ranks Test

Correlations

Nonparametric Correlations - Entire period under investigation (Feb 02 - Jan 06)

			Time	Bradford	Keighley	West Yorkshire
Spearman's rho	Time	Correlation Coefficient	1.000	-.846**	-.884**	-.973**
		Sig. (2-tailed)	.	.000	.000	.000
		N	48	48	48	48
	Bradford	Correlation Coefficient	-.846**	1.000	.838**	.888**
		Sig. (2-tailed)	.000	.	.000	.000
		N	48	48	48	48
	Keighley	Correlation Coefficient	-.884**	.838**	1.000	.892**
		Sig. (2-tailed)	.000	.000	.	.000
		N	48	48	48	48
	West Yorkshire	Correlation Coefficient	-.973**	.888**	.892**	1.000
		Sig. (2-tailed)	.000	.000	.000	.
		N	48	48	48	48

** . Correlation is significant at the 0.01 level (2-tailed).

Nonparametric Correlations - Before ANPR (Feb 02 - Jan 04)

Correlations

			Time	Bradford	Keighley
Spearman's rho	Time	Correlation Coefficient	1.000	-.695**	-.721**
		Sig. (2-tailed)	.	.000	.000
		N	24	24	24
	Bradford	Correlation Coefficient	-.695**	1.000	.569**
		Sig. (2-tailed)	.000	.	.004
		N	24	24	24
	Keighley	Correlation Coefficient	-.721**	.569**	1.000
		Sig. (2-tailed)	.000	.004	.
		N	24	24	24

** . Correlation is significant at the 0.01 level (2-tailed).

Nonparametric Correlations - After ANPR (Feb 04 - Jan 06)

Correlations

			Time	Bradford	Keighley
Spearman's rho	Time	Correlation Coefficient	1.000	-.576**	-.571**
		Sig. (2-tailed)	.	.003	.004
		N	24	24	24
	Bradford	Correlation Coefficient	-.576**	1.000	.574**
		Sig. (2-tailed)	.003	.	.003
		N	24	24	24
	Keighley	Correlation Coefficient	-.571**	.574**	1.000
		Sig. (2-tailed)	.004	.003	.
		N	24	24	24

**. Correlation is significant at the 0.01 level (2-tailed).

Detection of theft of motor vehicle

Test of normality: are data normally distributed?

Not normal, therefore use Wilcoxon test

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
B_Before	12	100.0%	0	.0%	12	100.0%
B_After	12	100.0%	0	.0%	12	100.0%
K_Before	12	100.0%	0	.0%	12	100.0%
K_After	12	100.0%	0	.0%	12	100.0%

Tests of Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
B_Before	.126	12	.200 [*]	.958	12	.760
B_After	.126	12	.200 [*]	.957	12	.746
K_Before	.204	12	.178	.922	12	.300
K_After	.135	12	.200 [*]	.977	12	.969

a. Lilliefors Significance Correction

*. This is a lower bound of the true significance.

Wilcoxon Signed Ranks Test: Are detections for TOMV significantly lower in Bradford South?

The change is not significant

Ranks			
	N	Mean Rank	Sum of Ranks
B_After - B_Before Negative Ranks	7 ^a	7.57	53.00
Positive Ranks	5 ^b	5.00	25.00
Ties	0 ^c		
Total	12		

a. B_After < B_Before

b. B_After > B_Before

c. B_After = B_Before

Test Statistics ^b	
	B_After - B_Before
Z	-1.098 ^a
Asymp. Sig. (2-tailed)	.272

a. Based on positive ranks.

b. Wilcoxon Signed Ranks Test

Wilcoxon Signed Ranks Test: Are detections for TOMV significantly lower in Keighley?

The change is not significant

Ranks			
	N	Mean Rank	Sum of Ranks
K_After - K_Before	Negative Ranks	8 ^a	7.56
	Positive Ranks	4 ^b	4.38
	Ties	0 ^c	
	Total	12	

a. K_After < K_Before

b. K_After > K_Before

c. K_After = K_Before

Test Statistics ^b	
	K_After - K_Before
Z	-1.687 ^a
Asymp. Sig. (2-tailed)	.092

a. Based on positive ranks.

b. Wilcoxon Signed Ranks Test

Theft of number plates (TONP)

Test of normality: are data normally distributed?

No

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Before	12	100.0%	0	.0%	12	100.0%
After	12	100.0%	0	.0%	12	100.0%

Tests of Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Before	.148	12	.200 [*]	.959	12	.773
After	.154	12	.200 [*]	.963	12	.821

a. Lilliefors Significance Correction

*. This is a lower bound of the true significance.

Wilcoxon Signed Ranks Test: Is the change significant?

No

Ranks		N	Mean Rank	Sum of Ranks
After - Before	Negative Ranks	8 ^a	6.44	51.50
	Positive Ranks	3 ^b	4.83	14.50
	Ties	1 ^c		
	Total	12		

a. After < Before

b. After > Before

c. After = Before

Test Statistics ^b	
	After - Before
Z	-1.646 ^a
Asymp. Sig. (2-tailed)	.100

a. Based on positive ranks.

b. Wilcoxon Signed Ranks Test