Masters Degree thesis project

Title: Technology in policing – An ethnographic study of the use of information and communication technology within Bedfordshire police force.

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Preface

The vision statement for Bedfordshire police embodies their purpose, culture, values and principles.

“To be a well respected, high performing, efficiently run police force working together to protect people, fight crime and keep Bedfordshire safe by being professional, open, legitimate, innovative, collaborative and empowering.” – Chief Constable Boutcher, Q.PM, Mst.
Technology in policing – An ethnographic study of the use of information and communication technology within Bedfordshire police force.
Abstract

Policing in The United Kingdom is an intricate business, balancing the enforcement of statute and other laws while dealing with public safety and security. Policing engages a diverse and complicated set of organisational structures and processes relying heavily on the skill and expertise of officers on the ground. Their role in preventing and or intercepting crime before, during and after it occurs is integral to sustaining peace, security, law and order in communities. The police operational and logistics staff work day to day with information and communication technologies, ranging from conventional databases and information systems to ubiquitous and specialised tools. Understanding the use of technology and its management in policing has formed the backbone of this research conducted through a qualitative approach.

This study adopted an interpretive paradigmic analytical lens using ethnography situated in the workplace as a methodology. The qualitative study took the form of field immersion for nine months using interviewing, and shadowing/observation to suit the complexity of the socio-technical context. Analysis was conducted using thematic analytical methods. Understanding how the police force interact with and shape the way that information and communication technologies enable them to fight crime is, then, the subject of this thesis.

The findings highlighted the complexities and intricacies involved in the use of technology, identifying unique differentiations in the way technology is engaged and integrated into policing including comparative understanding relative to other sectors and industries. On the whole the central features of this work highlight understanding of the role information and communication technologies; usefulness, usage in practice and operational activity, strategic business goals, knowledge management, business intelligence and intelligence led architecture, governance and performance models in policing the county of Bedfordshire, England.

Keywords: Bedfordshire police, policing, technology, governance, business intelligence, operational policing, law enforcement, crime, ethnography, informatics in policing, workplace study, interviews, observation, field immersion, shadowing, focus groups, interpretivism, relativism, subjectivism, information and communication technology, internet of things, information systems, social research.

Abbreviations

BCH: Bedfordshire, Hertfordshire and Cambridgeshire police forces alliance
Triforce: The common term used to denote the relationship between three police forces.
ICT: information and communication technology IS: information systems
ILP: Intelligence led policing
NDM: national decision model
ERSOU: Eastern region special operations unit
ERCTIU: Eastern region counter terrorism investigation unit
QIP: Quality improvement process model
HMIC: Her Majesty's Inspectorate for constabulary
HMICFRS Her Majesty's Inspectorate of Constabulary and Fire & Rescue Services
GPRS: general packet radio services
GDPR: EU General Data Protection Regulation
HOLMES: Home Office Large Major Enquiry System
CSCW: Computer Supported Cooperative Work
HCI: Human Computer Interaction

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Dedication and Acknowledgement

Dedication

I dedicate this work to the ying in our yang.
Thank you for the laughter, life skills and love and your ferocious tutelage on all things heritage and culture. Without you, there would be no us, you have raised amazons and remain priceless evermore.

Acknowledgement

This work would never have been done had it not been for the enthusiasm, openness, flexibility, cooperation and indulgence of several senior officers and key business leaders within the BCH triforce particularly those at Bedfordshire and Cambridgeshire police. They have given me immeasurable confidence and support throughout this process.

For my supervising and coordination superintendent at Bedfordshire police force who made time from his schedule to befriend me, coordinate and organise my field work and gave many hours to travel long distances to have meetings with me. Thank you for your confidence in me, your praise, support, professionalism and charismatic approach to exploring and learning and the moments of laughter.

This entire journey has included contact and interaction with over 150 policing staff including directors, managers, team leaders, superintendents, inspectors, sergeants, detectives, administrative and operational staff in administrative, project management, first response, specialist services and fleet at Bedfordshire police force including BCH leaders at other forces.

I went in to do this study with no expectations and came away gaining more than academic insights, making friends and as I did I became a different person, having immense gratitude to the many police women and men as well as administrative staff that helped me reach my research goals.

These hard working members of the police force embraced my work and accepted me with a high level of support. They selflessly went about their business and quickly adopted the new little walking tape recorder following them around, opening up their world and admitting me without prejudice or hindrance. The insights into their lives were completely without filters or veils and extend far beyond this report. The experience of working with them has been largely eye opening and changed me positively. It has enriched me socio-cognitively and professionally and enabled me as a member of an ethnic minority to better understand the complexities that policing involves and challenges therein.

To every personal person, my parents for keeping me focussed; my daughter who is my biggest fan and my boisterously supportive brothers and sisters for pep talk, support, visits and wiping my tears, my alumna sisters, and extended family who propped me the right way up all through it all.

To my ever attentive supervising Professor, Dr Dave Randall for his valuable insights and guidance and my tutoring professor Dr Christina Mörtberg who kept me focussed and in the right lane.

I want to thank all of you very much.
May God be praised.
Chapter 1
Introduction

Chapter 1 introduces this ethnographic study. It begins with an outline of the research work. It then goes on to detail the motivation and justification for the study with a brief justification of method. It additionally outlines study purpose and research questions. The chapter ends with an overview of relevance, beneficiaries of the study and self reflections on my work.

1.1 Overview

In the last two decades, information and communication technologies have evolved tremendously. They have become more ubiquitous, have taken many different forms [especially as we move towards distributed, web-based services] and become more accessible worldwide. The primary drivers for this trend include innovation, decreased cost of access to technology, accessibility to the internet, widespread use of web 2.0 tools and the rapid innovation and development of various internet of things [IoT] tools which hinge on information and communication technologies (Coleman, 2015; Jayavardhana, et al., 2013).

In public services, the propulsion of eGovernment has also increased the degree of interest that these services have in using and engaging with technology to keep up pace with the changing horizon of citizen centric public service delivery (Davis, 2015; Gichoya, 2005). This evolution has propelled information and communication technologies forward, with ICT fast becoming a significant part of the day-to-day work of managing, administration and delivery of services that are essential to citizens in communities through public services including policing.

Whilst some of these technologies are visible and public facing or exist for direct customer facing work, others are utilised for managing the behind the scenes elements that bring public services cohesively together such that they meet the needs of citizens. In England the use of ICT enables public services such as the police to manage their workload and uphold high productivity and reliability standards that are expected. This continues to be particularly important in the face of increasingly diminishing funding from central government, so far, by up to 25% in the period between 2010 to 2016 (Comptroller and Auditor General UK Home office, 2015).

In the field of information systems, informatics is particularly concerned with the social, scientific, behavioural and organisational structure and properties of the application of information, information systems and information technologies in organisations. Indeed, the advent of social computing has fore grounded the ideals of social informatics, expanding the scope for research, and applicability of informatics in its own right as a field of social research that is necessary and relevant to the current climes (Kling, 2000; Wang & Zeng, 2007). Social informatics as the speciality area governing this study is therefore appropriately defined by Kling, (1999, p.1) as;

“The interdisciplinary study of the design uses and consequences of information technologies that takes into account their interaction with institutional and cultural contexts.”

It draws attention to the properties, structure of use, and impact of information technologies with a view to understanding the relationship between people, their practices and information technology,
including environmental influences, social behaviours, work practices, knowledge management, education, structural and interface design to realise or achieve good use (Benyon-Davies, 2002).

Informatics contributes to strategic planning, decision science, artificial intelligence, management science, computer and information science, cognitive science and organisational theory driven by a need to create innovative solutions that enhance businesses and business services that anchor on ICT. It also draws attention to critical information studies, opening up a window to the interdisciplinary interplay between information, its use, cultural factors and relationships with human affairs. It also brings to the fore the consideration of the use of data and knowledge in decision making, artificial intelligence and information systems as valid and relevant precursors to decision making in policing and how information control and norms contribute to the flux of information and cultural elements in connected communities (Vaidhyanathan, 2006; Luff, et al., 2000).

The rapid pace of evolution in the sphere of information and communication technologies continue to influence design, material, components, engineering, adoption, implementation and diffusion, enabling an influx of comprehensively ubiquitous tools with an almost finite number of purposes as innovations emerge (McQuade, 2006; Skogan & Hartnett, 2005). In the context of policing, on the one hand this has led to increased information and communications management possibilities in relation to domestic and serious crimes as more innovative and fast paced technological tools become available; and on the other hand the needs and requirements for more modern technology to support crime prevention and facilitate crime solving continue to arise (Custers & Vergouw, 2015; HMIC - Criminal Justice Inspectorates, 2015). Not least, the last thirty years have seen the widespread development of information systems which are predicated on cooperation and coordination in the workforce in policing. Such systems, it has been suggested, need to take account of different legislation, policies, rules and procedures, different work practices, security, applicability and the heterogeneous nature of organisational roles which are characteristic of public service (Innes & Sheptycki, 2004; Koper, et al., 2014; Allen, et al., 2014; Barton, 2013; Brown & Brudney, 2003).

It has also been argued that assessing the possible benefits, cost and otherwise, of the introduction of new systems, is particularly difficult in the case of work which is ‘white collar’. Put simply, the complexity of innovative computer systems reflects the increasingly complex nature of organisational and [in this case] inter-organisational work (Randall, et al., 2007; Baldini, 2010). Indeed research into ICT in the public sector has focussed on the impact of ICT on efficiency, management, capabilities and internal administration and less on the use, adoption and impact on service delivery from the point of view of public service workers (Cordella & Iannacci, 2010) whilst others, fewer so, consider the importance of social informatics in driving understanding of information and communication technologies and promoting social change (Kling, 2000).

ICT has long been recognised as a essential facilitator for policing as noted by (Munro, 1984) and (Hoey & Topping, 2010) who present technologies that enable fast, secure and accessible communication and sharing of information as having a prominent role to play as security needs diversify and security matters dynamically emerge across Europe. Of some importance, research focussed on policing highlights the integration of intelligence data systems, adoption of mobile computing, use of video surveillance technologies, application of digital biometrics highlight user acceptance issues and challenges such as usefulness, change management and security associated with social media applications as prominent trends and issues that impact on the use and adoption of ICT across the European union in policing (Denel, et al., 2011; Babuta, 2017).
In view of these trends there is a real risk of a widening the ‘detection and awareness’ gap if the technologies in question fail to meet the operational needs of law enforcement personnel. These observations from previous research lend credibility to the need for continued research and evaluation of ICT use in police forces with a view to bringing significant relevant, useful and beneficial value to the informatics research community as well as to the policing and public service industry.

1.2 Motivation

The structure and face of policing over the years in the United Kingdom is a complex and multifaceted one. Policing in England has been noted as having technology that consists largely of ‘legacy’ systems (Ulrich, 2002), something that it has in common, surprisingly, with banking (Randall, et al. 1999). With citizens having access to modern information gateways and high end technology, police resourcing has to work hard to keep up with the pace of technological advancement and innovations as ICT systems and tools in policing are often quite primitive compared to demonstrable technology use synonymous with advances in technology elsewhere.

Her Majesty’s inspectorate independently reports on and assesses effectiveness and efficiency of policing and police forces in the public interest. The agency reported policing ICT systems and tools as ‘weak and ageing’ in 2017 with few forces having coherent plans to transform their usage of their ICT systems for improved service provision and or implementing newer ways of working. The findings report highlighted a limited focus in the area of development of digital skills and identified gaps in exploitation of new technology in the police workforce with notable difficulties with implementation of newer systems. They also highlighted the prevalence and persistence of the use of large numbers of old individual and bespoke legacy systems (HM Chief Inspector of Constabulary, 2017).

“The equipment used by the majority of forces still lags far behind the technology that officers use in their own homes and cars” (HM Chief Inspector of Constabulary, 2017, p.13).

Due to strict restrictions on the retention, sharing and management of information mainly associated with data protection issues, something that will become more significant with increased usage of GPRS for data communications through cellular communications], police forces continue to struggle to take advantage of new technology. Data sharing is riddled with complex protocols, a situation that will only get worse with the implementation of GDPR. Whilst technological equipment is often thought to be readily available, the modalities associated with the use of these often mean that technologies are either obsolete by the time they are fully integrated or they are unable to fully manage the levels of work when required. The complex interplay of organisational and technological change was recognised, inter alia, in management science literature some time ago in (Lawrence & Lorsch, 1967). In addition, each worker performs a role that is dynamic and somewhat unpredictable creating variations that require a closer study to identify the elements of technology that come into play (Babuta, 2017).

There are also key features within the structuring of services that present one with some difficulties when an individual force is isolated for study. The most marked is the individuality of each police force within the country. Although all forces operate within the same ‘frameworks’ and to the same ‘expectations’ and are subject to the same legislation and policy; each police force is a distinct business unit with its own unique funding and budget and indeed own business case structured around the demographics of the region it is located in, and the needs of the citizens who reside within the
vicinity. As such, each force will yield unique and rich insight into the applicability of current policy, the confluences that exist with other forces and the way in which information and communications technologies awareness, use, applicability and budgeting or lack thereof impact on policing.

Policing as it is has also changed significantly over the last five years due to continued austerity measures imposed since 2010. With governments making constant demands for reduced expenditure and more value in order to make ends meet, public services have taken the largest hits. The direct impact of government sanctions has been a significant reduction in vital funding and in turn resources from central government to police forces. In the last five years, cuts of up to 20% have been made to funding and police forces have had to reduce their operational expenditure by an average of 14% (Comptroller and Auditor General UK Home office, 2015). Despite these cuts, the police forces are constantly being urged to find more ways to save more money whilst delivering higher levels of efficient and effective policing. Diminished funding reduces capability and limits scope for investment in new technology that is not already provided and funded directly by central government (Crawford, et al., 2015). These demanding and continued changes impose an increased measure of pressure and complexity to the way police forces, in this case; on the way that Bedfordshire police force, works with ICT.

In order to develop this thesis, I considered several research efforts that are focussed on ICT and technology usage in police forces in England, particularly those that operate outside the Metropolitan and City of London police. This was necessary because London police forces not only benefit from more financial resourcing, but also already have a large share of research interest devoted to them. I established that there was a clear research gap and very limited knowledge overall with respect to what we know about use of standard and new technology in public sector organisations like police forces in the UK. Such matters are of both academic and professional importance, and are hugely relevant to the Bedfordshire police force as well as the informatics academic and practitioners community.

Critically, the underlying questions “What do we really know about technology in police forces?” and “Does policing use technologies with the same scope, flair and adaptability that are taken for granted in private corporations?”, particularly, “Do we really have a good deal of information on technology and policing in the UK counties in the research community?” were the kinds of questions that I asked myself and sought to determine during background research. In finding relatively little research in the area and even less that focussed on localised police forces, I found purpose.

To begin with, I was able through reading, to understand the uniqueness of each county force and in consideration of self funding and access negotiation procedures. I found enough justification for homing in on one county i.e. a number of cities and towns grouped together and policed by one team of police. This was important because the local structuring of police forces means that considerable variation is likely to be found, both technologically and operationally, from one force to another. I felt that by limiting work to one force, I would be enabling a focussed and manageable approach to information gathering, which might increase understanding of one regional county for my peers and perhaps ultimately highlight some generic problems common in policing in England and Wales.

My focus was further driven by some intricacies which exist within the policing system in England, particularly those that limit and influence the way in which ICT can be used and adopted at work. I considered the categorisation of crime and the way ICT is and can be used to enable crime management and eradication for instance. It is important here to acknowledge that use of ICT in public services is rarely comparable in principle and application to that of other organisations,
although there are some limited similarities to, for instance, other emergency services such as medicine, fire services and disaster management (Ley, et al., 2014; Reuter, et al., 2016; Hassey, et al., 2001). Therefore I read extensively both before and during my time with Bedfordshire police force, familiarising myself with general information about the police force and examining some statutory documents that are particular to Bedfordshire police force from Her Majesty’s Inspectorate for Constabulary in England and Wales [policing in Scotland is entirely separate].

Much has been said widely about the difficulties of gatekeepers, access, and trust and so on in the course of ethnographic work but in most respects such things were relatively unproblematic to me, in large part because of the enormous goodwill displayed towards me. I was determined, whilst attempting as far as possible to be ‘neutral’ in respect of the politics of the institution, to nevertheless endeavour to capture the worldview of police officers in relation to new and existing technologies and to understand their [varied] attitudes towards the changing emerging, continued and vital role it has in effective policing.

Taking an ethnographic approach to the study enabled a non-intrusive yet intensive means of building a robust picture of Bedfordshire constabulary’s approach, perception, understanding and use of information and communication technologies. The increasing need to engage ethnography as a purposeful research tool in informatics has been propelled by the rapid pace of technological innovations and how it induces and engages people to change their way of working. Invariably in all industries, humans work while using and being influenced by the technologies available to them. Ethnography helps to highlight the way in which peoples activities and behaviours in the field or workplace develop and demonstrate their relation to technologies also enabling an earnest approach to describing and modelling the circumstances surrounding the use and application of technologies (Field Research Informatics group, 2010).

Ethnographic work facilitates a meaningful and interactive process of dialogue, interaction, observation and understanding whilst enabling room for researcher disengagement. It lends support to understanding the working cultures/habits, people, processes, procedures, policies and functional working practices entailed and embedded in using and engaging with technology within the police force and elsewhere (Luff, et al., 2000). It therefore, enabled insights into the means, methods and modes of technology adoption within the force. This study additionally provided insights into understanding the strengths, weaknesses and limitations that affect working police officers and logistics/support staff where engagement and usage with respect to information and communication technology is necessary.

Policing of course dictates its own unique style of technology use and adoption. Invariably, both from an academic and public viewpoint, policing and how technology is put to use in policing is of definite interest and contributes significantly to the knowledge base in informatics and elsewhere in academia.

1.3 Purpose and Research Questions

Information communication technology innovations, in theory, enable police to assimilate new modes and methods through which crime investigations are conducted. In practical use it should enable quicker and more effective detection preventing criminals from evading capture and preventing criminal acts (Chan, 2001). The motivational and functional purpose of this study was primarily to elicit and evaluate what and how information and communication technology and information
systems are used in the day to day working activities in the police force. This included the use of technology to manage the identification, reporting and investigation of crimes by police officers. Critically this study adopted an ethnographic approach to throw light on these from the viewpoints and experience of officers.

Research Questions

The study was focussed on qualitatively understanding and investigating the types of information and communication technology used by the police and how they use and interact with these specifically to manage, record and facilitate prosecution of crimes in reality. The functional aim of the study was to understand and characterise the scope of application, usage, adoption and engagement of ICT as an active tool to make management of crime more efficient. This study also attempted to understand ways in which the Bedfordshire police engage with ICT and considered the police as humans in social settings where participants have different perspectives. It considered that technologies will have differing purposes including how, whether it does or does not aid the work being done, how it can be improved, how officers and staff engage with ICT and what types of challenges exist, in order to better address the issues presented in policing crime in the locality.

Core Question

How does Bedfordshire police use and engage with ICT to facilitate safety and security of citizens and fight crime?

Sub Questions

Does the police force have the awareness, expertise, proficiency and adequate tools with which to understand and recognise the role of information communication technology in managing crime?

Does the police force adopt an approach that leverages increased benefit from use of information and communication technology?

1.4 Relevance of study

According to the police inspectorate in the United Kingdom, policing staff who handle crime recording and detection on a day to day basis are not adequately aware of emerging trends in crimes that can be analysed using information communication technology and how these crimes can be consistently dealt with (HMIC - Criminal Justice Inspectorates, 2015).

Crimes themselves are increasingly being perpetrated using information communication technology which necessitates the need for police forces to be more aware and knowledgeable, able to, and capable of, understanding and harnessing ICT in crime control, prevention and reduction. These crimes include the drugs trade and the illegal drugs market, the use of guns and firearms by organised criminals, terrorism, organised fraud, human trafficking, identity crime, slavery, peonage, kidnap and extortion, money laundering, organised theft and commodity related criminality, armed robbery and vehicle crime, organised crime groups, terrorism and various forms of impactful crimes perpetrated by predators who use technology as a direct route to perfecting crimes with the goal of nominal detection and maximised breaches of security and safety (National Crime Agency, 2015).

Due to the constantly evolving and rapid innovation trends synonymous with information communication technology, there is a real risk of a widened detection and awareness gap for law
enforcement personnel, which in turn promotes and enables wider scope for criminals to operate without hindrance (Lum, et al., 2016; Chan, 2001). When crimes are not adequately recognised, and tools to fight crime are lacking in sophistication and applicability, policing quality declines, and citizens lose confidence in the ability of the police. As a result, police officers also lose the ability to work efficiently in respect of crime and crisis management in the community (Custers & Vergouw, 2015).

This study is the first independent researcher study utilising a workplace ethnographic study of the use of information technology through sustained field immersion in Bedfordshire constabulary that I am aware of. This study was independent and wholly self funded. It forms part of what is a very small corpus of work in this area, so small that it can almost be seen as entirely new [as we shall see, qualitative studies of policing and new technology have been done, but very few recently and hence few which deal with contemporary ICT issues]. As such, any input of this kind will throw light on and aid further development of ICT use in the police force, and highlight the challenges and limitations associated with it. It also illuminates the cost effective measures police forces adopt in attempts to direct balanced funding toward technologies and enables an understanding of the vagaries of adoption of innovative and communication technologies in policing.

It should be reiterated that as there are very few studies of policing in relation to new technologies in Great Britain and, as such, this study makes a valuable contribution. Given that there were few reference points to draw on as points of comparison, it was important to utilise this opportunity to collect as much information as possible in order to open up the world of the police officers. Indeed when considered, crime has an impact that is often life changing and irreversible. The added importance of crime prevention and detection, and understanding the limitations to change management by policing authorities stemming from use of information and communication technologies bring additional purpose to this study.

1.5 Beneficiaries of study

Crime has a serious impact on communities and citizens, creating uncertainty and insecurity, which cannot always be quantified with any certainty. Such quantification and measurement problems are common in professional and white collar work (Ramirez & Nembhard, 2004). Awareness of mode and use of information and communication technology to identify routes for facilitating crime prevention, detection and management are also important issues (Gundhus, 2005). Understanding how new technology and police practice support rapid identification, control and eradication of crimes in difficult circumstances to build a knowledge base of information with respect to policing in the United Kingdom is one of the main benefits of this thesis.

Field immersion, I would argue, enabled collection of critical and incidental information that gave insight into the way technology coexists with operational policing in ways that are unique. It would have been difficult in the extreme to obtain detailed knowledge of practices without adopting this kind of approach. The outcomes of this study provide, therefore, unique knowledge, delivering up detailed information about the practices of the police without which no significant evaluation of in situ ICT use would be possible, and which ought to furnish insights into ICT design and development for the force in the future.

This study could also benefit researchers who shy away from research in public services such as the police because of its apparent difficulty. In principle, it demonstrates that independent self funded
study which is often carried out by postgraduate academic entrants is possible. It provides a pool of information that has, as yet, never been explored within this particular constabulary with the added benefit of generating insights which wholly support a variety of directions for further beneficial and meaningful research. It also benefits Bedfordshire police and the BCH alliance by giving them an overview of their organisation from an unbiased uninstitutionalised perspective.

1.6 Scope and Limitations

The scope of this thesis in field has been broad in terms of gathering of information but focussed in relation to analysis. It considered the technology in use and adoption of technological innovations within policing specific to Bedfordshire police constabulary. It looked at how technologies are actively engaged with, and disengaged from, within Bedfordshire police staff. It examined the impact, importance, role and effect of various technologies. It explored the usefulness, applicability, appropriateness and impact of available technology on the human actors within the functional cycle.

Consideration was given to management of redundancies, continuity, and accountability to intellectual assets. Attention was given to the perception, preparedness, appropriateness and functional value to workers as seen from their position. The study also looked at and gauged the impact of technology adoption, implementation and innovation; particularly on how it impacts on operational staff in their work. The predominant emphasis was on the elicitation of information and understanding congruent issues this thesis sought to enquire about, from the viewpoints of the individuals in the working community. This was necessary as it was police officers’ whose world was being explored, and particularly this work set out to understand the practices and approaches which identified with the approach a majority of information systems research take instead of norms, values and symbols which are synonymous with anthropology.

The large part of the thesis involved spending time in speaking to and observing actions of police officers and business unit leaders in different departments. The process of obtaining permission was somewhat difficult but eased with persistence. There was also some concern about repeated access issues particularly access to police officers whilst in the line of duty. This concern was dispelled as my supervising superintendent took on the extra task of smoothing the way and indeed by ensuring that risk management and protocol agreements were in place to facilitate access to wherever I needed to be and to whomever I needed to see.

Although initially a concern, I was able to promote understanding of the benefits of the study to the organisation and to impart understanding of the essence of ethnographic study. Participants were reassured by the principle of gathering their viewpoints anonymously through direct observation and immersion. One to one contact was an initial concern as the observations were on work, in work. However this went quite smoothly, particularly because as may sometimes be the case the participants showed interest and enthusiasm and were encouraged positively by an interest in their work (Randall, et al., 2007).

Nevertheless, the people I was with were working. In fact, sometimes, I had to join in the work too, because it was impractical to sit idly by whilst they walked, ran, interacted and conducted their activities. In this respect, then, I was very much the ‘participant observer’ that ethnographic texts widely report on (Denzin & Lincoln, 1994; Hoey, 2014). Interaction was fluid in this sense and as work ensued, opportunities for dialogue emerged enabling clarification and when something appeared obscure to me, I would ask questions for clarity and understanding. By taking on an understudy type
position, I gained better insights and simultaneously maintained an appropriate level of detachment that facilitated better understanding of what I assimilated.

Security was a significant concern both from the perspectives of my supervising superintendent, the staff and mine. In this respect, I gathered pertinent details to enable a risk assessment for the organisation and for myself for every field endeavour. All officers also provided helpful support and guidance in field. They enabled my work by introducing me and setting citizens at ease about my presence and role where necessary. All effort was made to ensure the direction of enquiry; paradigmic, ontological and epistemological approaches were reviewed and reflected on during and after field immersion to sustain critical objectivity. Maintaining focus and approach was supported by the presence of an objective perspective from my supervising professor.

1.6 Report on own work

I began to develop my research thesis in June of 2016 having developed some measure of interest in the applicability of technologies and use of technologies for security, crime deterrence and policing. I began with an initial interest in ascertaining the scope of use of technologies in policing to manage serious and critical crime supported and perpetuated using technologies. My research direction changed as I conducted more background reading and identified that the area of research was highly understudied and therefore my enquiry would be better situated around understanding the use of technologies in policing to begin with. I independently developed my proposal and received process approval in September and ethical approval for my topic in October of 2016. My ethnography began from the initial point of seeking permission making contact with Bedfordshire police force for the first time on 16th September 2016. From that point, I made contact with and sent messages to a series of different people in the organisation including the police and crime commissioner who responded indicating that the office of the police and crimes commissioner was not able to assist with facilitation. At the end of September, having made little headway, I re-intensified my efforts and reached out to the crime prevention support business unit responsible for supporting corporate crime and prevention of terrorism.

I received a response finally in November after lengthy and somewhat promising correspondence digitally and via phone indicating that the prevent team and digital crime management unit were unable to support my study due to blurred permission paths. Undeterred, I wrote to all the heads of business units in December and immediately the New Year began, I placed calls to each department.

I subsequently reached out to the office of the chief constable for Bedfordshire police force where he directed staff officers to transfer my request to the Bedfordshire Hertfordshire and Cambridgeshire head of ICT located in Cambridgeshire. Upon reading my proposal and reviewing my email to lobby his support within the same day, he responded immediately and identified a suitable supervising superintendent who took time out of his business leadership duties to meet with me 8 days later.

One month later, following completion and signing off of internal research protocol forms, permission to ride with fleet vehicles, risk assessments and security and identification checks at the end of February, my supervising superintendent was able to initiate the study and facilitate necessary access. There were limitations on time for my work [which was originally to take 3 months, but instead took 8], due to delays in securing access, the sheer breadth and scope of information required and indeed gathered, and the need to align with the diaries of various staff members. The methodology adopted encouraged participation and the police force were actively willing to support the study but there were
some limitations due to limited resourcing and low levels of staffing. My observing presence had to be as unobtrusive for active policing as possible. As such, my field immersion was adapted so as to maximise flexibility on my part and maximise available time as well. I took up any working shifts I could, often working between ten to fourteen hours at a time in locations with limited repeat access during the day and at night shifts and at peak times such as weekends.

The business leaders I interviewed spanned superintendents in the BCH alliance leadership, mobilisation and digital innovation implementation management, serious and organised crime intelligence, continuous improvement, mobilisation and digital implementation, the collocated satellite centre in Biggleswade and ICT development and management at Huntingdon. I held further meetings with control room inspectors and assistant inspectors, response and fleet sergeants and assistant sergeants and duty inspectors at Luton and Kempston. I was also able to facilitate nominal contact with the supervising sergeant for special constables who offered his insights and made concerted efforts to organise a focus group meeting with 12 special constables.

The focus group plans were aborted at the end of July due to difficulties coordinating a group of four or more to meet on elected shift days. I therefore completed active in field immersion on 28th of July 2017 with further plans to deliver a presentation to a selection of business unit leaders drawn from my empirical findings and insights following report approval by the University assessment team.

All participants were selected on a convenience sampling basis. I was advised to create publicity material include flyers to promote interest; however, other more robust recruitment methods were adopted when necessary. This was the case, for instance, when reaching out to multiple teams to recruit willing participants that represented the diversity of departments to include both senior and junior staff when the scope, time and or funding limitations of the study allowed. The research depended quite considerably on the development of trust and a good working relationship with various respondents.

It was pre-agreed that I would aim to take no more than an hour of any senior officer’s time due to resourcing constraints. Although participants did not have the time to sit and talk for long periods, they quickly adapted to responding to me in passing and or being followed around. When shadowing and interviewing fleet staff, being constantly on the go with repeated interactions with other staff in the course of procedure allowed for a larger scope of incidental observations and enabled elicitation of collective group viewpoints. From a researcher viewpoint, the most engaging element of this study was the transformation of field notes into themed elements which invariably surpassed and spilled outside of the informatics field, demonstrably highlighting the robustness of method and the benefits of in work field observations using ethnography as a purposeful tool.

1.7 Thesis report disposition

This thesis report is organised into seven specific chapters. The first is the introduction to the thesis report above. The remainder of the report is structured as follows;

Chapter 2 sets out a literature review centred around a number of thematic issues central to the research study.

Chapter 3 sets out and discusses the paradigm, methodology and methods adopted in this study focussing on reflexivity, reliability, validity of these. It additionally considers the relevance,
applicability, appropriateness, and justification of use of the research paradigm methods and methodology. It concludes with an outline of data analysis with respect to the organisation in which the study was conducted.

Chapter 4 sets out the findings of this study in a structured layout spanning conceptual findings, study dynamics, organisational facts summary recap, factual accounting, critical analytical findings, categorisation and a presentation of a selection of case scenario vignettes that illustrate and highlight the worldviews in focus.

Chapter 5 focuses on reflective discourse of findings of the research, revisiting research question and purpose recursively. It reconsiders the weaknesses and strengths of the study. It concludes with an outline of knowledge gained with attention to the internal condoyle of the organisation including issue management and lessons learned.

Chapter 6 presents general concluding remarks in consideration of the research questions and an overview of the contribution of this body of work to research. It also presents a brief outline of perceived benefits of the research from my perspective.

Chapter 7 presents insights and representations of possible further research directions as indicated by issues identified during research an or questions arising during the research that were field related.
Chapter 2
Literature Review

Chapter 2 outlines a review of academic literature touching on various elements pertinent to this study. It covers use of technology in public services, data and information creation and management, knowledge management, use of ICT to enable big data incidental to business intelligence and technological innovation, reflections on structured design, the uniqueness of public services as stakeholders, the qualitative alternative and specifically the role of workplace studies to support informatics studies concluding with a more detailed overview of ethnography in research.

2.1 Information and communication technology in policing and public services

The introduction of new technology into the public sector [and indeed elsewhere] is often fraught with difficulty. There are many examples of wasted money (Montealegre & Keil, 2000), difficulties in implementation as noted in the healthcare sector (Greenhalgh, et al., 2009; Goorman & Berg, 2000; Vikkelso, 2005) and even danger to life as seen in the London ambulance service (Finkestein & Dowell, 1996), as a direct result of the introduction of new technology.

In times of austerity, it is arguably necessary, if at all possible, to identify the challenges and pitfalls for the police service that are evident in other contexts. The use of information and communication technology by police forces has developed over the years bringing much needed improvement to service delivery and approach to policing which is set to continue (Murphy, 2000). However there is limited research in the area of policing technology in the UK (Moriarty, 2017) in her edited book, provides some useful information in the context of the USA about the introduction of a variety of technologies and the constraints they operate under exploring and exemplifying varied usage despite the priority attached to adopting and implementing technology in police forces.

Although there are increasing instances where use of technology has led to success in fighting crimes, limitations such as funding and limited suitability, poor applicability, slow adoption and change resistance in the face of fast paced technological innovations coupled with inherent concerns about data use, security and prevention of organisational attacks present the most marked limitations to the ability of police forces to harness technology effectively. Contextual uses and effectiveness selected technologies are complex and adoption and implementation of technological advancements for use by police do not always improve productivity, cooperation or job satisfaction. In some instances, new technology is instrumental in creating failures in optimising strategic use of technology for crime reduction and community service (Sheptycki, 2007).

Manning, (1992); describes policing as ‘information dependent’, where the primary information sources are members of the public. The way that police forces acquire, process, code, decode and utilise information is significant when attempting to understand their work. He asserts that the technology police officers use is embedded in, and sculpted by, the social organisation it is used in. His study highlights the use of technology and the features of decision making such as consequentiality, differentiation, policy and case orientation, reactivity, complexity, heterogeneity and choice of action all of which rely on technology at the core and the consequence, impact and social significance on the action that takes place in the workplace as a result.
It also highlights the 'horizontal transformation of meaning' where transformations during transmission will culminate in human action and activity that impacts on its meaning, such that the way that they use technology is reliant on and impacted by the social effect of the interactions with the situational events and technology being utilised. ICT assimilation and use, he argues, is affected by working cultures and ingrained traditional policing habits. Studies of the implementation of computer aided despatch [CAD] systems, police responsiveness speeds, management information systems and crime mapping have indicated that that new technology therefore tend to have less effectiveness than anticipated and or predicted (Manning, 1992). He concludes that technology has an impact on policing, but that the environment, work place structure and organisational structure of police forces have more impact on moulding and shaping technology in use. He also cites the asymmetric nature of information as amplified in policing due to the social organisation of policing as it were, impacting on the expected usage of technology by lower level staff (Manning, 1992).

Other studies highlight marked improvements to the context in which police work such as a study of the use of computerised systems by detectives in a British constabulary. In a particular case, detectives found their working lives were eased through virtual document access. They were also better able to manage offenders having the benefit of digitised information (Harper, 1991).

It is obvious that ICT has changed the way policing is carried out, but the degree to which it can be said to be effective or ineffective remains unclear. Despite the marked criticisms and issues surrounding use, adoption, suitability and management; technology has continued to emerge in use as a facilitator and support tool to manage emerging crime, slowly aligning with the rapidly advancing world (Dupont, 2001).

As indicated by Ericson & Haggerty, (1997) technologies have altered police hierarchies, evening these out whilst obscuring the division of labour with ICT led surveillance systems taking a forward role in conduct regulation. ICT has also changed the face of policing by increasing transparency and accountability. Although it does not always work as intended or deliver the results expected, the increased levels of transparency and the enablement of better information management are positives to note (Ericson & Haggerty, 1997; Chan, 2001).

2.2 Public service stakeholder issues

It is relevant to this thesis, to consider the literature that highlights the way in which public services present with unique problems and issues when assimilating and engaging with ICT. Uptake has been slow and gradual across public services in Britain and this is evident even today. It is important to note that outside of working practices, organisational culture and management intricacies; and the adoption of technology to enable efficiency is a very complicated task. One significant reason for that is in the type of organisation. Public services have a broad pool of stakeholders which extends to citizens. In times past, processes were traditionally routinised and job roles required many years of experience to understand the intricacies of public service delivery. Post austerity, staff retention was often at a higher rate than desired in the public sector due to slow automation adoption. Today, many public services in the UK remain unable to eradicate paper working or to adopt automation at the same rates as global organisations in the public sector (Babuta, 2017; Beverige, 2002).

Pollit (2010) asserts that although ICT may promote new forms of working in the public sector, often new technology may enable the retention of old habits, patterns and divisions. He highlights variations in the impact of technological change. Particularly that implementation may be delayed and
or derailed due to conflicts and disparities such that efficiency of work processes may be realised but hierarchies weakened. He additionally notes that the variation of impact is also heavily reliant on the interaction and interdependency between types of activities, organisational context and culture and legal and financial considerations. He further adds that successful technological implementation and adoption requires good leadership, highlighting that bad management can derail, whilst good leadership can enable positive outcomes.

In this respect, he highlights other work citing the importance of understanding that implementation, adoption and subsequent use of technology is embedded in social and political working cultures. He makes the distinction between the terms, technology as ‘objective technology’ i.e. representative of the full potential of the particular technology vs. ‘enacted technology’ i.e. what the technology actually gets used for. According to the paper, organisations play a significant role in the shaping what is enacted (Pollit, 2010).

Cordella & Iannacci (2010) also draw attention to social and political dimensions, suggesting that they are often not accounted for in public sector policy research and, as such, there is a need to consider the complexities associated with the implementation of technology in the public sector instead of relying on universal strategies and ‘best practices’ as a precursor to success.

They present a case study within the criminal justice system. The crown prosecution service [CPS] implemented a system to enable police officers to limit desk work. This was partly in response to the recognition that casework was actually impeded by paperwork. The system implemented reduced cost and man hours by enabling electronic capture of case information to streamline the preparation of case files. This system replaced the manual file receipt from police which previously created increased burden. By implementing this the CPS was able to bridge gaps where both agencies had systems designed for their own needs without the ability to communicate directly and where case file preparation was a secondary task that was taking up police time.

Adopting this system built on the implementation of a new ‘joined-up’ government policy introduced in 1997 imported managerial practices from the private sector into the public sector in a bid to improve efficiency, efficacy and productivity. The outcome was intended to enable policy coherence and eliminate obsolete practices. The outcome, however, of the implementation over time is that the system became ‘enacted’ and not ‘objective’. The proposals became subject to the complex and differing organisational settings. Further proposals to harness interdependencies and propel an adoption of a unified system encountered conflicts of interest, power struggles and working culture clashes. Despite the investment in this new system, the outcome expected i.e. a final conjoining of the CPS systems to police systems seamlessly was noted as unsuccessful (Cordella & Iannacci, 2010).

Koper et al., (2014) in their study identified a theme of change resistance and difficulties with assimilation and adaptation to new methods and systems. This included reluctance to adopt modes of working that were seen to increase clearance rates and undermine working relationships. They also identified a theme of failure to apply technology in the strategic management of activities whilst utilising it for discretionary activities. For instance, police were more likely to use technology to check reports and assess performance of policing staff rather than to use it for the development of crime prevention strategies with junior officers (Koper, et al., 2014).
2.3 Data and communication management

Lindsay, et al., (2009) conducted an ethnographic study, investigating the use of mobile device technology and knowledge sharing practices in the Leicestershire police force. They identified the ways in which tacit knowledge sharing and isolation of information with technology use became more common with deployment of technologies driven by the need for increased productivity that excluded thoughtful consideration of the importance of the social process to information and knowledge transfer. The study found that the social interaction between officers was an essential part of their functional efficiency. Paradoxically, the technology being implemented was a positive one but as a whole it had the functional effect of divorcing police officers from social interaction. The paper asserts that the interaction between officers, including that between officers and technology, has the potential role of improving the exchange of knowledge and supporting a knowledge culture that enables formal and informal interaction. It further recommends ways to reduce technology induced isolation through face to face briefing, double crewing and organised social and team building events. To improve the adoption of the mobile device technology which was trialled during the research study, they recommend that the technological use of equipment should incorporate socio-occupational elements which cover communication, work protocols and safety, including appropriate training essentially highlighting that use of the technology successfully would need to be shaped by the working habits and social interactions of the officers expected to utilise it in their work (Lindsay, et al., 2009).

As seen in other research endeavours, the advances in technology and use of technology independently by police staff does not necessarily create immediate beneficial outcomes. Benefits of technologies such as prevention of crime and increasing accountability whilst enhancing community interactions and relationships, are reliant upon and dependent largely on the way that the technology is used in practice to achieve outcomes. This has been known, in the context of policing, since at least 1992 where issues with the use of the HOLMES system in policing led to problems described at the outset simply as ‘chaos’ (Ackroyd, et al., 1992).

The use of information technology for strategic response to crime issues; determining where to allocate resources and how to facilitate provision of information to citizens in a proactive way can be impacted by lack of encouragement, absence of systematic guidance and limitations to the ability to use systems. These limitations arise due to lack of skills and experience leading to misalignment and investment in resources that may be enabled with robust tools, but which are not harnessed by police officers who find themselves unable to adapt them to real life use effectively. They can also be due to failures to identify and exploit interdependencies within the systems and data sets that exist or understanding the true value of data with respect to other areas beyond crime prediction and statistics (Ackroyd, et al., 1992).

Lum, et al. (2016) for instance, identified variances in perceptions amongst police officers, which lead to a lack of uniformity and awareness of the scope of application, type of technology and efficacy that can be achieved by functional strategic integration and adoption facilitation for police officers.

2.4 The role of ICT in information management and sharing in policing

ICT plays a critical role in the management, codification and distribution of information including the sustenance of organisational learning and organisational memory in policing. Organisational memory enables the development of sustainable repositories based on in work experience. It is directly
relevant in service led public service organisations such the police where it promotes effective use of technology to manage intelligence, data, knowledge and information. It also enables appropriate skill matching and learning to improve performance, organisational cohesion and technology capability.

Organisational learning enables increased promulgation of advantage with the use of information and use of technologies. It propels continuous improvement through sharing of experience, insight and interaction to promote a cyclically growing and improving organisation. This in turn enables and promotes the emergence of new ways of management, interpolation of innovative ideas and infrastructure by infusing working with activities that change working practices. It challenges the workforce to aspire to higher standards and diversify knowledge sources through practice and principles that enable reflection, aspiration, collectiveness and understanding for and toward a shared vision and common goals (Lilley, et al., 2004). The continued cycle of learning and gaining experience from information that is stored, codified and or transferred human to human is a critical aspect of retaining organisational intellectual assets. In policing moreso, it is representative of a crucial element that brings beat policing into its element. It also promotes effective back-casting in organisations with a view to enabling strategically sustainable and effective decision making. (Argote, 2012; Pollit, 2010)

Sharing of information typically relies on person-to-person [tacit] knowledge [which is often local in nature] and information to solve crimes. This type of knowledge sharing is critical for intercepting and solving serious crimes and it is particularly hindered by organisational and bureaucratic culture and the dynamic quality of different activities they have to engage in with varying and diverse systems.

(Allen, Karanasios and Norman, 2014) highlight through their work, a lack of unified working practices, policies and procedures for embedding tools into existing infrastructure. These tools should functionally manage routine and emergency/crises situations and incorporate a cohesive means of managing information sharing and delivery. This is particularly important in critical emergencies that require multi department and or agency participation and to prevent limitations to efficacious expedition of services. This as they found, does not always happen. In many instances where the hierarchal command structure indicates an authoritarian managerial style this may create significant difficulty for senior staff in accessing the knowledge held by lower level staff, since they may fear that they will be held accountable, thus leading to gaps and lapses in the flow of information in such a way as to hinder decision-making.

It is important to recognise that in recent years, the role of the knowledge worker has become much more prominent and indeed so has the principle of the ‘knowledge organisation’. Frontline police staff are knowledge workers. The knowledge worker approach harnesses the scope of ICT as a means for tracking, capturing, organising and delivering information. This enables a preventative approach using a ‘community problem oriented’ policing approach to deter crime through preventative approaches. The ‘knowledge worker’ and ‘knowledge organisation’ approaches hinge on information, communication and associated technologies. Harnessing the benefits of the knowledge worker, enables placement of police officers into a more effective decision-making role where they can act to curb crime and prevent neighbourhoods from becoming overrun by crime. The officers are then goal-driven to stimulate productivity, effectiveness and performance with a view to limiting incarcerations, as demonstrated in some bodies of work with some success (Brown & Brudney, 2003).
In organisations where there is a highly dynamic quality to activities, interoperability and information sharing enables collaborations and fast decisions when they are fit for purpose and up to date (Oliver & Roos, 2005; Baldini, 2010). A number of researchers highlight problems associated with aged technologies used by security agencies and highlight the need to incorporate capability for intersystem interface equipment during implementation of new projects to enable harmonisation. Although, as stated, it is the unique features of technology in policing that are of interest in this thesis, one should note that information sharing has come to be seen as problematic across a number of domains. It is argued by some (Ackerman, et al., 2003) that orthodox approaches to knowledge management, associated with the likes of Nonaka and Takeuchi, (1995) are no longer adequate for the encapsulation of the problem of sharing knowledge and expertise in complex, heterogeneous and professional environments. Again, such a perspective depends on taking a qualitative approach to examining how, in practice, knowledge and expertise are actually shared, when and where, and for what kinds of purposes.

A key area of concern nevertheless, repeatedly highlighted within the context of policing and technologies is the issue of information sharing internally and externally. This issue spans managing and designing systems that hinge on interdependencies within local, regional and national policing systems and the other external public service agencies that either rely on information from or supply information to the police to function. The data held by the police to facilitate services or provide information to the police or other agencies for expediting delivery of public safety and security is thus controlled by the role of the knowledge worker, the mode of knowledge transfer and storage, usage and adequate adoption of suitable and sustainable technologies (Lindsay, et al., 2009; Alain, 2010; HMIC, 2017).

2.5 Ease of use, adoption and implementation of technologies

Frontline staff expect systems to work as expected, particularly in policing. They expect that technology will have benefits in relation to speed and accuracy and that it will not interfere unnecessarily with their practices, nor will it introduce overhead or strain. Indeed, such expectations are even higher from citizens, who imagine that technologies used to sustain their safety and security should be sufficiently advanced, beyond that available to the citizens and pragmatically within the realms of magic. Often inadequate routinisation of internal evaluation methods, however, prevent understanding of use, misuse or disuse and development of knowledge and technological management tools. This leads to diminished usage and ineffective realisation of benefits.

Without closed learning and knowledge sharing cycles or frameworks in place, police forces find they lack the exemplars they need for the understanding of legal applicability of technology. They therefore miss opportunities to identify skills and competencies of usage within policing teams, limiting progression, uniformity of usage and compliant adoption (Custers & Vergouw, 2015).

Custers and Vergouw (2015) recognise the lack of internal evaluation of the effectiveness of technology in use as a key problem affecting adoption and improvement of technology. They attribute this to the lack of understanding, limited knowledge of emergent technologies and the lack of overviews of available technology in police forces. They report that many policing teams actually consider the improved and broadening use of existing technology such wiretapping, fingerprints, DNA research, database coupling, data mining and profiling, camera surveillance and network analyses to be of higher priority in comparison to adopting new and more advanced information technologies and information management practices.
Statistical records in the latter part of the last century, indicated that lower level policing staff spend over fifty million man-hours a year filling in manual paperwork, marginalising the time available to spend on patrol (Ackroyd, et al., 1992). The use of handheld mobile information and knowledge management tools should therefore provide direct access to information and record information. In functional use, these tools should enable police officers to work more quickly, gather information more accurately and investigate crimes with more efficiency.

Despite this positive potential, the value of information and communication technology can be diminished by poor or inappropriate design and deployment. This is particularly so when the practical caveats of use are misaligned with purpose, working culture and people. The result of this is that ICT is increasingly presented by some researchers as an innovation that can limit and negatively affect the task of nurturing communities and workforces. This is due to the risk of undermining the task of communicating through social interaction in policing by attempting to use technological solutions to replace this element of policing (Lindsay, et al., 2009; Babuta, 2017).

Alain (2010) highlights the difficulties that may arise when bureaucratic authorities design systems for managing and formalising cooperation and communication between police forces. He directs attention to the confusion of process and communication channels between police forces which reduce the impact of policing and increase security risks. This is attributed to the creation of ineffective informatics systems with impractical structures due to poor alignment to needs.

These observations are aligned with findings such as that in a survey examining effectiveness of knowledge sharing in police forces by Birdi, et al. (2009). They found that informal face to face methods were sometimes preferred to formal methods of information sharing. The most frequently stated barriers were the people in the organisation, their working behaviours and problems sharing knowledge between people interdepartmentally. Limitations in this area included ineffective and inexperienced staff, as perceived by co workers; organisational hierarchal power issues and a lack of interest in sharing the knowledge held.

In principle, access to technology is not necessarily the only requirement of a service led and public facing department, because there are significant demands placed on workers which necessitate efficient and effective access to, and awareness of, the means and modes through which to facilitate necessary and crucial knowledge sharing.

Birdi, et al. (2011) identified ineffective or inaccessible technology as the second most cited barrier to internal knowledge sharing. Technology was, nevertheless, the most relied upon method of sharing knowledge internally. They also highlighted lack of access to relevant information as a key issue with regard to information sharing, which was attributed to poor working practices including low engagement at higher staffing levels with regard to sharing of information. They go on to suggest that improvements to working practices can improve working life and business efficiency, mitigating issues around knowledge sharing.

Dupont, (2001) presents a concise historical categorisation of issues that have impacted adoption of technologies in policing by highlighting a number of failures in technological adoption, deployment and use by the police force classified into eight broad groups including deployment of technologies that are not fit for purpose and lacking in objectivity such that they are representative of attempts to gloss over problems and more aligned for the purpose of propaganda and skewed demands which outweigh the reason for introduction in what he describes as the explicit agenda fallacy. He cites the
introduction of the 999 emergency calls and explains how the propaganda surrounding its advent used arguments beyond objective reasons such as ‘better productivity’ and ‘public good’ to drive political attention to prioritisation of technological needs.

He touches on the adoption of technologies which are hastily embraced simply on the strength of innovation and ‘modernisation’ wherein the programs are not examined for fitness for purpose but simply represent an attempt to claw at significant funds in order to enact copycat systems instead of adapting systems that exist to suit local needs with ultimate outcomes that lead to loss of revenue and nominal impact or abandonment. He describes this as the novelty fallacy.

He moves on to outline the surface plausibility fallacy where lobbyists invariably present rather plausible ‘common sense’ but shallow arguments to justify adoption of technologies as a quick fix, ignoring pre-existing issues which invariably never get resolved. He goes on to outline the free lunch fallacy where the associated and or related long term costs of adopting a new technology are craftily hidden and or withheld such that they are prone not only to misuse but overall represent a sizable cost to the public purse and the organisation in the long term and lead to negative productivity and abuse of citizen faith in public services.

He then calls attention to the quantification fallacy where cost benefit analyses are manipulated employing rudimentary variables which do not give a proper position or a justifiable business case such that in the long run, other areas of business suffer a significant diminished output as a result of poor decision making and poor evaluation of potential success by fixating on outputs instead of outcomes. The key pointer with the quantification fallacy is that it prevents police forces from choosing technologies that lead to best results, focussing instead flooding them with technologies which only look good in principle.

The next classification he presents is the technical neutrality fallacy which sidesteps controversial issues and diminishes the moral and ethical aspects of new technologies such that the perceptions of citizens are altered to such an extent that a fallacy of technical neutrality occurs, negating the ethical and moral dimensions of new technologies. The impact of this is such that public expectations are heightened to an extent where the resources in readiness cannot cope or indeed are not in readiness to handle or manage such demands because these are expectations beyond the scope of policing and beyond the expertise of frontline staff.

He then introduces the fail safe fallacy, which is driven by commercial promises by technological developers with low rigour such that they ultimately crumble in the face of rigorous testing. The types of problems associated with this include serious data and information security lapses and system failures. This is often to do with scalability and the fact that supposed fail safe technologies may never become fit for purpose or useable on the scale intended. These issues, he argues are in part due to lofty expectations as well as poor training and indicatively becoming victims of policing ideologies and traditions which enable repetition of past errors/mistakes with renewed efficiency and controversially he furthers a postulation that this is also attributable to sabotage and exploitation by police officers in order to retain some of the autonomy they are accustomed to.

He finally brings to the fore the fallacy of ignoring past failures which centres upon failure to evaluate failed implementations, adoptions and change in order to learn from these failed revolutionary ideas. Backcasting to harness the lesson of ensuring technologies have the potential they ought to in that they will support operational policing whilst understanding that indeed that they cannot erase the
workload or generate virtual workers to do the jobs which still require humans and the objective interaction and interface with a trained officer to effect the solutions and efficacy required to keep citizens safe and sustain cost effective services.

He calls on an example such as the computerisation of crime records which led to a peak in reported crimes as previously reported by Ackroyd et al., (1992) which did not translate technology adoption into a diminished rate of crime management and clear up, rather things deteriorated such that migrating away from paper records brought the ill prioritised issue of crime back logs to the fore. He concludes by asserting that the need to adopt technology to demonstrate and qualify professionalism of policing does not prevent inappropriateness and under usage, as such perceptive and circumspect approaches by management are needed and of high value to mitigate the impact of these fallacies which indicatively do not exist mutually exclusively. He also emphasises the importance of the police officers. In principle, he asserts that the knowledge of value which they have and which is particular to their terrain such that they provide detailed, contextual and well balanced solutions to issues aided and or facilitated but not substituted by technology. (Dupont, 2001).

2.6 ICTs and the Knowledge worker in policing

Policing communities generates a vast amount of data which is often important in the course of duty and also relevant to the sustenance of law and order, particularly for enabling a more proactive and preventative type of policing. This is seen as desirable for many policing business cases as they strive to improve services with limited resources while keeping up with the increased sophistication of crime modes and methods. With technology, old and new, becoming ubiquitous, the role of the police officer as a knowledge worker who generates significant amounts of data whilst acquiring direct information from community relation building is coming to the fore. The statutory requirements of policing have also evolved with this shift (Barton, 2013; Chan, 2001; Custers & Vergouw, 2015).

In recent years, the role of the knowledge worker has become much more prominent and indeed so has the principle of the ‘knowledge organisation’. The knowledge worker approach harnesses the scope of ICT as a means for tracking, capturing, organising and delivering information that enables a preventative approach using a community problem oriented policing approach. It acts to deter crime through preventative approaches that hinge on information, communication and associated technologies. By placing police officers into an empowered role consistent with persistence of technologies whilst carefully managing change resistance, knowledge awareness; fitness for use and purpose of knowledge can be further enhanced (Brown & Brudney, 2003).

Conducting a study of the police therefore necessarily requires some reference to intelligence led policing which forms part of the business model and decision framework guided by other statutory laws and supported in principle as it is in the main driven by data and knowledge generated by police officers and staff. This data is generated in the course of emergency response, proactive or reactive policing and disaster response including beat knowledge relevant to specific communities and community activities. To police effectively using ICT, the knowledge worker, knowledge management and business intelligence and criminal intelligence take centre stage and are the underpinnings of the worldview of police forces.

With ICT being at the core of the knowledge and data facing role of frontline staff, the work that they do is guided by ICT supported resourcing and must comply with national guidelines for operational standards. National standards require police forces to utilise an intelligence led model [ILP]. The use
of intelligence led policing as a statutory ICT supported framework and responsive policing business model was introduced in the early 90’s due to an increased demand for cost efficacy and effective policing aligned to localised needs. This in principle created a fine balance that should put front line staff where they need to be in the right distribution and at the right time. It would be made possible by harnessing the steady stream of data received through control and first response calls along with that which is collected by front line staff in the course of crime prevention, arrests, cautions, interceptions and street patrols.

Prior to this, policing work relied on reactive based models which became obsolete as criminal networks gained sophistication and technological advances created new risks, such that crime was now much faster, harder to track and easier to conceal with the use of sophisticated and innovative tools and methods. Intelligence led policing took centre stage as it became clear that waiting to hear or be informed about a crime before responding was inadequate and constituted an ineffective way to control criminal networks. It was now of high value to have data and information that could be comparatively and recursively analysed to identify and predict where and when crime might happen and how in order to actively disrupt crimes and prevent neighbourhoods from coming under siege (Kleiven, 2005; Ratcliffe, 2003).

Ratcliffe (2016) describes ILP as “a business model and managerial philosophy that emphasises analysis and intelligence as pivotal to an objective, decision-making framework that prioritises crime hot spots, repeat victims, prolific offenders and criminal groups. It facilitates crime and harm reduction, disruption and prevention through strategic and tactical management deployment and enforcement” (p. 66).

It is built on what is known as a ‘3i’ model. The 3i model relates to interpretation of crime statistics and intelligence on crime by police data analysts in order to provide critical decision making support information to influence decision makers in police forces. This in turn enables organisational leaders to manage and facilitate their resources for maximum impact in the areas of crime prevention, disruption and reduction (Ratcliffe, 2003; Ratcliffe, 2008).

The 3i policing model is predicated on a criminal network disruption focus and drives resources toward prevention. The data collected by frontline officers informs the intelligence led model to promote a recipe for policing that enables active apprehension of criminals and disrupts crimes. The information generated through policing enables that the force ILP use maximises its resources and meets its business goals and importantly enables forces to withstand scrutiny in the areas of efficiency and effectiveness whilst operating economically (Innes & Sheptycki, 2004).

Police forces are also required to actively utilise an ICT supported framework that engages ILP, and applies the national decision model in the policing and resourcing decisions made. The provisions of this model span use of information and decisions about collation, storage and retention of information. This element of data use goes some way toward addressing the critical information use issues around policing. The NDM prescribes a robust set of guiding tools and rules that aid the mostly autonomous decisions frontline staff make as to whether information they encounter is treated as intelligence and appropriated for that purpose. It embeds the legal and statutory provisions that must be adhered to for information to be recorded using ICT and stored such that the decisions officers make in active contact with citizens limits oversights and the quality of direct feeds for the purpose of crime mapping and predictive or proactive policing improves including allocation of resources (College of Policing, 2014).
In addition to the ILP and NDM, the police are also legislatively and statutorily required to build the national intelligence model [NIM] into their business model outline and to utilise it for the delivery of a business case for their resourcing and financing. The NIM is an obligatory requirement which is governed by the UK central government imposed on all police services. It was introduced in 2000 as a cohesive intelligence framework to embed in policing practice and infrastructural processes to enable policing. The NIM serves as an issue led guide to help forces to highlight and address any issues that may impact on and lead to service delivery deficits.

It rationalises and systemises the way that critical decisions are made with respect to handling of information and deployment of resources such that it supports rationalisation of and systemises the ways in which the police make critical decisions about resource deployment and handling of information. It enables business leaders to use the right criteria and methodologies to manage risk, respond to service demands, and manage tactical resource allocation by standardising strategic direction within police forces in England and Wales. In conjunction the three models work by managing and supporting appropriate exploitation and research of data and information for local, regional, national and international levels of policing. The NIM supports the ILP to be more economical, effective and efficient and standardise intelligence related structures, processes and practices including the way the NDM is appropriated.

Rationally, the implementation of successful ILP engages ICT to support its practical success and this often relies on a goal centred plan which accounts for and harnesses technology to develop appropriate architectures and structures to enable sustainable service delivery (Berkem, 2008; BRG, 2010; Vincent, 2005). Although the framework and models are thought to be well established across forces with a significant amount of input led by chief constables and commissioners nationwide, a recent study highlights the reality of limited adoption and widespread lack of use of the simplest of technologies for managing this merged management protocol. Specifically, a recent study of four different police forces by Babuta, (2017) identified gaps in the adoption of crime prediction tools for the development of digital strategies.

Through the application of ILP, business intelligence should supply crime mapping details effectively and efficiently using information generated by the front line police officers and community intelligence. The forces examined however used retrospective methods of hotspot identification based on crime data from public calls and police officers recording crimes. Despite the low cost and high efficacy of predictive crime mapping tools anchored in ICT and the scope to use more data from other sources, analysts at the police forces were still preparing crime maps by hand. Hotspot maps are therefore often out of date and received by business leaders outside timescales that make them useful for predictive and preventative policing. The study found that despite the proven efficacy of business intelligence as a tool in identification and prediction of crime hotspots, policing teams still spend a lot of valuable time conducting beat policing in the traditional way and radically, translation of data into intelligence maps was conducted using methods behind the times (Babuta, 2017).

2.7 Workplace studies and Ethnography

For the benefit of disambiguation, this section begins with some clarification. Workplace studies may engage a variety of methods and can exist in tandem with qualitative, quantitative or mixed method studies (Plowman, et al., 1995). They have been commonplace in the areas of Computer Supported Cooperative Work [CSCW] and Human Computer Interaction [HCI] since the late 1980s and have
entailed the study of many different environments, including air traffic control; the London underground; banking; healthcare, journalism etc. In the main, they are characterised by a desire to understand work practice ‘from the point of view of the actor’ and, as such, are often associated with ethnomethodology, drawing on the legacy of Harold Garfinkel.

Garfinkel proposed workplace ethnography as a means to understand how settings are organised in practice, how people orientate to ‘what do I need to do’ questions, and how they actively, in cooperation with others in the setting make sense of and construct the setting as they go along. In doing so, they operate in a material, organisational and cultural environment which they make visible in their actions. This includes displays of competence, skill and knowledge, awareness of others, trust and affection. Such an approach implicates something that looks like ethnography and, indeed, the two often sit comfortably alongside each other (Rawls, 2008). Whilst the study described by Rawls (2008) is not ethnomethodological it does draw on insights derived concerning the need for a detailed and rich picture of activities which take place contextually.

Workplace studies are often used in the design of technology for organisations precisely because they uncover local, contextual, detail which may otherwise be ignored with more formal methods of system design. Instead of delivering exact guidelines and rigid solutions, workplace ethnographies deliver a detailed and rich analysis of working practices, processes and procedures including behaviours, insights, perspectives and feelings. As a result, although there is often an inclination to provide recommendations following a workplace ethnographic immersion, workplace ethnographies typically inform rather than deliver solutions (Luff, et al., 2000).

An ethnographic workplace study can be considered the most suitable tool for the depiction of a workplace enabling elicitation of the fine detail often critical to the understanding of the interrelationships, interdependencies and dynamics of work practices (Luff, et al., 2000). There is a growing body of research studies that span the use of ethnographic workplace studies in urban transportation; air traffic control centres (Bentley et al, 1992), emergency dispatch centres (Normack & Randall, 2005; Pettersson, et al., 2004) and public service delivery departments. It is also in use in large private sector organisations such as newsrooms, helpdesks, call centres and financial organisations (Harper, et al. 2000).

These studies enable understanding of how collaboration is achieved using a variety of tools and technologies to manage dynamic processes, reactions, responses decision making, and the routine troubles and challenges experienced in complex settings. Workplace ethnographies have applicability to any work setting, but are often associated with highly dynamic, high intensity environments immersed in, or saturated with, technology with the potential for high risk errors. With the increased pace of technological development, new decision making problems arise more often. Organisations are increasingly interested as such in which tools should be adopted to aid and improve work processes and service delivery (Ilkka, 2001).

Workplace ethnographies play a role in understanding how existing materials and technologies are used in work settings with a view to recognising both the routines in which work is embedded and the troubles that sometimes beset it. It is assumed that understanding both routines and exceptions to routine will have a payoff in relation to how new technology will need to function in a work environment (Dix, 2007). Predicated on a ‘naturalistic’ perspective; the assumption that the right place to study work practice is where it actually occurs rather than, as has often been the case historically, through experimentally derived settings; workplace ethnographies provide fundamental
detailed knowledge that can ‘inform’ the realignment and repositioning of technology and work processes (Anderson, 1994; Hoey, 2014). Ethnographies stress the need for understanding what knowledge, tacit and otherwise, is actually in play, and in what contexts. They focus additionally on skills and competencies which may otherwise be invisible. They also generate insights that can inform decision making with respect to improving existing processes and technology and adopting new technology (Ilkka, 2001).

2.8 ICT at work: Private sector vs. Public sector organisations

In the public sector, ICT plays an important role in enabling new services, enhancing existing services, facilitating better working practices for workers and improving or enhancing citizen experience particularly by increasing value and decreasing costs in the long term. Emerging innovations in ICT have made it easier to organise work without the need for a fixed location limiting consumption of resources and physical travel (Vilhelmsen & Thulin, 2001). However the creation, adoption and implementation of technologies in the public sector are often plagued with difficulties and problems that limit the realisation of benefits from these efforts (Balzer, 1996; Brown & Brudney, 2003; Finkestein & Dowell, 1996; Hoey & Topping, 2010).

Working lives have become closely if not absolutely intertwined with ICT and indeed with policing, ICT has created a wider scope for working round the clock with better communication tools, self management and workload management tools as well as enabling work whilst travelling. The freedom that ICT brings to workers in mainstream industries particularly in the private sector is on the rise as technologies become much more widely available and scope for remote working and remote communication tools is increasing. Access to ICT has also been noted as decreasing travel based work and increasing in use other stationary work with higher dependence on robust technological tools (Benyon-Davies, 2002; Coleman, 2015).

Caudle, et al. (1991) highlight key issues which include environmental factors such as limited availability of a market with higher political influences, considerations of impact groups including legal and statutory constraints as significant and relevant to the public sector, They also draw attention to the mandatory steps that are required to meet a wider scope of actions to address concerns ‘in the public interest’ such as higher expectations, accountability and responsiveness. They further mention issues such as internal conflicts and bureaucracy, difficulties with delegation, diminished decision making scope by managers due to limited autonomy, impact of political appointments and lower levels of organisational commitment and work satisfaction amongst others. These issues are even more relevant for policing which has some of the highest levels of scrutiny and accountability with respect to use of innovative technologies for crime fighting and sustenance of safety and security (Ackroyd, et al., 1992; Lum, et al., 2016).

Inasmuch as ICT is seen as a tool that serves many relevant needs in private sector organisations (Gardner & Ash, 2003; Caudle, et al., 1991), it is also important to consider that the intricacies of the way the public sector works may produce different results, both positive and negative (Cordella & Iannacci, 2010; Davis, 2015). Additionally in the private sector, information is often deemed proprietary and utilised to gain a competitive market advantage, a trend which is in the wake of the implementation of GDPR set to change significantly but not to the same and higher standards including accountability which will be expected of the public sector (Koops, 2014; Tankard, 2016).
Success of proper and cohesive public service agencies requires increased inter agency sharing and robust interdependency anchoring which increases the sharing of applications that have similar functions to ensure that legal scope of use and transfer of information is sustained (Caudle, et al., 1991). Despite the impending GDPR changes which impact on the collection, retention and use of information or personal data and current practices with regard to data sharing; it is not sustainable and to the greater good to use information in an unfettered way and instead it is rational to expect, and indeed statutes exist; that promote understanding of the ultimate value, intention and rights implied including upholding the veracity of stored and disseminated information promoting careful and preventing indiscriminate sharing of information. This will extend and translate into management and securing of information and communication tools and systems to prevent overlaps that constitute misuse or permissions and or data sharing protocols (Miller, 2000; Bovaird & Elke, 2009).

Indeed, public sector agencies also have highly changeable requirements that are more difficult to elicit, creating a need for information needs requirements processes that are systematically derived and developed with an eye on information systems planning (Koper, et al., 2014). Tailored needs requirements processes integrate resource management concepts, record management and help meet statutory requirements. It is also important to acknowledge and consider the importance of managing political influences such that political priorities do not limit the scope for long term information system planning and that redundancies, legacy system and system change management are much more adequately accounted for (Beverige, 2002; Brown & Brudney, 2003; Lawrence & Lorsch, 1967; Oostveen, 2007).
Chapter 3
Methodology

Chapter 3 provides an outline of the methodological approach/es taken in this study and clarifies the appropriateness of these for this study. The data collection and data analysis process is set out in detail concluding with considerations for validity, reliability, ethical concerns and critical reflexivity.

3.1 Research setting

The analytical focus of workplace studies can extend from one area of work in a given setting to multiple areas of work in an entire organisation within multiple settings enabling the level of scrutiny of workers and work processes. Studies can examine a variety of focal points and utilise a combination of methods. The key to successful immersion is therefore careful design of a study to enable adaptive appropriateness and applicability to the given conditions (Hoey, 2014; Reeves, et al., 2008; Crang & Cook, 2007).

Bedfordshire police force is located in east Anglia covering an area split into three boroughs; Bedford, Central Bedfordshire and Luton. In England, several towns and cities comprising of boroughs are collectively arranged into jurisdictional counties. Bedfordshire County has the 14th highest population density in England and ranks as the 5th most densely populated non-metropolitan county in England. The citizen population speak up to 80 different languages and live in concentrated pockets with more than half of residents living in Bedford and Luton boroughs.

Covering 477 square miles, the police force serves to protect a diverse multicultural population of over 600,000 citizens resident in the county. It is currently served by approximately 900 police officers comprised of 700 policing staff, 100 community support officers boosted by about 250 special constables from within the community who volunteer as police officers. It is the lead police force for England’s eastern region special operations unit [ERSOU] and the eastern region counter terrorism investigation unit [ERCTIU]. The force is also part of a ‘triforce’ alliance with Hertfordshire and Cambridgeshire police force [BCH] which enables resource sharing. The BCH alliance focuses on pooling financial and operational resources to enable efficiency and improve information sharing including collaborative working. The collaboration includes roads policing, scientific services and firearms.

The Bedfordshire policing team operate an intelligence led lean business model which promotes management of limited resources effectively. In 2015, the force also adopted a quality improvement process [QIP] model to support continuous process improvement and aid technology infusion. It engages intelligence led policing aligned to national standards to enable maximised use and controlled expenditure focussed on areas of need and importance. It particularly uses its ILP and QIP to drive efforts at maximising their information and communication resources to meet force needs. The police force is an important part of the community and with this comes a significant level of public and statutory scrutiny. The police force is led by a chief constable who oversees all decisions including staffing. The police chief constable and other business leaders such as superintendents are answerable to the police and crimes commissioner for Bedfordshire with public scrutiny directed by Her Majesty's Inspectorate for constabulary [HMIC] now known as Her Majesty's Inspectorate of Constabulary and Fire & Rescue Services [HMICFR].
The management of police information and communication technology is a complex matter. The police force in England and Wales is divided into 43 constabularies. Every police force utilises a single police national computer system known as PNC which stores records of crimes, arrests, convictions and cautions (HMIC, 2017). They also have varied access to data management systems across forces on an ad hoc basis with limited scope and shared access to some core data management systems such as DNA databases. Beyond these rudimentary tools geared toward storing records of crimes that are prosecutable or notable for future reference, each police force is responsible for its own information and communication technology systems which are not linked to that of other constabularies. Information and data about crimes are held locally and not routinely shared and data is often only recorded on the PNC in the event of arrests, convictions and cautions.

The result of this is that there are stark variations and oftentimes large gaps in the types of technology used in each force. Access to, applicability and usage of technology sometimes creates a significant difficulty in bridging resources and sharing information without the use of complex systems. Abilities can also be constrained and effectiveness and efficiency reduced for forces that are unable to effectively use or access better technology. Varied use of technology is also marked when forces hold information of relevance to other jurisdictions but struggle to feed this into a complex myriad of information funnels where they can be used appropriately and expeditiously (Babuta, 2017).

This ethnographic workplace study focussed on identifying and understanding the underpinnings of policing and the use of technology at the Bedfordshire police force. It focused on understanding the working life of police officers in front facing roles and in management. It derivatively gave attention to their world views and experience with and about the use of technology. It focused on identifying patterns, risks, limitations, advances, benefits and critical characteristics of technology use within the constabulary.

3.2 Research strategy and Paradigm

The core purpose of social science is to develop and acquire an understanding of social reality from the perspectives of different people. Particularly, social science aims to illustrate how their views, opinions and ideologies govern and shape the actions they take in their reality. As a researcher, to carry out this study, it was necessary for me to identify and consider historical philosophies of knowledge. These support the understanding of individual meanings and actions of individuals and allowed me to ground my thesis project in information systems research and similar disciplines such as CSCW enabling an appreciation of social meaning constructed by people (Bernard, 2012; Donatella & Michael, 2008). Therefore I have adopted a strategic approach that emphasises the intersubjective meaning of reality by understanding the way participants exhibited in talk and action and the meaning embedded in them, expressed in how they interpreted situations.

I adopted a paradigm to set out the viewport/analytical lens my study would take by asking "what kind of understanding of the human experience will I seek?". For my study I took the view that the knowledge of reality is socially constructed by human actors i.e. an interpretivist approach. In order to clarify how I would determine what the reality is, i.e. “what is the nature of reality?”. For this study I considered reality as being "subjectively constructed and reconstructed through social and human interaction processes” i.e. a relativist ontological approach. In order to determine how people know what they know, what is the relationship between the knower and what is known, what are the characteristics ”. I adopted an epistemological approach that "people cannot be separated from what they know” i.e. a subjectivist view.
Interpretivism can be described as a paradigmatic approach to investigation which is underpinned by ontological and epistemological assumptions concerning the relationship between knowledge and social reality. It presumes that ‘reality’ is a construction, rather than existing independently of human interpretation. In describing this as a paradigm, it should be clarified that approaches to interpretation can vary. One can take, for instance, various kinds of phenomenological perspectives, including those of Alfred Schutz, Merleau-Ponty, and Husserl and so on; or one can take the ethnomethodological viewpoint described above. Although strictly speaking, ethnomethodologists distinguish between interpretation and understanding, one can additionally adopt approaches derived from psychology, including activity theory and distributed cognition (Nardi, 1996).

Interpretivism is a broad church which emphasises the subjective and intersubjective meanings that are constructed and reconstructed through human and social interaction processes. In this study, I avoided taking any of the theoretical positions described above and adopted a pragmatic approach to investigation, albeit one which oriented to the intersubjectivity of social life in general (Creswell, 2003; Bernard, 2012; Walsham, 1995). At the very least, this commitment lead me to consider the various ways in which individuals conceive of and act upon their beliefs and, furthermore, how social life is made possible by its interactional features (Cecez-Kecmanovic, 2005; Klein & Myers, 1999).

This study focussed on understanding and describing the different meanings that are attributable to information systems and the impact this has in different contexts by investigating the processes of ICT/IS development and implementation within the social and organisational setting at the Bedfordshire police force. It prioritised gaining knowledge in the field and around the police officers to gain a firsthand experience of how people construct meanings and how ICT impacts on the views of the police officers, describing behaviours that are observed from and by the police who use it to understand their particular values, motivations, interests and actions using social enquiry as the centre of interpretation (Creswell, 2003; Klein & Myers, 1999).

Interpretivism relies on interpreting and or understanding the socially constructed multiple meanings that humans attach to their actions. It directs attention to the complexity of human reasoning, or sense-making, as situations emerge to produce understanding without predefining independent or dependent variables (Klein & Myers, 1999). The interpretivist research approach will focus the study on understanding information systems in their social context and how they impact on and are affected by that context including how they are embedded in the social contexts of the police officers who use them (Anderson, 1998; Bentley, et al., 1992; Cecez-Kecmanovic, 2005; Qualitative Research, 2015).

This theoretical approach therefore supports understanding what, when, why and how the individuals are reacting to situations or circumstances accounting for complexity and contextual factors. Interpretivism promotes, I suggest, the collection of the views that are context and time dependent in a functional way leading to an understanding of the situation being studied which reveals otherwise hidden meanings and behaviours (Creswell, 2003; Klein & Myers, 1999).

3.3 Methodology

The core purpose of social science is to develop and acquire an understanding of social reality from the perspectives of different people. Particularly, social science aims to illustrate how views, opinions and ideologies govern and shape actions taken. The regularity of these actions means that they act as rules and resources for people, in turn producing social structures (Giddens, 1984). This study, then, is focussed on how attitudes, opinions and actions are reflexively constituted in relation to the use of
existing and introduction of new technology in the police force, emphasising the ways that police officers see and understand the world around them, particularly the way their awareness and use of information communication technology to combat crime and manage interactions in investigation of serious technology led crimes; influence policing style, habits and abilities to safeguard the community.

The methodology adopted for this study ethnography, is applicable to this study because the primary goal was to elicit and provide an in-depth detailed descriptive overview of everyday life and practices of the Bedfordshire police force. For the study, it was important to engage a methodology that would do the subject matter and the participants congruent to the study justice by selecting one that is an appropriate fit (Baxter & Jack, 2008).

For the most part, ethnography involves no postulation and/or hypothesis and entry to the study is, as far as possible [and recognising the reflexive elements discussed above] free of sentiment or opinion. Indeed it is necessary to sustain an open mind to facilitate information gathering without veils or biases. The information gathered was then analysed to identify themes, patterns and characteristics that give an understanding aligned with the interpretive approach (Crang & Cook, 2007; Madden, 2010; Klein & Myers, 1999).

The use of a work place ethnography as a qualitative method was adopted in order to stimulate discussions and communication, observe and record information and activities about ICT usage, ideologies, practices, opinions and approaches through open-ended interviews, group discussions and observations and shadowing in Bedfordshire police force. Because ethnography treats observations and information as readable, seeing it through an analysis of an ‘enculturated’ understanding of social actions in the workplace context, the data obtained from observation of natural behaviours are considered to be representative of modes of meaning making. Reflexivity is important in ethnography to aid understanding of how meanings are constituted relative to each other, and to help the ethnographers make sense of their own position vis a vis their enquiries. The emphasis on different senses, different methods and different observations enables the worldview of the participants to be organised into analytically distinct components that work in relation to one another. This involves viewing the world and the people in it, learning in and as part of the world, and seeking routes to share and understand the behaviour, activity and reactions of the people in it (Pink, 2011).

The ethnographic methodology relies on a close examination and exploration of data sources using a cultural frame of analysis. Instead of imposing an existing model of categorisation, the study used the ‘insider’ view to facilitate a representation that allowed meanings and categories to emerge from the encounters during interviewing, meetings and field observation. The methods associated with ethnography are usually participant observation supplemented by targeted data collection such as interviews and group meetings/interviews (Reeves, et al., 2008; Bryman, 2003; Crang & Cook, 2007).

The ethnographic methodology relies on a progressive and iterative approach, where the data collected will be reviewed continuously. This principally raises issues that produce ideas and orientation for collection of more data, such that new information is collected as it is thought about and the focus is progressively refined. It is a recursive process, as each piece of information can enable return to previous data and again inform the data collection process. It is also a process where each step contains the entire process i.e. by gathering information, analysis already begins to take place and by thinking about the information collected as a researcher, it is then possible to go back recursively and progressively implement an iterative process (Hoey, 2014; Crang & Cook, 2007).
Ethnography also emphasises studying the social phenomenon without predetermining a hypothesis, working with unstructured data and an open mind when considering analytical categories; investigating explicit interpretation of the functions and meanings of the human interactions through verbal explanations and descriptive (Creswell, 2003; Crang & Cook, 2007). As such it provides a framework for finding out why, who, what, when, how and where things take place, enabling identification and understanding of the location and the group being investigated in their natural working environment. (Sage, 2008; Reeves, et al., 2008; Denscombe, 2010; Crang & Cook, 2007; Klein & Myers, 1999). The suitability of ethnography for this study and motivation have been touched on earlier in this thesis, and reiteratively, it is again vital to emphasise that the study type, conditions, line and or choice of enquiry including time, funds and subject area specialism supported and justified this choice.

3.4 Research Method

In this ethnographic study, the qualitative analysis undertaken examined the police and their colleagues and clients in the workplace and outside in the community to make sense of the technology they use. The study was conducted contextually, recognising the different settings and dynamics which exist within the organisation. A range of methods were deployed in pursuit of this objective. They included the gathering of personal narratives and experiences, observing activity and interaction in dynamic situations, and immersing through field work to enable an understanding the rationales that police officers bring to their activities. This included behaviours and actions which depend on their communication skills, viewpoints and practices (Baxter & Jack, 2008). Data was also acquired through informal, semi-structured interviews and group discussions. It was assumed, in the absence of any prior knowledge of the field and given its dynamism, that preset questions would be inappropriate.

By adopting a semi-structured approach, some initial, and rather vague assumptions were made about how police officers might view the introduction of new technology, but those assumptions were refined as questioning and observing enabled prominent and common attitudes to become progressively more evident (Bernard, 2102). Engaging participants in non-directive interviews drove in-depth insight and clarification of answers was enabled with the scope this allowed during interactions to alter direction to suit the purpose. This approach was executed with few constraints and restrictions to participants thereby enabling free expression and creation of a relaxed setting where there was no emphasis on correctness of answers. The focus therefore was on absorbing, recording and understanding how the participants construct social meaning as they engaged and in doing so, obtaining frank and clear views where possible with constant realignment to ensure it would resonate with the participants sustained meaning system, limiting abstraction and detailing contextual information.

This promoted the elucidation of important and relevant understanding which reliably supported meaningful, rich and explanatory information with sustained probing to delimit responses and or clarify them. On the whole, this approach was key to promoting and enabling an explorative investigatory mode of working (Bryant & Charmaz, 2007; Baxter & Jack, 2008). Indeed, in this way, a comprehensive picture of attitudes and opinions, behaviours and how these things impact on each other was derived (Bryman, 2015; Flick, 2009; Donatella & Michael, 2008).
In addition to the open-ended interviews and group discussions, shadowing/observation was also undertaken to enable collection of contextualised information about activities and supportive reasoning behind these. Shadowing is a well-known means for obtaining a detailed picture of activities and the rationales behind them by enabling a wider and clearer understanding of people, daily life, and the meaning making through engaging to make sense of their world (Flick, 2009; Denscombe, 2010; Lincoln & Guba, 1985). Shadowing as it were in a dynamic and fast paced environment led to gleaning of a rich and clear understanding of the constituent elements of a working police officers life and the finer details that support their activities administratively and otherwise.

Intensive interviewing and observations, particularly those that require note-taking assessments to support studies such as this are more likely to yield good data when participants are not pressurised and conditions are such that they are not consistently estranged from and instead are enabled to participate in their natural environment in a relaxed informal way. Good data relies on repeating a process a few times with focus on gathering information, which does not passively introduce a conflict that prevents fact and fiction from being identified (Madden, 2010; Reeves, et al., 2008) and throughout this study, every effort was made to meet this ideal.

Sustained presence in the field was important so as to promote consistent orientation and enhance appreciation and understanding of context, detect and account for any deviations, build trust and promote elevation beyond my preconceptions as a researcher. By adopting the approaches outlined in Lincoln and Guba (1985), remaining immersed in the field for a long period of time supported an empirical and analytic depth which would not otherwise have been possible. It enabled identification of relevant elements from multiple participants and influences in different settings whilst identifying repeating events and or characteristics relevant to the study.

Interpretive studies are firmly rooted in hermeneutics, encapsulating symbolic interaction and phenomenology. To appropriately engage the methodology within the methods used, during field work the focal point was to consider the role of common sense reasoning of people as they go about their work and to understand the nature of social realities that structure it (Morrow, 2005). Shadowing and non directive interviewing enabled the understanding of the role of common sense and a firsthand view of the realities structuring choices, actions and decisions. During shadowing it was necessary and important to develop an understanding of social interactions and the nature of social reality such that it is made up of fluid definitions of social scenarios and situations based on these (Fossey, et al., 2002). The use of observations and interviews recursively revisited over time enabled in the main, a rigorous and systematic approach that would enable an evaluation that sustains credibility, confirmability, dependability and transferability (Morrow, 2005; Lincoln & Guba, 1985).

### 3.5 Sampling Method

Sampling for the most part was not seen as a critical issue as this was a qualitative analytical study insofar as the accuracy and reliability of responses is not determined by statistical methods but by adequate enculturation. Moreover, the diversity of opinions and behaviour was considered most important and favoured over attempts to synthesise that diversity into a ‘mean’ result. The population of police officers in Bedfordshire is in excess of 900 across over 40 specialised departments. A total of 105 respondents participated in this study with 70 members of policing staff including business leaders in Huntingdon, Cambridgeshire participating in direct discussions. Informal meetings, shadowing and observation in field took place on the beat, at the first response control room, custody suites and with fleet response at the two main sites for Bedfordshire police in Kempston and Luton.
A further 35 officers working in varied roles from on foot beat policing to custody management, fleet supervision, front desk management and armed response were encountered and engaged during stops at police stations, locations and during vehicle and shift changes. A serious effort was made to solicit viewpoints from officers occupying a variety of roles and statuses so as to reflect the heterogeneity of viewpoints anticipated therefore enabling relative representativeness. Inevitably, given the complex nature of the organisation in question and the difficulty of navigating through it, respondents were identified on a convenience basis and recruited by advertising to officers within the force and reaching out through team and business leaders.

There are some difficulties associated with convenience sampling, as highlighted by Etikan, et al. (2016) such as over-reliance on the inference of homogeneity in the population sample and the possibility that it can enable participation of outliers. It may also induce use of a non-representative sample leading to biased results and difficulties generalising results beyond the original sample (Saumure & Given, 2008; Etikan, et al., 2016). However, such reservations are mainly relevant to sampling procedures which will be deployed to statistical purpose. They are less relevant using an ethnographic approach because the ethnographer should be able, as contextual knowledge develops, be able to recognise and discount or ratify radically divergent views. The value of sampling of course, lies in suitability of participants for the purpose of gathering relevant information which informs with respect to research questions (Donatella & Michael, 2008). Convenience, or opportunity sampling, in the general sense I give it was thus a suitable and relevant choice for this study particularly considering the variety of constraints related to field immersion including the study method itself, budget and timelines and the transitional nature of working patterns of most participants. In the case of this study, the length of immersion enabled access to more rather than less respondents (Bernard, 2012; Denscombe, 2010).

3.6 Data analysis method

Ethnography is focussed on identifying patterns and trends which can be coded or conceptualised, and which guide emergent procedures in the study. Data analysis took place in a recursive and emergent manner using thematic analysis (Braun and Clark, 2014). The advantage of thematic analysis is that it comes with no theoretical suppositions, and so it is flexible. It also recognises the recursive nature of the various steps [six in all] that are normally assumed to be part of the thematic analytical process. As a foundational method of analysis, it was easy to learn and apply this method which relies on engaging the process as a flexible tool for analysing information collected during phenomenological interpretative work (Roberts & Sanders, 2005; Dane, 2010). The core driver for analysis of data was to ensure that there would be authenticity in the representation of participants perspectives. The type of research being conducted also necessitated an identification of themes that are associated with the analysed information from field notes to support derivation of meaning and accuracy (Alhojailan, 2012). Because thematic analysis enables rich and detailed accounting for complex data it ensures findings will remain coherent and fit in with the social context and data collected (Bryman, 2015; Crang & Cook, 2007; Bernard, 2012).

For the most part, field notes were the principal data corpus i.e. the primary means of means of recording collected data. Firstly, I recorded adjuncts and detailed field notes in extensive detail, i.e. what happened, what occurred, what I saw where, how and when. The data collected was extensive and, by the end consisted of some 30 notebooks. In order to acquire an overall perspective a significant amount of reading was also undertaken. Some of the material used was provided by the
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organisation and much of it was readily available on an open basis via the open web, news websites, government and policing websites in the form of reports, records, news clippings, research articles, statistical documents, records of parliamentary sessions in government and statutory documents available as part of auditing and or accountability records. The data obtained from reading was useful for understanding the field of policing, and indeed enabled a more in-depth approach during analysis of shadowing, interviewing and questioning notes, in some cases to understand, correlate and compare information made available publicly with factual information gained during field immersion.

The data set used in analysis combined field notes with material obtained through reading and was elaborated on reflectively, on who said what, in relation to what and how and for what reason. Where clarity was required, this clarity for corroborative balance was sought from some participants and business leaders. Following this I set about coding these field notes and then set about identifying themes which would focus on the questions this research was asking, which centre around the use of technology and indeed of what technology. This was done by blending the fragments of field observations that made logical and rational sense viewed contextually and cataloguing related patterns in expressed and observed feelings, statements, repetitive activity, inferred and spoken meanings, conversation topics and focus including use of language meaningfully (Aronson, 1998; Anderson, 2007; Anderson, 1998).

By searching across field notes and reflection after each exposure, issues of potential interest in the data, patterns and meaning began to emerge. At the conclusion of data collection, analysis continued by navigating the entire dataset and analysing to code extracts with formative consistency giving evidential meaning to the emerging themes. The first steps to analysis were therefore devoted to reading the field notes, immersing myself repeatedly, such that the content became familiar. Following this step, I then stepped back from the data, repeating the reflection process and then began to look at the field notes, highlighting and marking out labels to pinpoint important features that gave pointers which could answer the research questions.

Having adopted a constructivist approach to this study, the focus was on understanding the conditions, structural constraints and routine practices in order to elicit latent themes within socio cultural contexts. Analysing that much data was a non-trivial exercise and a great deal of time and effort was spent in trying to reduce this vast collection of data to a manageable set of themes.

The key analytical and professional criteria I applied related to deriving authenticity, plausibility, criticality and value. Once I had properly aligned related events and scenarios from observations I identified and refined thematic focus. I reviewed the themes recursively to ensure they were aligned to this. Comparing the various observations made to me and by me allowed me to judge whether assumptions were realistic and plausible both in terms of my own understanding and the way I try to represent them to others in this report. A critical element prior to completion of analysis related to questioning my own assumptions and also the incongruities apparent from the different perspectives offered to me by respondents. I oriented to ‘value’ in the sense that I hoped the results would be useful at an academic and professional level, focussed in and on ensuring that the themes encompassed the areas of study relevant to informatics and that they were capable of answering the research questions and refined them such as to deliver and discuss these in a way that would be useful and meaningful at an academic and professional level.

Finally I identified improvements, unknowns, grey areas and or complexities and challenged these assumptions or derivations. From this, themes, patterns, similarities and disparities that emerged were
analysed in detail, the scope and focus of each of the themes were refined and informative labels were decided. To reiterate, the themes in question emerged iteratively as I worked back and forth and progressively and I moved from step to step, reflecting the different encounters I had with personnel. Indeed as I circumvented through field work, I ensured that I included a constant line of enquiry that enabled me to increase veracity of emerging themes and iteratively and rigorously pursued better understanding of these. The themes that emerged from my analysis spanned various areas of work, such that these required and were additionally sorted to retain those that aligned with study goals, field of study and pertinently drew focus on expanding on the answers to the research questions. The resulting themes are outlined in the empirical results and in keeping with the spirit of ethnography, exemplified in ‘cases’ or ‘vignettes’ and reported speech some of which are included in this report, for the purpose of indicating the general themes behind them and lending understanding to the research process and findings.

3.8 Ethical consideration

Participants were advanced guarantees that their responses would be treated confidentially. This is particularly important in police work for some fairly obvious reasons. Not only are officers organisationally accountable for their actions, there are also legal and moral issues. Certain information has ramifications for criminal investigation and had to be treated with great care. There was a high need for confidentiality as observations meant that data about individuals not connected to the study did come into play (Ethics Guidebook, 2015). Prior to the commencement of the study, an outline statement of intent and working policy was shared, discussed and agreed by business unit leaders responsible for enabling access. Some security checks and risk assessments including a police/conviction record check were conducted with respect to me as a researcher.

A series of meetings were held to discuss the safety and professional practices required. It was also agreed that my field notes would be paper based with computer based information limited to specific identifiers which would be required to validate enumeration and organisation of information prior to reporting. A significant portion of the information related to the study was stored in a secure cloud workspace with nominal data held on my personal computer. I further set up a protocol for handling my telephone and managing records on it as I was given unlisted numbers to directly liaise with numerous business unit leaders.

Other ethical considerations included consent to interview, seeking permission to access officers, prevention of breach of confidentiality with professional and elite interviewees, managing intellectual property, researcher safety, disclosures of matters of concern and systems for debriefing if conducting research on potentially sensitive topics (Ethics Guidebook, 2015; Bernard, 2012; Research methodology, 2015; Creswell, 2003)

Although this study examined the working life and accessed opinions of police officers it was not intended to project perspectives and opinions by identifying individuals in any way, rather it was to gain insight and understanding of various viewpoints to enable characterisation and identification of trends. Recognising ethical considerations meant a commitment to transparency during data collection and analysis and recognition of the power relations between myself as a researcher and the participants.

My position of objectivity and respect for confidentiality, where relevant, forms a good basis for research, enabling openness and honesty throughout. Information of a private nature that was shared
incidentally has been left out or heavily disguised in this report. The police force staff who participated have been given clear identity protection. Names and collar numbers have not been included in the report and where necessary, dialogue and narrative is related without disclosing more than the rank or position of the speaker.

Information which could be considered sensitive and or constitute a breach of the secrets act, data protection act and or any other professional incidentals and or details of citizens incidental to this study are obfuscated and or only included in a way that does not enable direct recognition or traceability. Observations where third parties are involved did not record names or details, which can reveal the personal attributes or details of incidental participants whose action is not being observed. Recognisable descriptions of third parties with respect to this study are not included in the report and any sensitive information encountered during the study has not been summarised in a way that breaches data protection guidelines.

Integrity, commitment, a scholarly approach, genuine interest and willingness to balance lines of enquiry with reflexivity and affectivity were important elements to consider within the scope of ethical consideration due to the inevitable crisis that may often arise due to implied or assumed moral and or intellectual authority. Absorbing experiences and reporting on selected elements was reviewed to retain the true value of material relevant to the field of study, topic and rigorous answers to the research questions. It is important to clarity within this segment that the process of lengthy immersion also includes feelings as a researcher, shifts in power dynamics during immersion and the propulsion to summarise these findings without giving clear insights would affect the overall understanding of the work itself. Where relevant and possible, I have documented the impact of observations and the study on my feelings and that of participants and contextually highlighted where emotions and power dynamics or the shift thereof have played a role.
Chapter 4
Empirical findings

Chapter 4 is organised around the presentation of the ethnographic study findings in a thematic way to initiate answering research questions and bring findings into focus. It begins with an introduction to the emerging themes and sets out perspectives gained over a number of topical areas such as usage, mode of engagement, implementations, change management, innovation, and role of technologies and impact of use using thick descriptions that highlight the patterns of social and cultural relationships contextually.

4.1 Overview

“Technology is not everything, you can’t copy 25 years of working with the best, the intel, the street knowledge, experience of long serving response centre staff and the CID out of anyone’s brain. You need humans to pass it on to” – Control Room Inspector

Technology in policing can be perceived with ambiguity when considered peripherally. The logical expectations that technology creates a better policing service and ease the execution of duty. In reality the key to better policing lies in knowledge. In particular, the driving force for officers, first responders and operational staff is knowledge of the citizens, their habits, their culture and their acquired and environmentally induced behaviours.

The core question that this study asks relates to how the police force utilises and engages with ICT in order to facilitate safety and security of citizens and fight crime. In order to answer this question, it is necessary to consider the way in which ICT is managed at Bedfordshire police and engage some of the key modalities identified during analysis of field immersion.

Bedfordshire police force pools resources with two neighbouring police forces. Hertfordshire and Cambridgeshire police forces blend resources with Bedfordshire in order to meet their needs under a strategic alliance and digital collaboration agreement. The police force is tasked with transforming its approach by redesigning its services and operational models to ensure that the police are increasingly ready to meet and keep up with the fast pace of innovation.

The rudiments of policing in Bedfordshire are dependent on understanding the terrain, knowing the neighbourhood, awareness of demographics and strategic approaches to policing that are adopted. These multiple and intricate elements of policing are entwined with information and communications technology at Bedfordshire county police force.

For Bedfordshire police force, policing involves an area which includes municipal boroughs with known ethnic imbalances and significant diversity. Many areas consist of a mix of middle to upper class residencies often short distances away from areas with marked social and economic imbalances. The cultural, rural and economic dynamics that exist influence the types of crimes that occur. Technology use is primarily for the facilitation of routine tasks, particularly to maximise time spent on actual policing and limit time spent ratifying and recording information.
The use of a mix of technologies aids and eases the collection, storage and management of crime records within county specific databases and police national computer information systems. The systems in use have limited scope to promote codification of tacit and non tacit knowledge and intelligence. They rely, above all, on inputs from officers, inputs that cannot always be guaranteed given shortage of time. They nevertheless enable collation for key data to support enablement of priorities, policy and business intelligence led goals.

“My role as an ICT director is to perform as a functional resource. I have to make myself available to the business leaders from three forces, and act on their ICT needs to support their business cases. In this particular area there are times where the solutions my department can deliver are simply put, bound by the limitations of the business leaders and their business case. Theirs is to deliver a business case to me that is founded on strong awareness of their own needs and that is aligned with the overall digital collaboration agreements within the triforce that importantly accounts for the needs and future plans for each force.” ~ Director ICT BCH

In the area of innovation and bridging interdependencies with neighbouring forces, Bedfordshire police force like many forces tend to adopt technologies based on exemplars of successful use in other regions and are at times constrained and led by choices made by the home office and implemented globally in all forces. That is not to say that these solutions from central government are particularly successful.

We do get various new types of technologies to try and sometimes we engage with officers who will triage and report on these technologies. There is a somewhat steady influx of interesting and exciting devices and tools but irrespective of this we are budget constrained. When you hear the cost of the item itself and sometimes when you check if it is on an open market and see the price disparities or even more so, when you read new policies or directives on what we can and cannot do, suddenly, the attractive gadget does not seem so attractive. At other times, gadgets are wonderful on a small scale, but trying to deploy them to several officers at once flags up inconsistencies that indicate they are not suitable or ready for the type of use we will subject them to or that they will not meet our needs or that they will not stand the test of time. That all said we are part of a triforce. Just because we like something here does not mean we dictate what gets adopted. Our technology is a joint venture and beyond that if we want anything, our joint pools are still constrained by local government revenues and central government budgets – Mobilisation and Digital implementation Superintendent Bedfordshire police

Business leaders are tasked with the role of developing business cases that will often firstly account for the various demands imposed through scrutiny, through government policy and through directives. In many instances, the business cases will also be influenced by notable events and or decisions from reviews or enquiries. It is not to say that these are not relevant or appropriate, however it is important to note that the imposition through directives of what must be done when enquiries are conducted often brings an imposition of shifted perspectives and priorities to the fore. In effect, these elements influence the robustness and direction of business case and ICT requirements and may misalign
demands with the longer term purpose of police forces which is of course not policy enactment or subdued management of security but is active protection of the citizens and learning from the past.

When planning takes place in central government, it is different from what will happen when a police force outside the eyeline of the planners needs to fit these ‘planned’ directives into their business case and implement it, it does not account for the timelines from decision to implementation which can often sit outside the scope and control of localised business leaders within each force. Industry standards, sustainability, efficiency, effectiveness and local variations alongside political and stakeholder views and needs are also therefore influencers of choices with respect to information and communication technology usage.

Most marked in this force is the evident desire by all staff to work cohesively to promote and support the organisation. In practicality, each field immersion period enabled and immediately yielded up insights into the working process and flow of information as well as dynamics that coexist around the use of technologies contributing to a robust bulk of information from different dynamic events and locations.

The average patrol officer wants to do a few things: prevent crime, promote safety and respond to crimes where there is risk to peaceful living or danger to persons. A lot of this actually involves rational thought not gadgets. For example whilst on your way to a called in job, also consider and remain alert to what is going on around you as you make your way to a job. Our primary role revolves around reacting in a way that builds public confidence and supports crime prevention and for that you cannot be oblivious to what goes on around you – police constable

With diminished staffing levels, the focus on technology is even greater especially so, there is a need to promote a feeling of togetherness and bridge gaps between senior and junior staff using better and more effective reporting tools. Indeed, improved technology is clearly needed; however this force has demonstrated resilience in doing what they can with what they have. They additionally express understanding of emerging and existing limitations due to the way in which they are governed centrally and limited locally through policy and legislation.

4.1.1 The Control room

“The usage of our resources is a joint responsibility and we as call handlers need to decide not only how best to record a crime, but also whether or not the information is relevant and or constitutes a crime” – call handler – first response control room

The control room is a small open plan office with an average of 15-20 first response officers triaging and answering emergency and non emergency calls throughout the county. They share the space with a small team of 5-8 crime investigation bureau staff who manage intermediate crime investigations and organise appointments for fleet community officers to call on victims of non critical crime. The workers sit in mini cubicle desks fitted with medium sized computer screens, aged switchboard phone systems with hook over hands free headsets to enable hands free talking. Sound quality is sometimes poor and the staff often work with several windows open at the same time on the computers in order
to query and input data into multiple software systems as calls demand. There are currently up to 250
database systems in use in the control room amidst a range of enquiry systems, some of which are
managed by other public service agencies.

"We have had several years of being told that the financial situation was such that
we could have our workforce moved to another county and our first response centre
would be closed. The most difficult and concerning aspect of this for us was knowing
that if we are shut down, our local knowledge and bank of information and
intelligence would be erased. Officers who work here are locals who bring
intelligence to work and retain intelligence through experience. Its internalised
knowledge. The new recruits learn and benefit from it. We ended up staying, but the
uncertainties we see day to day mean that all that experience and knowledge could
be lost. Leaving the area limits our capabilities, being near those we serve gives a
reassurance that is significant." – control room supervisor - first response control

It is apparent from this quote that systems in and of themselves do not ensure that organisational
knowledge is retained. This means that, rightly so, the workers become specialist intellectual assets
akin to tools in that fewer and fewer members of staff have the in-depth knowledge needed to operate
the systems that will guarantee retention of knowledge or access to it and as such their functional use
is limited to those who have good experience and hold the knowledge to exploit what value they have
appropriately.

The decisions and actions to enable enforcement of the law including those made at the first contact
control centre depend on human input of knowledge into databases. This officer is very much
centered by the prospect that policy decisions about manpower might result in the disappearance of
local knowledge, knowledge which, in his opinion, is only gained through experience of local
conditions.

“We have to log all calls with the exception of crimes where the victim did not witness the
incident such as a burglary or break ins which we pass to the crime investigation bureau
staff” – First response call handler

“When I receive a call, my priorities are to listen effectively, hear and record effectively. It
is often not possible to immediately log a job in full. Whatever information we are given, we
know that there just aren’t enough people on patrol” – First response call handler

“You cannot just log anything and everything, if we sit here and log calls without thinking,
we suffer and the people living in our county suffer because we waste all the resources they
give us and fail them as police officers” – First response call handler

When calls arrive at the contact centre, they are nominally queued according to priority with 999 calls
taking precedence. Each call received is input onto a database system and call handlers are tasked
with first line querying of any of over 250 database systems used at the centre and subjectively
assessed using interrogatory and motivational telephone interviewing.

“When someone calls in with complex and multiple issues, it becomes really hard for us to
decide what we can do for them. Sometimes callers report several issues at once and it is
up to us to make a judgement about what to do. Yes the caller has reported a problem or
crime, but which problem or crime do we record” – First response call handler
“We have training issues. It is no longer the norm to buddy up new staff for extended periods, there simply aren’t enough of us here. Sometimes, things slip through the cracks and we get inconsistencies in the advice, oversight in logged situations that mean officers go out to dead jobs or make time wasting calls” – First response call handler

The categories available in the system do not, observerly in and of themselves, give call takers an unambiguous decision about how to categorise a call. The first priority is to manage the situation using existing intelligence, intuition and the on hand supplied information to determine the best path of action. Jobs are fed through to the radio control team after conferring between colleagues. This usually engages one to two other team members in a dialogue where tacit knowledge is shared and existing data is analysed carefully to identify patterns or key issues that are critical.

Once a caller hangs up, quick decisions are made which may lead to further calls of enquiry from the control centre to citizens or indeed to other departments that manage real time visual data systems such as traffic scan systems and closed circuit television [CCTV] systems. Computer based intelligence is also retrieved and appended on an ongoing basis as this enables the radio control to deliver knowledge to the street patrol officers. A range of technologies are in play while this goes on including information systems, phones, computers, closed circuit television screens, hands free headsets, airwave radio bases and so on. As such, these technologies can be thought of as an ‘infrastructure’ or ‘ecology’ of resources. The use of these resources, however, depends on a variety of issues, of which training is one of the most important.

There are some plans to migrate the control room to one of the newer structures on the headquarter site. The anticipation is accompanied by scepticism and the staff are unsure. However they do speak with some relative enthusiasm and hope for the future despite disappointments in the past. The completion of these plans were as yet unconfirmed at the time of completing the study.

The contingencies such as direct transfer on for callers who misuse the police service to enable escalation to appropriately suited and relevant public services with logs of calls handled on behalf of other agencies will be a useful tool to call management staff. With policing teams increasingly being used as a first response, first port of call service by citizens to manage real emergencies, existing risks and obscure demands some of which relate not to policing but to other areas of service best served by other public agencies. There is a real strain on policing staff as to where and how to handle and sustain recording of information received.

Out of date technology contributes to feelings of inadequacy and can promote withdrawal of commitment. This can lead to the facilitation of slow adoption of poor working cultures focussed on finding explanations rather than delivering solutions. Indeed where it concerns the significant spill over from other public services, what is apparent is that other public agencies take a less emphatic approach to funding cuts and simply disinvest time and support to services which could handle many matters and with such events comes a gap in services which citizens often demand police fill. The staff at Bedfordshire police force work to fill these gaps, however in many instances, it was clear that the role that beat and fleet officers were being expected to take was not one that was within the caveats of their expertise, knowledge or scope of control.

The main precursor to this is the knowledge that police cannot ignore calls and indeed also knowing that police services are available round the clock. In the control room, the staff were aware that they
had the hope of a small multidisciplinary team mainly to manage social health issues but the presence was indicatively observed to be microscopic when related to the demand. There is a distance felt between senior staff and first responding staff and call handlers. Presence and approachability of senior staff who demonstrate an awareness of and understanding of the high pressure critical role first call handlers encounter may boost morale levels and give staff purpose and direction, particularly giving them the confidence that their needs are seen too with respect to technologies and working processes.

There are some issues regarding expenditure on training of staff and on managing the existing systems. Funding limitations and demands for efficacy have impacted on how long and how much training is given. That said, with the dynamic nature of policing, it can be said to a fair extent that training in the use of technologies requires balancing that is best assimilated on the job and in the role.

As is noted in the vignettes which accompany this report, it was apparent that the police force share interdependencies with many government agencies. These interdependencies predominantly lie unharnessed and man hours are lost with workers juggling between high numbers of databases, which increases the burden on the call handling staff. With plans to implement new systems that use even newer technologies, it is not known whether this will further distance or better align the current processes used to those in other agencies in a beneficial way or continue to enable connectivity of interdependencies. It is also not clear whether other agencies will be in readiness to work with the force when this happens and or understand the need to place relevant value on the presence of the police as a working partner in the success of the communities they serve. It is also unclear whether the anticipated ease to working processes will lead to increased workload and or impact on performance levels. It is relevant additionally to clarify that staff members are not engaged in the active development of ICT and business leaders are often not all actively included in influencing the procurement process.

### 4.1.2 Radio Despatch

"*Our first responders have a fending baton, tasers, body worn cameras, disarming spray, handcuffs and a car with siren activation systems. They're supplied with phones and notebook computers too. But their lifeline, our tool to enable the officers to get into their element is the radio. Frankly; there is no other rational way to get information across whilst enabling a speedy response."* – First response Radio Dispatch controller

The radio operators share the same space with the call handlers situated in one corner of the control room. They are split into two teams, one managing the north and the other the south Bedfordshire response vehicle dispatch. Their desks are serviced with three to four computer screens per single person workstation tuned in to maps, location of fleet officers and queued jobs with one free to enable the sending of emails, database and information management querying ad hoc.

"*The complexity is multitasking within the working space and remembering which system to use to do what*"- radio dispatch controller
At this particular first point response level, a traditional pedal operated radio system becomes the most important piece of technology that the force uses.

“You need two officers per car to enable realistic use of ‘fiddly’ in car systems, you can spread the officers to one able officer per car when there’s a radio communications system. If there’s a large amount of critical intelligence or background info, the key points go across the radio and the rest is emailed to their phones. If they cannot get to their phones and a location simultaneously in a safe and speedy way; its back to and down to the radio control to drip feed them with data.” – first response centre inspector

In the investigations team, various crimes are managed by a team split across domestic, serious and increasingly digitally enabled crime. Technologies in use are multifaceted, spanning surveillance equipment to basic field equipment.

"We are struggling and 'managing' without complex or huge expectations. In reality despite all the different complex issues and limitations we have, the public overview is limited and expectations are very high. In reality we are approaching situations where the criminals have better or more sophisticated technology and we are playing catch up. Good hard policing is still the rule of the day, but today's good policeman wants technology that works and presents a better way of working to protect and save lives” – First response radio dispatch controller

The room ceilings have large TV screens placed in the corners which switch constantly providing footage from city centre CCTV in all the local town centres in the county including high human traffic hubs such as markets, shopping colonnades, bars and restaurants. Staff keep an eye on these screens and tasks and call outs including deployment of officers and or backup support are generated based on observation of events on the CCTV.

“That said it is a one way system and only one officer can call in at a time. One could argue that multiple channels can be used, but then the radio serves a multiple purpose. It keeps officers who are on duty informed; they listen to the radio conversation as an active part of work. It guides officers to locations, we have no GPS in our squad cars, and officers either know the way there or ask over the radio. It gets information to officers without compromising on response times and cuts the times from call out to arrival on scene enormously. It helps officers who cannot access cell coverage or computers to request and get clarity, assistance, intelligence and support. It works almost like a safety tool as it enables officers to drive on scene situations across to the control room to enable decisions about reinforcement to be made. No other gadget is as vital as that radio, it's a lifeline” – Oscar One, First response dispatch inspector

During high alert and or critical periods where anxiety and the strain of emergency work is high, the collective team morale is boosted by these light hearted interactions interspersed with pep talk from Oscar 1 and Oscar 2 , the duty inspector and team supervising officer. There are nominal facilities after office hours, a small well equipped kitchen with seating for up to 8 and a small television serving as the ‘lunch’ break room. Basic Bathroom facilities are provided with a canteen during office hours serving refreshments at moderate to high end prices. There are no exercise or recreation areas for staff
doing late shifts and staff take walks outside the building for up to ten minutes if workload lessens, in the dark often accompanying each other as a pair for safety.

The investigation of various crimes are managed by teams split across domestic, serious and increasingly digitally enabled crime. Technologies in use are multifaceted spanning surveillance equipment to basic field equipment.

"We are struggling and 'managing' without complex or huge expectations. In reality despite all the different complex issues and limitations we have, the public overview is limited and expectations are very high. In reality we are approaching situations where the criminals have better or more sophisticated technology and we are playing catch up. Good hard policing is still the rule of the day, but today's good policeman wants technology that works and presents a better way of working to protect and save lives” – Oscar One, First response dispatch inspector

The collocation of the first response, call management, first despatch, routine despatch and duty inspector works well, however police officers do not come into face to face contact with the control room, despite being collocated at the same site. They are also not able to feed into CCTV footage from the control room, nor is the control room able to access body camera data for knowledge management or future clarification.

“Our officers have body worn cameras and they are invaluable in limiting the use of resources to effect prosecutions and indeed to limit the workload of staff who perform investigations. That said, we cannot retain all data from body worn cameras. In the first instance, we simply do not have the capacity to do so. In the other instance, we have to comply with data use laws and finally, we have to consider the scope of the type of incident from the attending officers view and enable them to decide if material is indeed of value -through sustained training.” – ICT Director BCH

Airwave radio remains the best and most relied upon tool worldwide, however the centre is understaffed and technology is old. This limits the amount of support that the radio despatch can give to the staff that are in the response fleet or on foot going from job to job. The airwave radio accounts for all communications to officers from the control room except for more lengthy background material which is emailed to mobile devices. Airwave radio systems are used worldwide by police forces to transmit information in a similar way. The radio is a one way-one call system only and in this respect it is rational to work to include more radio communication ports and have more staff to reduce backlogs and support officers quicker and efficiently.

4.1.3 The response fleet

“It is appropriate to expect fleet to stay out there in the community and build capacity. But it is not enough to give out gadgets and spend money on wireless beacons so as to be seen to be ‘using’ technology. Tech needs to be designed around us and with us and it needs to work or people will not use them.” – Fleet sergeant
The response fleets are managed in two separate locations serving the south of Bedfordshire from Luton and the North of Bedfordshire from Kempston. Each response fleet is led by two fleet duty sergeants who also respond to incidents when there is an overflow. Officers check in with their fleet duty sergeants who keep in contact with the radio control despatch. The sergeants are supported by a duty inspector who also extends supervision to the custody sergeants.

The sergeants are often located in near proximity to the duty inspector who manages the issues that may arise with fleet and custody. The officers have a mess room they can use to manage paperwork, dock and charge gadgets. It also functions as a rest, interaction, planning and communication room.

“The job has become a different thing in recent years and we are often called out to incidents that can be managed with community resolutions. Increasingly we are called out to police petty issues and to support people who would really be appropriately served by local authorities and social care services. Instead we are lumbered with it and sometimes, when officers are repeatedly exposed to these emotionally challenging situations where their skills as police officers do not extend to social care and counselling. It can affect them a lot. What with the inherent stress of the job, you don’t want to go to call outs where you walk away wishing you could help but knowing it is not only outside your remit but that what the citizen needs is not part of your job in any way.” – Duty fleet sergeant

With officers increasingly single crewed, the mess room provides them with a vital means of speaking to other officers and enables conferencing and planning should there be need to plan and send out a collection of fleet cars together to one location to manage an incident. That said, for some of the activities that officers may return to the mess room for, there is technology embedded into their vehicles to do so.

“So we have phones and laptops and you’re sitting there in a lay by trying to do some nominal paperwork. The thing is after switching it all on, it might not work. You cannot get internet access, network goes off, strangely for example, my personal phone is on the same network as my work phone. I have reception on my personal phone everywhere, I struggle to get one bar on my work phone everywhere. That is not to say it does not work sometimes, it is to say that instead of continued battling, the easiest thing is sometimes to just use your personal phone for quick calls” – police constable

The office mess also provides access to desktop computers with larger screens and indeed this is an attraction as the laptops range in size from older ones with 15 inch screens to smaller new ones the size of a tablet. Some of the smaller items have removable lids so they can be folded and stood up to view information ergonomically, but for repeated data input, they can sometimes be difficult..

“The problem with a lot of these officers is that they sometimes do not really know how to completely maximise that technology. Take for instance sometimes officers come into the mess and complain that they cannot get reception on their laptop. It turns out they simply do not know how to tap into the network beacon on the tops of those cars. I have even had officers who did not know they had ‘wifi’ in the beacon”- Response fleet sergeant
Technology is important for the officers and they use a variety of tools such as in office computers to monitor and log information that piles up as they are sent from job to job. Although officers pile up paperwork and make a pit stop to use the computer, most do so because the moment they finish a job they are sent to another and they don’t get that time to stop and have comfort breaks or do routine paperwork on the spot. They also come in to sit at a table of some sort to eat and make use of bathroom facilities. They can also file requests for equipment replacements and stop to speak to the duty sergeant to get advice and for supervision discussions. This helps them with compliance and enables better decision making on the road.

In field case use demonstrated that the radio systems that are used to give work out to the fleet are reported by high numbers to be inadequate. Officers cite the ambulance service that allows access to a job using purpose built and readily visible digital access consoles in vehicles. Many respondents from the fleet response felt they would benefit from this ‘upgrade’ to their vehicles and additionally from better system uptime.

It was also interesting to see that the officers seem to benefit from contact in the mess room and often they used this chance to exchange knowledge and intelligence and to confer about certain hotspots and issues in a more robust way than could be achieved using technology alone.

It was apparent that a lot of officers were returning to the office because their devices do not work. They struggle a lot with reception on mobile phones. This meant that often the sergeant had to call and ask radio dispatch to radio in to tell an officer to come into the office only to find he has had no mobile reception on his work phone for a good few days.

“It is altogether nice to make my car my office. But when we are busy or when we are all being resourced to different jobs. You don’t get a moment to stop and to be honest, sometimes you really want to go over the issues in a case with another officer or speak to the sergeant. But even now the sergeant and duty inspector are so rushed off their feet that you can go in there and unless its shift change time, there is no one to sound off. Calling someone by radio is an option, but the radio system is so vital it is best used to send short messages, not for long conversations.” – Police constable

In some cases, officers find themselves called out while they battle to make their phone or computer work and in some instances, they deliberately ‘forget’ their laptops inside the office mess, and then report that they cannot find it many days later, so that they do not have to repeatedly explain that the technology does not work. At other times, information is received but it is impractical to access this whilst rushing to attend an emergency which reduces efficiency, efficacy and overall turnaround of fleet operatives. It is additionally important to consider the limitations to changing or renewing technology given the resourcing and financing constraints the police experience can limit the scope of the force to replace or substitute devices. The decision making that controls how, when and what devices are given out is not one that has any autonomous decision from junior staff. Essentially, they get what they are given.
4.1.4 Serious Crime and specialist work

For what it is worth, we know that we have technology that cannot be seen anywhere else. That is to say, the technology is so old, nobody outside of the police force would risk their credibility by using it. – DCI serious and organised crime

The serious and organised crime department is comprised of a good number of non frontline staff and some core frontline staff such as armed police response teams, covert and office based digital investigation teams, criminal and forensics specialists, detectives and researchers. They are a relatively small team when considering the amount of work they are expected to do.

“Web connectivity is a persistent issue in our work. Although we are supposed to use it a great deal, when tech and web access consistently doesn’t work, it presents us with a problem”- DCI Serious crime

The specialist teams work with technology that is often not available to other departments however the issues with these technologies is that they are old and sometimes they are no longer fit for purpose. Connectivity, obsoleteness and reliability are significant problems which impede work.

“The criminals have technologies which we cannot simulate appropriately and in turn our technology is what can be described as adequate. It is not rational to be pursuing criminal using systems that are not adequate for the task and are simply adequate for policing.”

The teams stimulate and work together to support fleet services in some cases and to follow up on intelligence but often have to work with outdated systems and sit within very strict constraints and limitations to scope and applicability of their systems.

“It is very important to understand the problems of innovative crime and to appreciate that the surveillance technologies are not giving us the advantage we need to disrupt crime as well as we know we can” – Detective chief inspector Serious Crime

On any given day, workers may encounter multiple failures within the ICT systems they use. Workers are very aware of the restrictive nature of working that comes into play when they are held back by technology that is no longer fit for purpose. Despite still being fit for use in the sense that they perform some tasks, but perhaps not the tasks that are necessary or in effect simply not ‘broken’ yet given the sophistication of new technology aided crimes they are not suitable. It is also difficult for investigators to keep up with and adapt to newer ways of investigating crimes when faced with this.

In the area of serious crime, there are many innovative technologies widely available but limited in deployment at Bedfordshire police. In light of the limited training and awareness they are limited in their expertise to existing systems. Without active provision or enablement of access to and harnessing of training to understand and utilise the full breadth of newer tools, increased awareness of sophisticated crime exist but tools to disrupt these are limited. Crimes hinged on the internet of things [IOT], particularly those that are ubiquitous and harnessed by modern software and hardware and
crimes that are perpetuated using newer dark web and encrypted communications tools still remain difficult to disrupt due to these limitations.

A part of the work of serious crime management is highly constrained by the principles and rubrics of policy, statutory guidance, legislation and strict data collection, management and usage laws. Technology failures and inadequacy particularly outdated equipment and consistent web outages appear to be consistent across one or more services who work to disrupt crime. To some extent the organisation and core management relevant to needs elicitation and process and policy alignment to tasks and needs for the purpose of satisfying risk management for serious crime is also limited. There is enthusiasm and optimism and continued technology use despite this and workers find more and more adequate ways to make systems work for them or work with systems that are not completely functional to do the best they can.

4.2 Technology use Case scenarios /vignettes

Here, I offer some vignettes which demonstrate the different uses to which technology can be put and the organisational constraints that determine what use it may be put to. Some of these constraints, as we shall see, are legal, and others have to do with coordination problems across different police forces and with other agencies and sometimes between business leaders who are constrained by narrowing of tasks and duties within their roles and or limited in scope of activity. In some cases, they also relate to poor management and support and increased reliance on police forces as a first defer to or go to service. These vignettes also enable contextual visualisation of duties and how technology is engaged

4.2.1 Managing delinquency

A call was received by first dispatchers in the late hours of the night at a weekend. My current shadow position was with one of the radio dispatchers for the Luton south radio despatch team. The radio dispatcher had to stop for some time and make a quick gesture to Oscar 1 who came over and had a conversation. Services needed to be reprioritised, this was a minor in an emergency I was told. In the flurry of activity that ensued, coincidentally a radio dispatcher from the north team piped up in recognition. The Oscar 2 officer also returned from his break at around the same time. Their first comments almost in unison were “he’s out”.

For a brief few minutes I was the outsider as the dispatchers conferred, they needed to find out if they had an up to date MISPER, I was told. MISPER is an acronym used to refer to the missing person’s database. The missing person’s database is used to collect information about any person who goes missing. Files are updated if the individual is a persistent absconder from home or places of safety. The file would have a digital ready image of the person, a description and any recognisable features and list the details of all the locations they are known to frequent and or visit including details of any persons known to be in their social circles and locations where they have been found in the past.

I am given insight into the case at hand. A young man YM1 has been in and out of correctional facilities since his teenage years and was recently released into the community. He is now almost an adult but still of an age requiring statutory parenting by the local authority he has been released into, presenting with marked risks of exploitation. The call has come from staff who have observed YM1 being taken away from the street outside the co located residence he lives in circumstances believed to be against his will. They have also recognised the vehicle as one driven by a known drug peddler who operates across Essex, Cambridgeshire and Bedfordshire.
YM1 has been through the criminal justice system multiple times, starting with petty and escalating to significant crimes building up a criminal record unusual for one so young.

The police staff also pull up closed circuit television footage of the local hotspots and spend some significant time poring through each moving image fed in from videos located in and around the town centres and localities in the county. They appear very perplexed as they will technology to aid them. The radio dispatcher finally finds a fleet officer free and he is given details through the one way radio system. Then the radio dispatcher meticulously sends him an email with some further documents.

At the end of the activities at hand, I have some questions for the radio dispatcher. How will the fleet officer and street bound officer use his phone to access the extra information if he is meant to be driving. He explains that this is the mode for sending additional information to street or vehicle bound officers. At this point I walk across to the management desk. I am intrigued by the hubbub of activity and I have questions. I wait until Oscar one is free and as I ask how the police can help such a child if he is prone to running away. Between Oscar 1 and 2 they ring around to several places and identify his most recent whereabouts.

He has, it seems, been to a family member’s home earlier and then departed for his accommodation. There is a lull whilst officers make the journeys and feedback via radio with status updates. For the first time that evening, I realise that Oscar 1 has a look of sadness in his eyes.

“He is what we often see classed as an at risk delinquent runner. He often returns to two locations to his family and so when he vanishes, sometimes a quick call to Intel contacts for them will find him”

“Now here is the dilemma. He has developed a sense of entitlement and an ingrained rebellion against authority because instead of giving practical aid ......” and he glances at me “I don’t mean courses or social workers door knocking. I mean actually sitting with this family and working out what has caused problems and how they can be supported to fix it’

“snatching a child is described in our policing protocol as ‘a last resort’, but in majority of our calls or assistance, we find that local authorities use this as a tool which defies our continued efforts to build and sustain good relationships and at times the data they generate is highly skewed and also lacking in any value except to achieve an aim of driving compliance through fear which usually encourages families to hide and to keep silent, when there is aid available for their needs”

“In any event as far as the child is concerned, irrespective of his stints in prison or as we call it juvenile detention, he knows that he can walk out. He associates with people who know how to play on a child’s vulnerability. Yes he will feel being he has been in prison this makes him an adult, but actually, he is still a child and we have to keep him safe.”

I ask questions about how technology can help, does the control room have a means of letting the duty inspector access social workers in an emergency and do they know how and what to do to help YM1 should they find him. As he begins to answer, the cheers come across the radio from one of the vehicle bound officers. A street bound officer has indicated to them that the car he got into usually plies the inter-county drug supply route to Essex. This has prompted a call to Essex police who have actually got him in their custody. The case is passed to Oscar 2 who then has to make arrangement.
And at this point I have more questions. How and why is it possible that YM1 has been stopped by police in Essex and held for some time but yet the police in Bedfordshire cannot access that information? I jot down my questions and just before my break I go back to sit with Oscar One and we speak a little while taking a quick breather and I then show him my list of questions.

“The technology dilemma is complex. We do not share systems with Essex police and he cannot be listed on PNC [police national computer] just because he was encountered in a fruitless stop and search or dispersion of possible public order breach. At the same time, the social care system also does not share records. Through a good deal of footwork, we have been able to add as much Intel as we can to our MISPERS system. So we have an ‘action plan’ attached to that. But on foot patrol, when an officer checks in on someone there is no guarantee of a pick up on the MISPERS flag. And here is another twist, a couple of our officers here know the lad, but he was only released from a 2 year custodial sentence some weeks ago. So in our control room, when we hear his name mentioned, the force of local knowledge prevails and officers remember him and know what to do. Last time we had to go hunt for him, he was 12/13 back then, and now he is 16. How do you control a 16 year old who lives in a glorified hotel?”

“That aside, the Intel we now have is that he has been back running drugs since he got out of prison for a drug dealer in Essex counties. He had to turn in monies and that drug dealer arrived and bundled him into a car and drove off. The hostel staff reported him as abducted. By the time we sight him again, he is in Essex and there as he says of his own free will. No shared Intel on common internal systems to ours and even on the Hertfordshire and Cambridgeshire’s channels tells us that. So police officers there cannot detain him if he is not committing any crime. Remember, we don’t have an arsenal of officers dedicated to hunting a 16 year old who knows how to evade us.”

In the time that has elapsed, a call comes from a relative who calls the control room to say he has been asked to leave as they know he is reported missing from his accommodation.

“He stayed with one relative and we were informed via phone. And we cannot go there and just arrest him: all we can do is log his location. In this short time, he has moved on again to another relative’s home. So another call has just come. Now the relative is elderly, their argument is she is aware her home is listed as a safe place, but she does not want him there.” “We used to have a policy where we could arrest a juvenile or criminal even if they are not committing any crime.”

He engages in dialogue with Oscar 2 and they both make some calls to senior colleagues on duty in custody and fleet on the other side of the premises.

“So if we could arrest him under a particular section of the law that addresses preventing the individual from bringing themselves to harm” “But the problem is how will it be viewed by advocates who aren’t in the thick of it and importantly could there later be a blight where we are accused of misuse of powers.”
Finally, I see relief come to Oscar 1’s face and I realise he is pleased to see YM1 is not to be left to wander for the rest of the long night shift.

“Yes, we may go with that one and we hope he will still be at this relative when we arrive.”

The entire two to three hour situation that had dominated the emotive state of the control room finally calms and a dispatcher is queued to go and see if he can be picked up.

Disparities in the purpose of protection services and the increased pressure on police to support the work of local authorities and the increased demand for such support requires resources and has increased pressures on police staff at Bedfordshire. In field this is resonated by the types of calls and the types of requests, a vast array of service providers in the public sector are predominantly cutting their level of input into certain support systems and this creates a workload of a new kind for police officers. The fears of scrutiny and the errors of the past mean that they cannot refuse to respond to what is presented as an emergency nor can they refuse support even if they do not agree with it and or have other opinions on management thereof for social cases which relate to areas of medicine that really do require specialist care.

Recently, the local mental health team has begun to supply a bank of ‘sitting in’ mental health workers who crew with police, but this is not enough to manage the entire spill over. Often police officers have to take charge of citizens who present with medical issues some of which are psychosomatic and indeed until the citizen is given a health clearance at a hospital, it ties officers up guarding and waiting on a citizen they have arrested. In many cases, other arrests are often related to low value crimes such as shoplifting and or pick pocketing or social disorder. Until they de-arrest a citizen, the police are responsible for the welfare of the citizen and can be held liable if they come to any harm.

The limitations of technology with respect to protective powers is also an issue that this situation highlights. The limitations imposed are due to information systems that are not synchronised or shared explicitly due in part to issues such as legislative, regulatory and territorial resistance issues as highlighted by the public sector research centre (Pricewaterhouse Coopers’ public sector research centre, 2007).

In this control room case, MISPER did not have details of prison releases and the solutions for YM1 required calls to different departments and interaction with multiple databanks to develop a solution best suited to his situation. Key technology utilised here were the communications radio, telephone, computer databases, and surveillance cameras. Key promoters of success in bringing the incident under control were supported by technology rather than effected by technology.

The dominant skills in play were insight and experience, street knowledge, tacit un-codified knowledge of YM1 and the area in general. The factors that promoted success were inter-force relationships, tacit knowledge retained as noted by older serving staff who recalled the subject and his history, along with the persistent dialogue and brainstorming to make group decisions. Consultation with databanks to ratify legal standing and find solutions also came into play and indeed in this case, the databanks needed staff that were long standing and had knowledge of use and access.
4.2.2 Managing beat patrol in fleet cars

I am paired with a single crewed fleet car with an officer who is referred to as PCA in this segment. He is out on the beat and also on priority call should an emergency arise. There is no navigation console in the vehicle;

“Our phones have satellite navigation systems” he tells me, “besides; you need to know your way around without a gadget out here”.

The windows are rolled down, the car is not very clean and he apologises for the state of the vehicle.

“When you sign on shift you check in with the superintendent and inspector if need be and then you check out keys. We don’t get to choose what car we drive. We just do vehicle checks and we hit the road. The quicker I get out there, the quicker the control room can use me “.

We make small conversation and he stops intermittently to listen in on the radio. I ask how he sustains a consistent flow of attention to the road and also to the radio at the same time. He explains it is something you get used to with time. I ask about the technology in vehicles, particularly the lack of it.

“sometimes, the kind of technology we wish we had as beat patrol officers can appear ambitious and what everyone thinks we have is an overstatement”

I ask what areas he is assigned to patrol and he clarifies his duties

“I don’t have a patch; every part of this sprawling town is my patch. I am alone in the vehicle and I need to remember areas that present as potential hotspots and when I’m not called out, I drive by”

As it is quiet, he lets me know, he will drive to one of the areas he mentally double patrols due to the events in recent weeks.

We drive to a secluded cul de sac. We emerge and walk about around small calm pathways with maisonettes surrounded by walls and small car parks. There are disused garages showing evident signs of fly tipping and a large saloon car parked in one of the lots.

PCA shows me a walkway and explains why he has chosen to show increased presence in the area.

“We received a call out from a resident in this block that a group of youths were peddling drugs on their doorstep and it was becoming a habitual street drugstore.” “This incident has four parts to it. First the call handlers, sometimes we lack trained staff, other times the workload prevents workers form spending as long as they would like with a person calling in too report a crime. Secondly if the radio circuit is busy, specific Intel may be missing when information is relayed.”
“This is perhaps where an in car system we can consult quickly may give us more information, but at the same time, when I arrived, the numbers were such that I pulled back away and called for assistance before leaving my vehicle. When we finally had enough reinforcement, the youths were confrontational and adamant they were just hanging out. A quick frisk yielded zero drugs on them, so we let them go. Our next task was to door knock the nearby homes. One of those homes was that of the resident who called us. They informed us that their call about drugs being sold in the vicinity was not in their view actioned quickly enough.”

“They had explained to the call centre staff that there was an abandoned car and made calls to the city council with a view to getting it towed.”

“This is a common problem where the local authority also claim they lack resources to manage fly tipping and abandoned vehicles, we also cannot act unless it presents a risk to life or property such as a security risk”

“Well you see, if we had in car quick swab and test kits which read digitally and measure even microscopic amounts of known illicit drugs, we could have held those youths and swab their phones or hands and detain them on the basis of a thorough search”, “but we don’t and again; we get a lot of calls like this, the goal of the caller is to force us to come and move rowdy or boisterous youths or to remove or force removal of fly tipped waste and or abandoned vehicles”

“The long and short of this is that the resident indicated the car was their ‘one stop shop’, but it wasn’t broken into nor were the windows open. But the resident was adamant. Guess what?! On closer inspection, we found the fuel port door was open and recovered almost 1kg of street diced cocaine and heroin. It was a big blow and of course the youths were long gone.

I pointed out signs saying there were video surveillance signs around and some cameras aimed at the car park and the officer clarified the situation;

“in this vicinity, signs saying ‘CCTV is in operation means zero. We can rarely get footage. If we are told who operates it or can quickly access and circulate images of thee youths. If we have shared system access.... But no such sharing exists and crimes like these will open up and carry on again hours later somewhere else until someone calls us again. If it’s me, I know the drill and can search more, but it is anyone else, maybe not. There’s nowhere for me to store this info and record it for sharing with colleagues meaningfully or PNC a location and type ‘car possibly used to store drugs’. There is no one in the car, it is parked legally, and taxed accordingly. So what to do except face palm and go back to the station, painstakingly lodge the evidence and endure the jabs of arriving with evidence and no prisoners and hit the road again and see what we can do to keep the streets safe, secure and crime free”

Much of the work that takes place here is dependent on liaison over the car radio and by mobile phone. What is more obvious, however, that the effectiveness of response is heavily dependent on local knowledge as highlighted by previous research (Ackroyd, et al., 1992; Birdi, et al., 2011). The
officer in question is familiar with the area, knows the person who made the call and relies on firsthand knowledge received. Some of this knowledge is delivered face-to-face when officers patrol together. There are challenges, insofar as single crewed vehicles mean that information gets confused when callers present several bits of information to the call handler, then via radio, so ‘the right context’ is not always obtained. Limitations to police powers to stop and search and lack of mobile drug test kits to identify presence of drugs and justify arrests as well as lack of access to public surveillance also restrict on ground policies. Overall, reassurance to maintain good community relations provided a resolution for the citizen but was not enough to prevent the suspected offenders from moving on to reinitate activity in another location.

4.2.3 The custody suite

Information had been shared during fleet briefing about a person who was wanted in another policing district for alleged crimes in a different county. I am out on the beat with a police constable referred here as PCF. Due to policing knowledge, PCF who was single crewed had a good knowledge of the areas the wanted person was living in. In fact, we had driven past the property en route other call outs four times on the same day. There was a lull in radio activity and as we drove along, PCF decided to stop and drop by the address the wanted citizen was bailed out to. We were greeted calmly by two middle aged adults. The female indicated the person of interest was having a shower and this was upstairs. They then left us standing in their lobby and the male adult turned to his leisure activity.

After a short wait in the lobby of the house, PCF made a call for assistance, noting that we had waited quite some time and he was alone. The response was quick and soon an extra officer, PC (B) arrived. Officer B received a quick briefing from officer A. She then manned the hallway whilst officer A mounted the stairs. Officer B covertly indicated to me that she would move to the rear of the building whilst I had sight into the living area and clear up the stairs to PCF. She wanted to pay attention to the rear of the property for any possible escape attempt by the citizen as the wait was quite long.

The encounter took a turn as the citizen finally exited the bathroom and took to a bedroom where he painstakingly dressed with slow movements whist challenging and goading the officers. The citizen insisted he would not be cuffed as he carried a mattress duvet and pillow in his hands down the stairs with other occupants assisting him in moving several large items of luggage which required an extra police car. In the end, he relented and was cuffed and we exited the property.

The citizen was displeased at being cuffed and was of the firm opinion that the officers should have waited while he collected all his belongings. From what the eye could see, the citizen had already packed a very large amount of things and he had spent upwards of almost a half hour in the bath. We soon arrived at the police station, where he made gestures at the imaging systems at the security clearance holding area.

The clearance holding area was a vacuum between the entrance and the reception pods at the station custody suite. Citizens and officers would have to wait till the custody sergeants were clear of arrests and ready to receive the next client. See image 3. Custody suite Bedfordshire south

The custody suite was served with secure barriers and a plenitude of cameras. The two duty custody sergeants introduced themselves and explained that they would need to conduct an identification, health and safety and statutory assessment of the citizen under arrest as well as log any personal items
he had and enable him to bond them over for safekeeping. I was surprised at the heavy surveillance in the custody suite. The duty sergeant explained to me that it was for compliance and safety.

“The cameras give us confidence as we work. Often there are multiple reports of mistreatment and abuse in the custody of police. Other times cheats may allege we have inaccurately or untruthfully accounted for their actions or uttering. These cameras record every subtlety and ensure we can prove our behaviour toward every citizen we deal with is appropriate.” - Duty Sergeant A

“This enforces transparency. Often, being brought here is not indication that a person has committed any crime. Their experience here will create a lasting impression of how they view us and how well we work to respectfully deal with those we encounter. We are not a hotel, but every citizen is expected to be treated respectfully and with dignity. We must never create a situation that brings our work into disrepute.” - Duty custody sergeant 1

“These new resources make it easier to reassure those who arrive here that we are not going to disrespect them or treat them like criminals before a lawful conviction transpires, ours is to process not prosecute or persecute” – Duty custody Sergeant 2

Booking in was a lengthy process as the custody sergeants complete a welfare assessment spanning health and diet and the citizen’s bags and pockets had to be emptied and items listed and stored in locker.

Officer B came to confirm that Officer A had heard the threats issued by the citizen to the onlookers outside his home. They both agreed that they would submit their body worn camera data so it could be uploaded to their servers and attached to the specific call out intelligence data set.

The officer was then tasked with administrative duty and contacting the police force in which the citizen was wanted. This was not a straightforward task. There was no centralised hub and interdependency harnesses with other force systems are limited. He navigated the complex system with which he could inform the fleet or custody or duty officers by telephone. PCF explained that they had resourcing and responsibility protocols and it was seen as a better use of their resources to assist with arrest and custody and keep the citizen at their site until the other force confirmed their plans.

As the responsible force, the onus was on the other force to use their own resources to facilitate the onward custody and preparation of their case files as well as any interrogation. As we took to the streets for onward travel to the next job, the custody sergeant put a call through to the radio team who informed PCF that despite the volume of belongings already taking up a quarter of the storage space for all guests, his relatives had arrived at the police desk with more bags of belongings after we departed, only to be turned away.

In this scenario, the elements of information sharing that enabled the swift capture of the citizen were not sufficiently developed enough to support the transfer of information to update the other force of his capture. In another stead, the time required to manage the intake of a citizen for remand in custody required the use of both paper and ICT and technology did not in any way limit the amount of deskwork the officer had to do, in fact it appeared to extend it because it required presence in the
4.2.4 Managing a domestic incident

I am in the field with a two crewed vehicle on the evening shift. The two officers attending with me indicated here as PCR and PCT. We are called to attend an emergency call from a young adult regarding a family dispute that has become violent.

On arrival there is a youth exiting the property with minor injuries and there is a couple inside the property. As I have attended with a double crewed vehicle, one of the officers, PCR takes the young adult outside to the police car and they have a dialogue which I am not party to.

PCT takes me inside the property with him. There appears to be a language barrier and the male occupant involved in the altercation struggles, in view of this the female occupant translates for him. It however does become apparent through body language that the male occupant does have a better grasp of the English language than he will admit to, as he then tells them he works in a customer contact job that requires proficient command of English.

After a number of attempts to clarify what has occurred, PCT switches on his body worn camera and asks the couple to sit across from him in a more convenient place in their dining area. The couple appear to be slighted and it takes a significant amount of time to initiate a conversation. They are of the belief that as they did not call the police, the young adult who is outside is the one that PCT needs to speak to.

PCT sets out his role in attending a call out to an altercation and indicates he is not there to make judgements or take sides. He wishes to establish what has transpired and what is now happening and help the family to seek a resolution. The female occupant indicates that she had arrived back to the property only a short time before police arrived. She was not party to the incident. She however does indicate that there is a leadership tussle/male ego conflict type issue that arises often.

She translates for the male resident and upon being told to explain what has happened, he fetches a bag of vegetables and invites PCT to inspect a carrot that appears to be deteriorating. A good measure of time later, we are able to elicit that the conflict has arisen because he asked the young adult to purchase vegetables from the supermarket the previous day and upon preparing a meal, he notices some of the vegetables his son purchased have rotted.

He indicates that in the dialogue that ensues, the young adult shoves him to the ground and they scuffle. As he rises up from the chair to demonstrate, he indicates a position and PCT discovers that he has some injuries and he is asks him to explain the injuries which appear inconsistent with his account. He indicates he has poor command of English and asks PCT to refer back to the young adult.

He is issued with words of caution and finally the adult man explains that he has become involved in an argument and subsequent wrestled with his son during which he claims he attempted to defend himself and assert parental authority. It is established that two other minors apart from the young adult are resident and the young adult is just under eighteen. The female indicates that the young adult and his father often react negatively and verbal arguments ensue.
Finally a resolution is reached. PCT confers with PCR and it is agreed that the young adult will go to stay with a relative for the night to allow tempers to settle and he is offered a lift to the train station to begin his journey. The father protests and indicates he does not wish this. He is however reminded to accept the resolution in order to maintain the peace for the younger children. PCT and I comfort his wife who breaks down when her children arrive from school to find police in attendance. She indicates feelings of shame and PCT reassures her.

We depart after words of wisdom are shared with the couple and give the young adult a lift to the station. The youth also receives words of advice and is finally dropped off.

“Often we encounter citizens who will develop language barrier issues on sight of a police officer. This is frustration and time wasting. Often it is a delay tactic to enable citizens to develop an answer or what to say or do. It can work against our efforts. We however now have the advantage of body worn cameras with which we collect situation evidence including speech and movement and capture injuries immediately. This can serve as valuable tools should cases be serious enough to warrant consideration for arrests or prosecution”

Technology in use were body worn camera, radio, phone. Officers were able in this case to proactively defuse situation without the need for third party involvement and resolve grievances speedily without need for further action. This was because they had autonomous control and good grasp of the type of approach to take and were able to promote a solution that was easy to implement. There are issues connected to the functionality of equipment and serving the diverse population well such as limited battery life span of body worn camera, absence of a translator to give real time clarity of the discussions the adults conducted in another language.

It can be difficult to control and or obtain relevant information from citizens when there is a conflict and officers are able to sustain a calm approach. There is some risk with body worn cameras that citizens may play to the camera in order to exaggerate incidents, the body worn cameras record subtleties and conversation serving as a reference for the future. The lifespan of the device when in use was called into question during this incident as the officer’s camera ran out of battery before he could finish interviewing the citizens, lasting less than an hour.

4.2.5 Managing non serious crime

I am in a double crewed vehicle on the day shift and police officers here referred to as PCQ and PCS proceed to undertake what they describe as a confidence patrol. We drive to a secluded private estate where residents have experience spates of confrontational and brazen burglaries repeatedly.

The officers drive around the area and speak to the residents and identify which of the residents is away for an extended time and make notes to patrol more often. Through the residents that are encountered, they are able to gather intelligence about the habits of the residents, the types of items and goods that burglars target. They are also able to offer safety and security guidance and advise to the residents they encounter.
The resident indicates she is feeling confident and thankful for the police presence and we depart. PCQ gives me an overview of the purpose of their drive by.

“We often patrol areas such as these in order to them, we give victims confidence and identify those who have been victims and speak to them to make sure their preventative methods are functional and active.”

“unfortunately, or many of the victims in areas like this, technology often fails and the penalties for trespass or coming armed to commit a crime are often vary nominal. Even if they are filmed in the act, the image quality is often so poor that enhancement costs outweighs the gravity of the crime. But we do our best to utilise whatever intelligence we receive appropriately.”

It is evident that beat patrolling is still more relevant to policing teams and indeed this could be better targeted. The impact of low value crimes and support of victims of crime is clearly important, relevant and helpful. The limitations to staffing numbers has an impact on efficacy and affectivity of work. Citizens may benefit from better information from policing teams about appropriate security and surveillance equipment perhaps through enhanced citizen social hubs that are built around technology such as social media and mobile applications. It is clear that it is important for victims and areas that are highly frequented for crime to have increased police presence. In this instance, the knowledge of the crime hotspot was tacitly exchanged between officers and harnessed beat patrol knowledge.

4.2.6 Citizen arrests

I am riding on the beat with two first response officers here referred to as PCW and PCY who are called to a local public park to respond to a citizen arrest. Upon arrival, we find that there are two citizens referred to as CT1 and CT2; CT1 seemingly very upset and up in arms and another CT2 who appears disgruntled and protests vocally about maltreatment. All around us there are people, mostly youngsters going into and out of the park on foot in groups, there are some vehicles full of families also going in and out. It is a hot sunny day, and so both young and old are scantily clad.

As there are two officers, I first remain with PCW and determine he is interacting with a man CT2 who gives no more information than that he did not expect to be tackled and that he feared for his life. He holds with him a shopping carrier bag and to the plain eye, he appears no more than a regular citizen. He then proceeds to seek reassurance but does not disclose why.

“I know I perhaps shouldn’t have done it, but he scared me, I thought he would kill me.”

No clear outline of what is occurring emerges until I advance toward PCY, she is speaking to the other citizen CT1. The citizen is very upset. He is holding a phone. PCY is recording the audio and video from his phone using her body worn cameras. As I come closer, PCY introduces me to the citizen. The citizen becomes emotive and states

“My children and my friends, we all go here, I realised if I did not stop him, he would carry on”.

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After some time, PCW and PCY confer. They intimate to me that the citizen CT2 had been observed extensively by CT1 sitting under a tree, performing lewd acts upon himself. CT1 has been shocked and surprised and decides that instead of tackling CT2, he would first record information using his smart phone and then apprehend the citizen and call the police.

PCW tells me

“We cannot make any judgements, but it is clear that this man CT2 is not going to be safe here and if what CT1 says is accurate, he will simply move to another park or part of this park, we need to remove him from here and decide what to do at the station.”

A further search of the accused citizen reveals suspect material in a large shopping bag and indeed PCW has also collected extensive footage further to a suspected illegal act in the open. CT2 indicates his vehicle is parked in the vicinity and it becomes clear that he left the privacy of his home, and the comfort of his vehicle specifically and deliberately entering the park and secured a very visible position in which to conduct his activity.

I am uncomfortable. I am also surprised that this has occurred in a public place and taken aback by the calmness and indifference of CT2. It is indeed a good thing I am sitting in front, as I see more children flock into the park, I become red eyed. I am scared that I will cry. But, the months on the beat have toughened me as I remind myself that no child or person has been harmed so far and none will be harmed today.

On the drive back to the station, CT2 is keen to reassure us all that he is sorry and it takes a very long time to book him in as with each question, he is keen to explain how he did what and how he knows what he should not have done. After the officers are signed off responsibility for CT2’s welfare, we then proceed to the admin room where the unsavoury job of bagging the evidence takes place. It is eventually decided that instead of sorting the items one by one, the entire bag is placed in a jiffy, tagged and marked. PCW and PCY confer and they are required to submit a preliminary statement which will be presented to the CPS as part of the evidence. They explain that cases such as this are quickly advanced to court where possible to prevent any harm coming to parties. PCW goes to contact CT1 to take a statement, PCY prepares his statement and explains to me that he is required to give a clear account of reasons supporting relevance of prosecution, In this case, the video taken by the citizen, the bag of things and indeed the demeanour of CT2 are at forefront.

The administration takes about two and half hours. At the end, there is a busy spell, PCW is finished with her statement so she transfers from her partner to single crew to another job. I sit with PCY while he finishes cataloguing and sending off the information needed to arraign CT2 as soon as possible. While we remain there, the duty inspector also passes by on her way to do a custody check. She is briefed on how busy custody is and she also gives some advice on what to do with the case. The duty sergeant also weighs in on the process of paperwork and asks some questions about securing of evidence and whether both officers used their body worn cameras. By the time PCY is finished, his shift is ending. I then transfer to the sergeants office where I sit with them, a welcome break awhile until they are called to the road.

The proactive use of technology by the citizen has been pivotal in collecting critical evidence which could otherwise have been subject to dispute if it was only verbal. Through the technology in use
such as the mobile phone, body worn cameras, police radio, computer, evidence log tag software, police officers were able to quickly and appropriately deal with the incident before it escalated as well as protect the accused citizen. Their proactive response also reassured the citizen who observed the incident and gave him confidence that the right outcomes would be found and he was able to effect an immediate resolution to the threat he perceived.

It was clear that even with technologies such as body worn cameras and radios present, having more than one officer in the vehicle enabled a quicker, calmer and more focussed roadside handling and swifter processing as the workload was shared. There was also the added benefit of being able to confer immediately and not having to seek a second patrol car to manage the situation. The use of the body worn cameras was therefore of significant advantage in this case. A citizen had footage of the citizen and the police had captured the same which would in principle make for swifter prosecution and quicker rehabilitation for the citizen.

4.2.7 Serious crimes, community policing, safeguarding and community safety

I am in field with a police constable PCD, we are sent to a location where there has been a recent raid. We drive to a sedate neighbourhood lined with family homes close to schools and other facilities. We are advised that the control room has received some form of information alluding to the repurposing of a recently raided property for more crime. We arrive at the property which had been converted by criminals into a makeshift brothel. The property was littered with an assortment of items used to ply the trade and various personal articles. Each room in the property had been repurposed to serve as a seedy service centre through which money might have been exchanged for services and women and men may have been subject to abuse, exploitation and peonage.

The officer explains that the influx of travellers in transit and increased migration into the area over time has created an opportunity for a complex matrix of groomers and brothel syndicates who often rent premises paying in advance. They then convert these right in the middle of residential suburbia to their devious purposes. A lot of these syndicates develop their crime using web tools and digital means that are difficult to detect and are capable of building a base of clientele in short time spans. The end result as it were was that the police were eventually tipped off and able to go and arrest, support and rescue any modern prisoners and to bring the trade to an end. On this occasion, the doors and windows had been forcefully accessed which caused some concerns that the evicted sex workers or their employers attempted to return and or that the property was being targeted by squatters or indeed that regular clientele had attempted to force entry.

From the moment we arrived at the property, the officer switched on his body worn camera to record any evidence that might exist and any events that might transpire, however we found no citizens remained there only that the doors and windows had breached. On finding no active crime in progress, the officer explained that he would place a call to the property owner in order to secure the premises and he clarified that the presence of this particular type of ‘business’ in the locality had attracted crime and disturbance increasing risk and deployment of resources to the area on a regular basis. The officer was able to use his body worn camera to record information and his radio to maintain a line of communication with the control room, should he require back up or find any anomalies. The presence in this instance of these two technologies enabled a swift response and facilitation of an action plan, bringing the matter to a close.

In a second instance, I am paired with a police constable here referred to as officer PCQ we were
called to follow on from a job that had been listed whilst I was on fleet patrol with a separate officer. This was the case of a missing adolescent who had previously confounded officers with his ability even with little money to skip county borders and travel a great distance on public transport undetected. As was to unfold, much of our journey to search for and find the youngster was not led by computer technology but by a blend of practical policing and prompt use of communications technology. The technology available supported the officer to discover known addresses that the youngster could have gone to. Some of the information held was additionally obsolete and of little use.

In the journey of searching we were joined by a second officer here referred to as PCT and our travels took us on to the school premises and we set to hand searching neighbouring fields, shrubbery and brush within a 1 mile radius of the school and location where he was last seen in the dark at low temperatures. Navigation was through the use of Google maps on one of the officers’ personal phones, work phones sadly had no reception. Each encounter with any persons was governed by a decision/choice to use or not use body worn cameras to gather any information. There was some effort after a second spate of foot searching to involve the transport police and rail station management in the enquiry and in this process, it was clear that the capability of the transport police, rail managers and police to dial in with key information into the main radio wave transmission system is a means/method of delivering information quickly and enabling a faster response than ringing a switchboard at late hours and trying to find out who was needed.

After a four hour search and as we resignedly gave up ever finding the missing child, we received a break in our enquiry and search from a radio call in from the national rail service. Our youngster had chosen in his adventures to pay a visit to a seaside town and had travelled approximately 150 miles in the process. In this instance, the short wave radio, the use of policing skill, and the stored historical data regarding the habits and possible location of the adolescent were key to solving this matter. Funding also played a role as the police force at the other end refused use of their resources to transport the adolescent back to the policing county he resided in. Therefore he had to be collected by the officers who were on the case and as I rounded off my 14 hours in field on that day, they drove to the location he was found to fetch him back to his mother.

The radio system demonstrably became quite important in this incident. Technology was limited to provision and querying of existing information and hands on policing was expected and deployed to manage the situation.

In a third instance I am paired with a police constable here referred to as office PPCP we are called to a home location by members of a family who are concerned about the welfare of their relative, an adult male who they suggest is prone to illicit drug use and suffers from medical conditions. They provide a background to the individual and insist that he has vanished uncharacteristically. The officer I am with PPCP takes as much detail as possible and indicates she needs to search the adult’s room for any clues as to his destination or whereabouts.

The relatives are adamant that our destination should be the local store where they insist that more than groceries are sold behind the counter. Despite this, the officer explains to me that protocol is for her to search his room and then to conduct a search of all the places they indicate the adult who is missing is known to frequent. A search of the room was laborious and fruitless, however in the interim, the relatives have reached a friend who gives details of parks the adult frequents. As nightfall approaches, we engage on a hand search of the entire park concentrating on secluded areas. We do not
find the adult, but we do discover a fire lit on the bank of the pond on the boundary of the park and find young adults who are unable to explain how they arrived at the park and what they are doing there.

By the time we leave the location, we finally received a call via radio to tell us that the adult has now called his family to say he is absent because he is absent and the search was called off. In this instance, local knowledge and beat policing took precedence over use of technology.

In a fifth instance, I am sent out with a police constable here referred to as PCH. I am doing an evening to morning shift and start at 4pm to finish at 7am. PCH and I are sent to provide assistance to an armed police team who have apprehended a suspect who they need to hand over. We have to swap to a secure transport van to collect the arrested citizen. He is searched and a handover ensues. I am to sit in the back to watch him. As we head for the custody suite, the citizen suddenly slumps and officer PCH pulls over immediately I bring this to his attention. We both exit the van and the officer loosens his clothing whilst I attempt to get a response. I check his pulse, it is slow and irregular and his skin is clammy.

I wonder if he has a health condition so we agree on the remote chance he carries a medical alert card. We search his belongings and find a long glass pen barrel that is brown/black on the inside. The officer recognises it and tells me it is a ‘crack pipe’ and that it is common for users of the substance to consume whatever they have in their possession rather than be caught with it and charged for possession. He radios in to the control room who tell him to drive back to the custody suite as soon as possible. As we drive, one of the duty fleet sergeants connects with us and follows us from point of discovery back to the police station in convoy.

Upon arrival, one of the custody sergeant who was informed prior to arrival is waiting inside the car park. As soon as we drive in, he indicates, we may not stop and we may not remove the citizen unto police premises, instead, he directs us to go straight to the hospital immediately and fast too. The custody sergeant clarifies that practice policy and health and safety mean they cannot admit him to the custody suite as that is the same as to assume responsibility for the citizen’s welfare. He also confirms that one of the armed police officers should have ridden with the citizen as his arresting officer.

Some chastisement ensues, the constable was only able to radio in for instructions not to the custody suite and in this case, he was misinformed. The key issue here of course is the constable took instructions by radio from the control room who do not actually have radio contact with the custody room nor have they enquired from them on the course of action. After a quick discussion, I disembark to join a different fleet and at this point my involvement ends. I do not witness the follow up for the citizen, however some five hours later the sergeant informs me when I come back to the mess after another period out on the road that the citizen who was unresponsive, literally ‘rose from the dead’ and walked into the Accident and Emergency department at the hospital unaidered.

The situation is discussed in the mess room and when his name is mentioned, several officers know him having encountered him in the course of duty. They explain that he is a habitual arrestee and drug abuser. The sergeant confirms that he was accused of committing a low value high impact crime worth under £80 which he indicates is neither here nor there, but importantly he has social care issues and vulnerability due to his lifestyle and police are not equipped to manage or provide drug misuse counselling. The impact of his crimes on the police force that evening was however high with the impact of a loss of a fleet car and a police constable for and beyond the rest of his shift. The police
constable had to stay by his side in the hospital until and beyond the morning. This is because it had been established that he takes some form of drugs which cause blackouts and for this reason, the police having arrested him are responsible for his welfare until when he is deemed fit and well and discharged from the hospital. When I leave the police headquarters at 7am, I make a gentle enquiry and discover PCH is still by the bedside of the citizen awaiting clearance for his discharge.

In this incident, the lapses that can occur using communications technology when there is a hierarchical chain of command and knowledge may sometimes be limited within the radio staff room was exemplified. What was clearly observed within this was that the policing staff responded swiftly to the events such that what was required to kept the accused citizen safe in custody and that in the course of this event through tacit to tacit learning, the officer would come away from the event better informed about what to do in future situations of a similar nature.
Chapter 5
Discussion

This section is a reflective discourse of findings of the research which highlights dominant themes, observations and characteristics.

The structure and face of policing over the years in England has been multifaceted. In many respects, political, social and economic changes have had impact on the way in which police deliver their services (Denel, et al., 2011). The increased expectations and demands that scrutiny have on policing also bring significant pressures to bear in the areas of performance and efficacy, much of which depends on the availability, engagement and deployment of ICT as a facilitator (Custers & Vergouw, 2015). There are many key features within the structuring of services that present with some special and unique intricacies particularly evident when Bedfordshire police force was the subject of this workplace ethnography. In particular, the meaning making of the staff was brought to the fore in situations where they were connected with technologies and engaging these to deliver services.

I considered and explored the change preparation momentum, critical trends, commonalities and deviations associated with the implementation, use and evaluation of technology. This took place in a context where leadership and frontline services are passionate about serving the community and dedicated to excellence, but where the complexity of the organisation and the growing need to cut costs creates difficulties. As is synonymous with modern policing and exemplified in Chan (2001) and Innes and Sheptycki (2004); technology is used for the facilitation of duty, enablement of information and data management, routine staff management, containing evidence, enforcing policy, transparency during execution of duties, collation of crime statistics, monitoring efficacy and supporting crime prevention. The insights gathered therefore relied on the interpersonal perspectives on and around the use of technology in action.

Understanding how technology facilitates work, what limitations there are, what adoption of existing and new technology is like and perception of the use of information and communication technology [ICT] for crime management is a complex task due to the various intricacies, statutes and laws that police forces work to. Bedfordshire police force is unique in structure whilst being governed by standardising protocols from central government. The individualisation and decentralisation of application of technologies and constraints imposed by central government impositions often mean that what is provided or mandated is what is worked with.

The perceptions that policing staff have of technologies and their role in the continued improvement of service delivery and professional development are important. The bottom up analysis and assessment of understanding of adoption of technologies and the change therein as highlighted by this study are critical to the success of the organisation. ICT is widely considered to be a key enabler for the police force in Bedfordshire by all levels of staff. In order to sustain the momentum of the continued restructuring and enable alignment with police financing changes as indicated in reports such as (Comptroller and Auditor General UK Home office, 2015), technologies will need to continually be stepped up to meet emerging and existing needs.

In the process of conducting this research, it was important to align the study with real life situations in order to better assess the role and use of ICT and other technology. The congruent issues that emerged from this study presented a wide array of information that led to the elicitation of themes that stem from social meaning making, social interactions and practices in a highly regulated, fast paced,
dynamic, high stress and complex working environment. In the periphery, a number of themes emerged that are rooted in socio-professional organisational areas such as job satisfaction, organisational enculturation, institutional entrenchment and perceptions of leadership.

It was evident that the role of the operational and non-operational staff in development of technologies is pivotal in that the organisation needs workers to fully embrace organisational decisions, policies and mandates and to own these decisions which guide their way of working by understanding them. The key to helping workers to understand ICT/IS is to involve them in the process of developing these as an active and continuous process, particularly when these technologies are mandated from central government. Additionally, it is important and empowering to enable an ownership level that invests interest in improving longstanding centrally funded infrastructure that is outdated before superimposing new ones in such a way that leadership or ground staff, with constraints present in funding and resourcing are empowered to work happy and work efficiently.

The outcomes of this study demonstrate that despite limited resources and significantly complex, unique and dynamically challenging working conditions, Bedfordshire police staff have an average understanding and high levels of willingness to develop understanding of specialised technologies to suit the scope of applicability needed for their work. Adoption levels are varied, and indeed some elements of technologies that are provided for use are not chosen or controlled at a local level or introduced and or rolled out in a fashion that promotes ease of use and job satisfaction. User led design is seldom considered at the conceptual stage with varied levels of engagement during design, which does not always allow for best fit solutions. Overall, the force works hard within its resources to engage with the use of ICT to manage crime at a fundamentally adequate level commensurate with available resources.

5.1 Use of information communication technology

Technological expertise and efficiency are demanded of police forces more often in the wake of emerging technology and the lapses and inadequacies of police forces are subject to more scrutiny than was possible before the digital age, as seen in Custers and Vergouw, (2015) and Koper, et al., (2014). Whilst policing is a public service, expectations and aspirations can often differ from actual functionality when engaging with information and communication technology.

The internal organisation hierarchy and authority structure in policing can often create needs, awareness and change management gaps, which are not adequately filled by presenting technology to forces without internal cyclic management of diffusion and continued adoption analysis. The adoption of technology is seldom properly evaluated and this initial implementation does not take much account of local variation (Skogan & Hartnett, 2005). There is little understanding of the local knowledge that is regularly deployed in effective police work when technologies are designed with data capture being at the fore and functional policing in action is sometimes being sidestepped (Haggerty & Ericson, 1997).

Police officers in general show varying levels of understanding and skills with respect to technologies with most having more sophisticated gadgets in their personal lives compared to those available at work. There was a high level of interest in the possibility being engaged in finding out what technologies would be best and an understanding of the constraints relative to their needs. A majority of staff showed good proficiency and engaged with each other on issues that affected or would impact on use of technology such that standards would be diminished.
There were multiple limitations to effective use of information communication technology. Existing research acknowledges the gaps and difficulties in streamlining ICT across public services that collaborate. Issues such as working culture, inadequate or inexperienced leadership, change resistance were all important. This is as true for Bedfordshire police force as is elsewhere (Brown & Brudney, 2003; Custers & Vergouw, 2015).

A major problem this study identified was that, in the absence of a national police force, liaison between forces can be problematic, compounded by diverse databases and categorisations. The issue of legacy systems retained in use continually is one that has been highlighted in many statutory reports (HM Chief Inspector of Constabulary, 2017). There are also no primary operational frameworks, architectures and or functional daily interfaces that unite all forces apart from a limited police national computer system. Other academic work has noted sustained prevalence of issues with interdependence and interoperability especially between police forces (Allen, et al., 2014; Chan, 2001). Put simply, interoperability is a major issue (Baldini, 2010). New forms of crime, notably cybercrime, have been reacted to rather slowly, reflecting a lack of resources, training and expertise in these matters. Most national reports about cyber-enabled crime rely mainly on quantitative analyses through surveys usually conducted by external statutory bodies where depth is not particularly possible on a large scale and indeed where responses and or respondents are not representative of local populations in any given region or county (Caudle, et al., 1991).

The use of technology was mainly for task facilitation rather than task fulfilment in isolation as mirroring in findings from (Ackroyd, et al., 1992) and other bodies of work such as (Lum, et al., 2016; Chan, 2001; Innes & Sheptycki, 2004). An important element that was clearly defined in the findings of this study is that the adoption of technology and use of it plays a role in how it is best used for task fulfilment. It can be propelled by incidents that generate a high level of scrutiny or indeed trigger official enquiries. In many cases, technologies are hastily adopted and or adapted to accommodate the issues at that particular time and in doing so can overshadow the goals that policing should be intended for. The array of technologies acquired, adopted and implemented are rigorously treated from the value, goal and policy perspective, aligned with documented trends by Birdi, et al. (2011), Cordella and Iannacci (2010) and Chan (2001). This can, however, overwhelm existing business cases by diverting funds and resources toward managing a problem or preventing recurrence of a major incident whilst sidelining purposeful policing (Dupont, 2001).

5.2 Innovative use of ICT

There are three conjoint elements that forge the way a police force will work, allocate funds to ICT/IS and drive governance for digital capability, embedding innovative tools. The first is the business strategic approach that is translated using a well adopted "intelligent policing" approach. Intelligent policing governs the way business intelligence is translated into action, resource allocation and performance measures. The second is the scope of introducing and adopting innovation. The third is the way in which resources can be exploited to drive the usefulness and applicability of resulting solutions. When these elements are taken into account, the world of a police officer at Bedfordshire police in any given role, and how they would use ICT/IS becomes rather complex. Successful working with ICT aligned to policing requires the necessary but often overlooked task of introducing and or harnessing fresh perspectives from outside the organisation (Brown & Brudney, 2003).
Indeed the working constraints and cultural climate at play in this particular public sector organisation are typical of public sector organisations as they work to keep up with multiple constraints and limitations imposed by the very nature of being a government agency ruled in the main by political change and economic fluctuations (Caudle, et al., 1991). The route to technology creation and adoption in the organisation is not based on participatory design, nor is it driven by workplace studies and or focus groups that engage frontline staff as stakeholders. The decisions are often made by looking at business models and business cases often led by complex demands and national directives steered by funding. Often forces set to considering what evidence there is of a successful adoption or case use in practice. This is not always a relevant and or an appropriate choice or in the hands of business leaders and, where relevancy and appropriateness appears justified the way such technologies are phased in often leads to adoption by junior workers as a result of necessity and not adoption with a view to maximising purpose (Barton, 2013; Cordella & Iannacci, 2010; Dupont, 2001).

In the area of serious crime, Bedfordshire police plays a significant role as a regional force managing serious and organised crime as well as terrorism. The overall findings of the scope of serious crime technologies available and in use at the force are mirrored by findings from other research carried out in this area (Bell, et al., 2016; Brown & Brudney, 2003; Custers & Vergouw, 2015). There are legislative restrictions around the collection and retention of data which impacts on the way that investigations can be conducted. In the same light, there are limitations of tools for surveillance purposes and when and how the tools can be used.

For instance, if it is suspected that an individual is inside a building manufacturing explosives, police cannot mount surveillance on the premises with heat seeking cameras or enter the premises to search it without a warrant granted on probable cause, they also have limited resources for street surveillance by the way of technology. The types of equipment that are available for coordination and management of investigation are dated and whilst they may remain functional from the ‘shelf life’ perspective, they are often significantly dated to the point of obsoletion and behind when compared to the types of technologies that criminals who operate serious crimes utilise. When this is coupled with outdated and obsolete technologies and in comparison to the sophisticated systems that are used to implement crimes; the outcome is diminished capacity, limited scope to serve and extensive man-hours dedicated to grappling with and attempting to decipher sophisticated crime using substandard tools (Brown & Brudney, 2003; Dupont, 2001).

The most pertinent issue identified as affecting the way that Bedfordshire police works, particularly with respect to its expenditure on information and communication technologies including an active workforce is funding and increased demand for their services due to cuts to other public services. Funding of police forces in England and Wales are calculated using a police allocation formula [PAF] using workload categorisation, population count and relative needs. The funding Bedfordshire police force receives is derived from specific and fixed police grants administered by the home office. It also receives funding through ring fenced revenue support grants to address issues such as terrorism and receives redistributed business rates from the department for communities and local government [DCLG] (Johnston & Politowski, 2016). Each police force is cornered exclusively by its specific county location and this has a profound effect on the amount of budgetary stipends central government allocates. Each force relies extensively on collating and acquiring supplementary income directly from the boroughs within its counties.
This is not without difficulty as local councils direct efforts to enforce payment and coordinate this collation. In addition to this, as these supplemental amounts are at agreed percentages collected through council taxation; should the police force recognise a need to vary this in line with needs or inflation, the decision is subject to a socio-political referendum by citizens in the locality/county where increases are sought.

5.3 Pace of adoption and prevalence of technological innovation

The case of Bedfordshire police demonstrates significant complexities, including keeping pace with technologies otherwise available to consumers, learning challenges, adoption of fit for purpose technologies and the ever present constraints of legislation, policy and funding. There are clear deficits in the way the working environment is designed and equipment is aged as noted in HMIC, (2017).

The most prevalent technologies in policing include information system databases, text and image files, camera surveillance, closed circuit television, fingerprinting technologies, global positioning systems, tracking systems, sensing systems, cryptography, data recovery, DNA, biometrics, social media, citizen participation networks, wiretapping, body worn cameras, network analysis, profiling software, automatic plate number recognition, voice recognition, lie detection software, radio frequency identification, privacy enhancing technologies, weapon technologies, narrowcasting technologies, drones, facial recognition technologies, outdoor imaging and virtual reality systems. It is hardly surprising that the skills needed to interpret or understand the data that may come from these technologies is not equally distributed through the organisation (Birdi, et al., 2011; Brown & Brudney, 2003).

In the case of Bedfordshire police, databases and information systems are used most often and practically engaged by most staff at all levels as this is the primary means of noting, storing and keeping records, but field staff have the most prominent use of data capture technologies. Technologies such as the body worn camera are highlighted as suitable for use in locations where traditional surveillance cameras are out of reach and indeed can capture close up images and videos that support facia recognition whilst granting officers autonomy regarding use and retention which is necessary to align with legislation on data use particularly where the key risk with these devices is linked to privacy and appropriation of material that is recorded.

Body worn cameras were rolled out by Bedfordshire police force in the spring of 2014 to enable officers to record every visual detail and communication from the moment they respond to a call out, acting as evidence and referential sources of crucial information, but these have limited use (Coudert, et al., 2015). In a fair number of cases in the field, the body worn cameras battery life depleted within an hour to two hours, limiting the information that could be recorded, in other cases, the body worn cameras docks were either not functional, absent or not available.

Attimes as reported in research, efficacy of these systems can be a problem, for example, batteries that become exhausted quicker than expected and or devices that fail to start up (Dupont, 2001). Key benefits include accountability, limitation of false complaints and or malice, improved public relations and improved satisfaction for policy makers and citizens (Coudert, et al., 2015). Overall, the use of multiple and not quite linked databases increase the amount of work to be done and the focus on recording short, quick and direct details and comments made it easier to record events but could also
later present with need for a longer or more detailed evidence giving for the officer should the case come to court (Coudert, et al., 2015).

In other cases, the decision to use these devices triggers a use decision scenario because data transfer and charging of the devices require officers to return to the police station, somewhat affecting the availability of officers to respond to call outs. The most critical organisational complexity impacting the adoption of this technology is capacity for information retention. Bedfordshire police force is also limited by funding and existing infrastructure for the purpose of storage of data generated from these body cameras and retention relies upon the decisions that are made by the officers as to relevance of information gathered. The reactive use of the body worn camera aids the police to capture vital evidence when attending scenes of incidents (Chan, 2001). It contributes to evidence taking, and can be referred to later if need be to clarify the intelligence collected at scene as well as acting as an expedition tool in cases of prosecution (Harper, 1991).

There are also additional caveats affecting the usability of the information from body worn cameras requiring retention of information to sit within the legal frameworks for data retention and usage by the police and on whether the crown prosecution service makes active decisions to prosecute citizens using such information. Indeed should a decision to use the information be later changed, there is the likelihood that the information could now no longer be available.

These findings align in part with a number of bodies of work that make reference to the value of body worn cameras and indeed give overviews of the impact of use of legacy or complex systems (Dupont, 2001; Harper, 1991; HM Chief Inspector of Constabulary, 2017) and specifically highlight the benefits to be derived from technology which indeed in the case of policing acts as a facilitation and data capture tool effectively. This however has not eliminated the use of officer notebooks and the presence of these technologies has not advanced in a way that one would imagine.

In principle, it is expected that fleet officers should utilise work laptops to maintain database entries after call outs whilst on the road and imbetween call outs to manage database entries and notes about call outs. These laptops however present with issues of ease of access, ease of use, limited ergonomical design and applicable functionality. In field usage observation revealed that officers are enthusiastic about the availability of the devices, but the size of the devices is a significant issue.

The web connectivity required to enable connectivity to the police networks rely on mobile internet access through beacons on police vehicles which a number of workers have limited training and understanding of and observations revealed extensive unreliability due to inherent peaks and troughs in mobile coverage which could not otherwise be ameliorated as mobile coverage in itself relies on mast proximities and other environmental constraints. There were also risks and dangers presented when single crewed as is often the case nowadays where the workers are not able to take appropriate breaks and rests. The concern of mobile coverage has indeed featured in recent parliamentary debates around the ambitious and seemingly controversial plans to eradicate the use of short wave radio and roll out the use of radio communication devices that operate solely by harnessing 4G mobile web technology (House of Commons, 2017).

In addition to these, detailed information about specific call outs where there is a large or complex amount of information to communicate and radio transmission is not feasible, are transferred to relatively standard mobile phones which often have varied use because of limited reception, network variations, fluctuations and outages. In field, observing case use, many workers experience and report
outages on their work phones whilst they have full coverage on their personal phones often powered by the same mobile phone networks.

These few rudimentary issues amongst others present with three known problems that can affect the use of technologies. These are accessibility issues, adoption issues and overall perceived ease of use and functionality. The constraints of inadequate technology include lost time at work and inefficiencies (Barton, 2013; Baldini, 2010). Most valuable of observations is that street bound and fleet officers report the need for, and indeed require some form of, human contact during their long shifts and breaks. The use of technological tools also needs careful consideration of ergonomic issues and of the functionality demanded. For most public facing staff, the way the technologies are used, accessed and perceived are particularly driven by interest, indeed, it can be difficult to task a worker with the use of a technological gadget which is somewhat obsolete and difficult to use due to size, speed and limited functionality due to multiple and arduous security loops required for basic access. Some of these issues could be managed simply by creating and or incorporating the views of workers actively not simply through surveys which are widely used at the force, but with the added use of workplace studies from time to time to establish whether in use technologies are indeed appropriate and fit for purpose. The value of technology of course lies in preventing the enactment of systems that present with inherent lack of sustainability whilst satisfying the public funding case and importantly meeting the functional needs of the workforce in a public service setting (Babuta, 2017; Dupont, 2001; Chan, 2001)

Business leaders reportology on these technologies echo some of those that are indicated by operational staff in junior positions but also shed significant light on other issues such as funding, limitations of forces to adopt and procure new technologies when existing ones are still very functional and ‘not broken’ whether or not they are indeed ‘fit for purpose’ or not an issue which is categorised in previous research studies in policing (Dupont, 2001).

Senior workers additionally find the disengagement from the working day more difficult as they often take their work home with them and again are reliant on and constrained at times by the same difficulties that fleet workers encounter both at work and when working from home. Some of these issues spread out into psychosocial and welfare needs, but yet again centre on the broader understood purpose, adoption and engagement with technologies to the detriment of other areas of welfare and monitoring. Again, there are broader issues of maximised use of these technologies being limited by the policies that are in place regarding use of information wherein the police force indeed have the highest levels of accountability where it concerns data use, storage and management and importantly finding a means of bridging the use of these devices in such a way that they serve their purpose.

5.4 Enhanced ICT services through collaborative working

The Bedfordshire police force has in recent years worked to build a triforce alliance between Bedfordshire, Cambridgeshire and Hertfordshire. Primary motivations are unison within a micro region but indeed most importantly; the pooling of resources in the face of funding cuts.

Although this may appear straightforward, it in fact creates an additionally complex web of responsibility, accountability and united understanding of specific areas of need which resources are pooled for. At the same time this coexists with the autonomous planning each force has in place to meet its own goals specific to its own area of jurisdiction. The key here is learning and or relearning
how to maximise and determine a balanced usage of the intellectual resources that collaborative working with shared funding across ICT present and benefiting positively from sharing technological and intellectual asset resources.

The ICT architecture at these "married police forces” is, as a result of this alliance, preparing to undergo a number of changes. Put simply, these changes should unify their database and intra county internal information systems and update/upgrade the hardware and technology used for communication. In reality, the joint choices made have yet to materialise as functional requirements have not, as yet, been fully derived. Tests spanning two years have been unable to meet the performance thresholds, staff have been trained many times without seeing a system materialise, new and other elements are constantly being added to the mix such as the upscale of the Tuserv system to manage the proposed transition to the emergency service communication system using a controversial 4G mobile network and within this, there are also existing systems that still fall short of standards expected by police.

In addition to this, the emphasis and demands of funding cuts have also driven many other public services toward seeking closer collaboration with the police force. On the one hand, from the perspective of maximising technology, the immediate assumption would be that the inherent and apparent interdependencies within and between multiple agencies could be harnessed. Additionally, it would be rational to assume that agencies that now place an increased reliance on Bedfordshire police force such as local authorities, social care agencies and youth support services, particularly with respect to the vulnerable and psychologically challenged, would gain a great deal from closer liaison through technology.

Instead, the opposite is true in this case where inasmuch as police front line staff are exposed increasingly to conditions and clientele that they are unable to aid due to limitations in scope, they also have no proper interdependent systems with which to consolidate and or deliver appropriate responses that encourage the right or relevant agency to follow up and take ownership. They are often passively expected to take up a role of ‘social work’ policing rather than the proactive, preventative and active presence policing they should be undertaking. This leads to the use of systems geared for gathering intelligence and supporting crime prevention for purposes such as management and primarily recording, following up and routinely storing information about social care emergencies in a limited way (HM Chief Inspector of Constabulary, 2017). The increased prevalence of these situations, on balance places inestimable and unplanned strain on information systems and technologies in use and prevents the use of staff for appropriate functional policing which maximises what technology is already available. Technology however new or innovative is not of value if the humans required to operate them are in low numbers.

Business leaders have a critical role to play here and the most influential element of their role is to recognise the importance and value of their unified ICT team and to develop their business models such that they present cases to their central unit which makes their needs explicit. Going along with whatever is decided is not adequate as these teams rely on the business leaders to be as clear as possible and to harness their expertise remains at the disposal of business leaders. To a great extent, front facing police cannot be tasked with steering citizen facing decisions and executing solutions without the benefit of being appropriately informed and properly used.
5.5 Limitations to the use of ICT

Knowing that ombudsmen such as HMIC exert a measure of pressure on the senior staff to improve in certain areas without recognising the pressures frontline workers are under adds to the pressure. Beyond HMIC; public scrutiny, press and media attention and a number of other factors such as interest groups and splinter groups including the continuous presence of vested political interests all have an overarching impact on the way technologies are implemented, utilised and maintained.

The bulk of responses and reactions to scrutiny tend to create a snowball effect in organisations where attention is diverted away from restructurisation of working approaches. The bureaucracy that surrounds scrutiny puts pressure on and can often lead to adoptions to satisfy rather than adoptions to suit functionality. Often timelines that are misaligned with capacity and capability are imposed and criticisms are such that police forces feel compelled to act quickly which often leads to ineffective solutions in the long term. The technologies that are then adopted may well provide a short term respite and appear to be appropriate, but cease to have value and or utility when practical and current work goals and business cases are put into the loop (Dupont, 2001).

The police force usually considers the type of system development with a tendency toward tendering to external agencies. A majority of forces adopt a ‘see do’ approach to the choosing of software This often means that operations and field staff do not have an active say and do not actively co design these working systems. The systems that are used in policing at Bedfordshire police rely on a number of functional chains of command and routes for dissemination of information. Others are utilised for prevention and awareness of crime, for monitoring, recording and sustaining compliance, whilst others are yet used for the collation of performance and crime mapping statistics and intelligence led policing . There are also problems as noted by Caudle, et al.(1991), (Whalen, et al.(2002) and Custers, et al. (2015) with complex and ambiguous categorisation of calls which can limit the scope of recorded or transmitted information and whether information is recorded at all which emerged during this study. Although field and operational staff often have opportunities to voice their views in quantitative or mixed surveys, the surveys/investigations do not engage workers as system owners and co creators. Rather they are regarded as a workforce that has a job to do and as far as senior staff are concerned, have a system to enable them. Without in work observations, it would not have been immediately apparent that workers do not take the view of persistent complaining and prefer to simply make do.

It is important to note that in the case of intelligence led policing and crime mapping, the most recent body of work in this area in England indicates that these important elements of policing should ideally enable street and fleet officers to perform more effectively. In fact, most preventative work is actually still done by hand instead of harnessing multiple open source business intelligence tools which can promote speedy outcomes. The result of this is a significantly slow and delayed output which then can only be said to serve a statistical purpose rather than a policing one (Babuta, 2017). Confidence building patrols in crime hot spots increase confidence in police abilities and improves perceptions and relationships (Ackroyd, et al., 1992). This can only be effective if police officers are patrolling with better use of the ILP model and more robust crime mapping in a timely and appropriate fashion (Kleiven, 2005).

Technologies for in field use and for deployment of information for the purpose of emergency first responding, routine and or random semi urgent call outs and on the fly incidents which are either reported or observed through closed circuit televised feeds in the central control room. are
commonplace. Manned by a small team, the control room serves as centralised authority for information dissipation and dissemination hub where street and fleet bound officers will receive information that is recorded and updates as and when, by operatives despatched by radio receivers on designated channels. The systems operational constraints prevent over calling which means only one officer can interact at a time via the designated channels whilst others are then tied into listening in.

Attimes this in itself serves as an assistive process, as officers often may have answers and or support or inputs and have the peripheral knowledge of where their colleagues are, should there be a need to deploy additional aid or assistance or indeed should the emergency escalate and or spread quickly. Officers who receive instructions via radio are tasked with a local autonomous role which differentiates them somewhat from some other public services. They are trained to engage a model that encapsulates ethics, decision making, leadership and working culture in order to effectively translate received instructions into appropriate actions which should in principle be well placed to balance their behaviour, the way they demonstrate ownership and leadership and how they interact with citizens when managing crime is properly aligned to the global principles of policing.

From the leadership perspective, field work identified concerns that senior staff have about social isolation, in job stress, socioemotive well being and the impact of consistent non human contact as most of their contact could be limited to airwave radio contact only.

Another element of working by Bedfordshire police force engages communications technologies for the purpose of reactive work and proactive work. Crimes are either reported in real time, or observed by, and or spotted when patrolling and responded to, or indeed crimes are managed proactively through the building of community ties and in street and on road patrols of known areas of concern. In this respect, the primary issues that emerged related to the distinguished lack of known good knowledge repositories for beat and fleet police officers to pool street gained intelligence in a meaningful way. In that respect much of the knowledge of the terrain and indeed knowledge of or about repeat offenders tend to be local to particular officers and not accessible to others. There is, therefore, an ‘organisational memory’ issue as officers move on, retire or are transferred to different roles within the organisation where their knowledge and expertise is no longer called upon.

There is also the understanding of limitations to the use of awareness, monitoring and recording technologies and the concerns that arise from knowing that performance technologies do not appropriately account for diminished resourcing, staffing and capabilities. Workflows that still rely on systems which are agreed by a majority to no longer be satisfactorily fit for purpose create issues misaligned with the level of technology which would be expected or imagined for a police force that delivers services to such a large population of citizens. Invariably this is aligned with statutory reportology and linked with the need to encapsulate understanding of this force’s unique position and it is relevant to acknowledge the efforts underway to change this situation as outlined in this report.

When all of these issues are considered, this in itself means that fairly traditional development methodologies tend to be deployed. Often these are handled by an organisation that is on the face of it a software development company, by way of qualifier defined as a group of developers who themselves have been in policing and know about policing needs. Often the solutions that emerge from these Policing software experts come from what is describable as an ‘institutionalised’ perspective. In effect, systems get designed by individuals who have a strong inclination toward older methods of policing that sound good in principle but may not adopt well because the policing they believe they are designing for is not the policing that needs a solution. Without the knowledge and
expertise that is required, and with heavy reliance on ‘experts’, business leaders are inclined to adopt solutions that work for others but which can hinder the identification of the best solutions for them. An understanding of shifted needs and shifted idealisms and new visualisation of the new face of policing is needed.

The constructivist approach taken to this study is mirrored by (Oostveen, 2007) who introduces a gentle explanation of social constructivism as an approach considers technological development as a social process where the values and biases that enable sense making including political influences are closely connected to the technology. In conducting this study, it was apparent during field immersion that the workings of policing create intricate deviations from the norm which are attributable to the mode and method through which technologies are provided to police. On the one hand they are indeed saddled with systems which they pay for but have no direct significant choice or major say over. These core entities are indeed managed and procured by central government as is. Business leaders are then tasked with the evaluation of their needs and identification of technological needs which again are subject to another caveat. The collaborative working agreement with Cambridgeshire and Hertfordshire counties sets in place some new challenges as the three forces must build progressively and sustainably an ICT solution that meets all of their needs and enables interoperability, seamless unified data systems creating connected microsatellite teams to enhance efficacy, efficiency and effectiveness of policing. The main benefit as identified in this study of this alliance is that it’s very success will open up a bigger source of data to all three forces as they will share local crime data.

This should in principle become an enabler as it will widen scope for crime interception and crime deterrence within a wider area without the limitations of crime ‘escaping’ jurisdiction boundaries which in principle means that monitoring and access to rational information that can enable apprehension of disruption is slow to transfer to the places and officers who need it. It however remains to be seen in action. Although successes have been reported by other forces, those forces are not the same as the BCH alliance. Two years on, the alliance, is still waiting to see the new system stay up and running with the promised capacity in basic testing and indeed with the concerns over mobile network data transfer, it is unknown if this system will not be overtaken by another new central government policy in the future which will render it a white elephant.

In the main, although it is an accepted and commonly shared feelings amongst many workers. It is never considered within the scheme of things as a reason for change resistance. The stark reality is that despite inspectorate criticisms the police force has a talented pool of staff. This is readily acknowledged by the suggestive nature of publicly declared criticisms of ICT in policing. If the average officer has more innovative technology at home than at work, then it is rational to consider that they then will also have more creative, innovative skills that could exceed the level they are required to apply in their day to day job.

In the process of this study, as touched on before, there was a central government mandate rolled out to integrate for instance a new method/technology for communication on emergency service networks [ESN] called the ESMCP [emergency services mobile communications program]. This would rely on using 4G mobile telecommunications networks to transmit messages and communication. The government and parliament have tabled many arguments for its use and debated on its security, sustainability, suitability, reliability and applicability (House of Commons, 2017). Only one country in the world, namely South Korea, has ever used such a system. The motivation for edging toward this solution, as with most technologies foisted on policing, is funding.
In my observations, I found that the level of difficulty with connectivity cited by officers and workers using the 4g technologies they already engage were frequently mentioned. Additionally, coverage would be relying on functionality of masts and ability to work with these tools. I therefore formed the opinion which I explored to a fair extent that the enthusiasm put forth by the home office was fundamentally flawed as this solution looks good on paper but had no precedent in an advanced economy that could be used as a yardstick.

As I neared the end of my study, I revisited ESMCP and found that as with most of the technologies that have been mandated for use, despite its planned roll out between July and September of 2017 as at July, the technology had not been developed to a nominal acceptable use level by the contractors who tendered such that it could be tested even in small pockets. It involved a complex lot of separate procurement lots dividing enablement, management, integration and provision of a network to different contractors. There was some complexity to procurement alone as it was evident that companies were rebranding and moving to different umbrellas to show independent ownership of bids but indeed appearing on close scrutiny to still be the same suppliers of old. It would also cost a significant amount of funds to implement and assimilate and as yet has not passed adequate testing in any one force even in isolated or piloted usage. In fact the planned piloting was at the time of the study already severely delayed (House of Commons, 2017). This in itself should not present a problem, however within organisations, reliance and or contracting of work to too many organisations under one organisation by public services can lead to serious difficulties in management of any failures or problems with contractors in future.

In simplicity, delays, uncertainty, failures in risk management, issues surrounding practical use emerged as real risks following arguments before on sustaining continuity in emergency service communications. In referring to this, I am drawn to a conclusion that mirrors past studies showing that ICT/IS solutions do not always reach full implementation despite much investment of time, effort and other resources (Chan, 2001; Dupont, 2001; Ericson & Haggerty, 1997; McQuade, 2006). Most of the issues with poor technology deployment at this police force are attributable to mandates from central government and the constraints therein as are with this specific example of ESMCP which I highlight and are true of other new services which had taken significantly longer and were still awaited at the time of my study.

5.6 Information sharing, Interdependencies and interoperability

Organisational memory and appropriate knowledge management is an underestimated and underused element observed within this police force. The critical purpose of knowledge management is to empower and strengthen organisations whilst building an intellectually sound workforce. As a cross over interdependency, there is much to be gained by actively sourcing intelligence from the workforce at the frontline and in first response. Here what ought to be considered is the type of information and knowledge that is often outside the frame of ‘reporting/recording crime’. This information will often be tacit, and will often be based on the working patterns and routes and observations from frontline and first response (Ackroyd, et al., 1992).

Observations identified gaps in knowledge sharing and transfer which impact on the functional ability of the police to adequately implement knowledge management processes. Throughout the field immersion, the term knowledge management was not one that was volunteered, nor did there appear to be a specific known plan for managing localised knowledge beyond recording crimes and filing evidence by way of statements and peripheral or incidental information relevant to a crime.
Officers practice informal knowledge transfer and knowledge as and when they meet (Hoey & Topping, 2010). The pressured working environment, however, limits and disorganises that transfer, such that there are no timed meetings and or routine exchanges of information as part of the working day for the officers except for shift briefings. This is so especially when the officers are all working different shifts, returning to their desks at random times without being able to predict what opportunities may arise to meet, share and manage any information available.

Where incidental meetings do occur, the staff show an immense amount of acumen and generally share information with each other readily. During this study, some significant issues with knowledge sharing and transfer were brought to the fore. Although the police make every effort to assemble teams and or boards to manage information sharing, and organise start of shift briefings for officers before they go on the beat, the cohesion and consistency of these efforts and indeed the predominant absence of these information sharing bridges, using ICT, can create loopholes and significant gaps in information which can lead to serious problems when serious incidents arise (Innes & Sheptycki, 2004).

There are also particular clusters of issues that may present an immediate limitation when redundancies, knowledge transfer, value led organisational memory and capability are considered within the scope above. Knowledge often resides within people and if they have no rational way of passing it on, it loses its value and cannot be exploited appropriately. Junior officers tend to be mostly working in high volume public facing positions with complex dynamic tasks dictated by the flow of work through first response and control. They are often supported by sergeants and inspectors who bring experience to bear, coordinating, supporting, guiding and advising in a hands-on capacity. This, however, in a highly dynamic environment does not always allow for information sharing in the broad sense and is limited to exchange of critical information relevant to the present scenario. The longer term/wider scope value of the knowledge frontline staff have is therefore lost or forgotten for want of where to put it, how to store it, who to share it with.

The loss of local knowledge when moves to processing centres on a larger scale are envisaged has been reported in other contexts (Harper, et al., 2012) in their study of a retail environment. The inherent differential distribution of local knowledge, varied ease of access to information in new formats and the particular nature of information repositories vs. unpredictable demands all affect the way that work can be done. The value of technology to policing is significant, but evidently works best when used in conjunction with human judgement (Koper, et al., 2014).

In particular, knowledge sharing can sometimes be limited in such a way that a manager expected to implement an IS/ICT system to drive the business results it is expected to deliver will rarely be consulted in depth on the functional intricacies of how, what, which tools or features it will have. In these situations, a manager is left with preparing for eventualities, but limited in how to prepare and streamline change when it occurs as their "lane" to implement. As this occurs, the value added element of incorporating tacit to explicit knowledge streams is often not factored in at all.

Business leaders at Bedfordshire police need to recognise and economically harness organisational memory by using their people and recruiting people who have experience in other industries as intellectual assets and information resources. Consulting all levels of staff and diversification of workforces before adopting a business intelligence approach, direction or decision often yields clearer understanding of the workplace and processes from the viewpoints of the doers.
5.7 People, Working Culture and Institutionalisation

Deployment of ICT is driven by the business case that the police force adopts, performance measures put in place by a functional but politically elected police and crime commissioner and the elementary considerations of what is required emanating from top management.

Within public services such as policing, it is altogether relatively easy to see people in typecast roles without identifying their other peripheral strengths that can aid and support others. The pace and frequency of change and demands for increased efficiency require a better mode of managing change and working culture and general camaraderie and morale boosting that comes with helping workers to understand what is going to happen, why and when and enabling them to have a say is a vital need.

The hierarchal way policing works often create pockets of conjoined senior officials within a complex web into different areas of work from operational to strategic extending to operational and specialist functions. Senior officials have designated roles which drive them toward managing particular areas of work, but limit them in scope of knowledge sharing where they may indeed feel disinclined to tamper with decisions as their job is to follow instructions, implement and facilitate rather than devote time to subjective questioning of decisions made executively. Junior officers operate in an environment governed by instruction taking and effective compliance to set policies and guidelines and their views will feed off their perception of the levels of understanding demonstrated by their immediate business leaders. The issues that present in the workplace which can be impactful on the mode, method and ease of acceptance of technologies observed in this study were consistent with generalised views demonstrated in other bodies of work where technologies are largely seen as controlled by managers with limited autonomy (Ackroyd, et al., 1992; Brown & Brudney, 2003)

As detailed in the previous section, at the time of completing fieldwork, the plans to roll out an emergency services mobile communication system [ESMCP] which would rely on enabling one device communications, recording and record retrieval for call outs all running off a mobile network using 4G networks was in the offing. The ESMCP service would hinge on packet based wireless communication services across a network that are emergent i.e. 4G and in principle meant to be fast and efficient making the smallest of devices faster for voice and data transmission. These plans however were due to be rolled out in March of 2016 and as at July of 2017 there were still significant delays and no sign of deployment in any realistic way.

On the one hand, a majority of reactions rendered opinions that although the entire project is a central government driven idea spurred by the need to significantly drive down costs of communication, there were serious concerns about entrusting a mobile network to take on this role coupled with some other concerns around the area of re enacting an agreement to manage an even more ‘wobbly’ system using the same and or similar or regrouped and or subsidiary companies tied to the same supplier for the existing air wave radio. From objective reading and comparative, recursive investigations with business leaders, it was clear that they were indeed willing to engage with and try out newer technologies but regarded the suggestion of reliance on a mobile network with some concern.

Many concerns about security, safety, reliability and robustness were indeed raised at a parliamentary sitting which examined the home office decision to replace the existing systems which are used everywhere in the world, replacing this with a mobile network communication system that is only used by one country in the entire world. Questions were raised about whether the model which appears to have success in South Korea could be said to be robust enough to manage the significantly
different and complicated terrain and service levels required in England. The positives outlined such as high speed data, flexibility and low cost were subjected to questions which revealed answers that mirrored the views and opinions of participants in this study and many indeed remain unanswered as at the end of field immersion (Bell, et al., 2016). The viewpoints that were gathered regarding this from the participants spelled anticipatory positivity alongside scepticism considering and highlighting the well known understanding and issue or mobile coverage, terrain issues, emerging security problems and risks associated with absolute reliance on mobile networks for the purpose of transmitting vital and singularly important emergency communications.

Indeed on the whole, the theme most associated with the idea of improved systems being deployed at Bedfordshire police from front line staff was that of resigned indifference mixed with hope and a desire to be engaged better as stakeholders at all levels and ranks. As this new innovation was being slowly announced, they were very aware they had been waiting over one year for a promised software overhaul which had failed at uptime expectations on two test runs. Some staff members had received extensive and costly training multiple times on how to use the expected new information system named Athena, which was to merge with two key systems, Tuserve and Storm, to power and blend the communications currently carried out by phone, tablet pc and radio into one single device which would also incorporate the new 4G radio communication system. No single respondent was hopeful and several highlighted their experience of many schemes that they trained and got briefed about that simply never arrived and later got scrapped due to obsolescence by the time of readiness for implementation.

When changes are mandated, particularly in the area of ICT, there is a significant disparity between decisions to adopt and actual full implementation. The delays to implementation often mean obsolesion by completion, abandonment of projects, alienation by completion or the development of a general frustration and distancing of users from the functional product through disillusionment. The biggest challenges here are therefore fragmentations in leadership and management and the rate of changes and movement to and from roles.

Competent teams need consistency in approach and appropriateness of duty (Manning, 1992). They are more inclined to become disillusioned and fail when there is poor change management and delays to or scrappage of implementations they have prepared to accept (Dupont, 2001). This inevitably leads to an approach to technology that limits questioning and instead encourages indifference (Pollit, 2010). Each person along the chain eventually either reluctantly accepting that should they have ideas, that those ideas do not matter or having ideas but realising the easiest political stand would be to toe the generally accepted line or deciding to tick all the boxes and only do the job they are asked in order to fit in.

The use of ICT to manage and fight serious cyber crime is receiving increased attention but hampered by a distinct lack of resources and low levels of retention of staff due to market pay scale disparities and difficulties around legal limitations to the access and use of data from ubiquitous, web based and social media based information. There is however good awareness and enthusiasm and encouraging understanding of the scope of cybercrime and indeed a majority of staff were motivationally enthusiastic to share their insights on ways that cybercrime could be better categorised and managed in order to keep up with citizen expectations. There was a strong desire expressed to have and or see sophisticated systems that enable disruption of cybercrime which often affects the most vulnerable citizens and to have more practical resources to support citizens in safety. There was also a strong
desire for community led information hubs which promote publicly supplied intelligence to help policing function better.

The tools used to validate and distinguish crimes for action or non-action were noted as markedly aged with limited expertise in many of hundreds of systems which workers have to rely on to access information. There was a clear desire to see interdependencies and interoperabilities better exploited with a view to reducing and or sharing resources between various public agencies who the police are increasingly carrying out work for as many public services continue to abandon service provision leaving the police as a first resort rather than last resort, particularly in managing social issues and community based issues including critical healthcare and support for vulnerable citizens.

Interactions between policing staff and citizens and or allied service colleagues is fluid, with some marked concerns expressed about increased expectations and demands that other departments place on police to carry out duties which are essentially non police related. Some concerns also arose about the way interdependencies are limited and information sharing is constrained, whilst indeed with the limited information gained, officers often have to uphold law in cases where they have principled concerns about the way that other organisations implement duty of care and or make provision for safety of vulnerable parties. In settings with high variances in ethnicities and multiple language barriers, workers expressed hopes and interest in having technologies to support translation and or understanding of citizens to enable proactive responses to threats and risks.

Whilst it is important to acknowledge that there are areas where the policing service’s abilities, tools and method or mode of engagement with technologies can be improved, it is likewise necessary to admit and acknowledge that the force is cash strapped and majorly constrained by this in many respects However, the areas of improvement that are key relate mostly to a realignment of business leaders to staffing on the frontline with a view to lobbying for better accountability and realistic expectations from central government and the amplification of frontline staff voices in the decisions that impact on the type of technologies they are provided with. Digital capability is at a subpar level due to the complexities of resourcing and indeed with time and dedication, business leaders acknowledge deficits and express a strong interest in continuous and sustainable improvement of services at Bedfordshire police

The level of adoption of ICT and the perceptions of the staff gained through observation showed good awareness of the value of technologies but also comments about the need to harness and explore capabilities of staff as well as to consider more active effort to improve adequacy, reliability and functionality of facilitation tools to help them work better.

It is clear that ICT is an integral facilitator for policing and appropriateness is key to enabling best outcomes. Technology presents as a high value tool for policing but works optimally when used in conjunction with human judgment. In particular, the duties of policing staff benefit from effective use of technology. However technology cannot be said to have capabilities that surpass human capital. The state and level of technology in use requires equally capable humans in numbers which are particularly absent due to zonal funding cuts. This study as a whole has therefore enabled an outside in exploration of issues that affect the ability to police the region particularly those that impact on efficiency and efficacy and which inspectorate reviews may not often detect due to their subtle yet dominant nature.
Chapter 6

Conclusion

In the conclusion of this thesis, I revisit and reflect upon findings in order to briefly summarise indicated perspectives and concisely touch on a few helpful highlights and reminders of the research outcomes helpful to the police force and to academia.

This study was initiated to explore technology in policing and to study the use of information and communication technologies within the Bedfordshire police force. The aims therein were to understand and characterise the scope of use, application, adoption and engagement of information and communication technologies for fighting crime. To identify and characterise tools in use and to determine humanistic views of the world of policing with respect to informatics at one police force. The overall goal was to do this in a social setting whilst appreciatively assimilating information within a diverse and dynamic environment to gain rich overviews and understanding and a clearer picture.

The thesis took a strategic approach that considered historical philosophies of knowledge with a view to understanding and making meaning from the field immersion and in order to work pragmatically, the interpretive view was taken with acknowledgment for a reality that is socially constructed by the human actors with a relativist ontological positioning to highlight the value of eliciting information from a reality that is constructed and reconstructed subjectively through human and social processes and acknowledge the conjoinment of the knower of the information through an epistemological stance of subjectivism, in that the knower cannot be separated from what they know.

Adopting an ethnographically focussed research process meant an emphasis on real-time, real-world, practices. This methodology supported the eliciting and providing of an in-depth detailed descriptive overview of everyday life of the Bedfordshire police force. The first goal therein was to revisit the research questions and to consider whether the emergent themes encapsulate the summary answers to these.

In working immersively to understand how information systems serve to inform and support officers in their work it was clear that each of these systems they use have differing acceptance levels. It was also clear that the work they do is highly practical and relies on critical thinking and does not allow a measure of independent thinking or adoption of innovation with the same scope as the private sector and/or that sits outside of policing policies for data use, technology use and management of decision making at many front facing levels. The length of time spent in field and the amount of data collected has been insightful. Around 10% of the workforce participated in this study, a far higher number than originally anticipated and this yielded a rich dataset. The reporting of this ethnography outlined in this report and the overviews presented within it are however focussed on research goals and can be described as the tip of the iceberg with respect to the complexities that this police force manages from day to day.

The core research question was: **How does Bedfordshire police use and engage with ICT to facilitate safety and security of citizens and fight crime?**

In answering this question, the study identified and examined what characteristics, patterns and trends exist in usage and engagement based on the perspectives of the police themselves. Bedfordshire
Technology in policing – An ethnographic study of the use of information and communication technology within Bedfordshire police force.

police force uses ICT and IS as a facilitation, communication and administrative management tool. The bulk of policing administrative needs are related to record keeping, database management and information collation. These include centralised information and communication deployment and receiving technologies, technologies to support reactive work and information generated for this purpose, awareness, monitoring, recording, compliance, performance and security enhancement technologies. Some of these technologies are exclusively for communication and used in tandem with non digital tools, others are for information, storage and retrieval to facilitate tasks and duties.

A majority of these technologies have a prominent role in public facing conditions whilst others are incidental and or located in the environments where backroom policing is required. Indeed there are issues in the area of interdependency management and development as noted by previous work locally, regionally and interdepartmentally as well as nationally (Babuta, 2017; Baldini, 2010; Brown & Brudney, 2003). Usage characteristics, patterns and trends at this police force are varied and use seems to be motivated by fitness for purpose, job role and working pattern. These include usefulness, practicality and functionality. In all, although technology is routinely embedded in police work, the most up to date technology supports record keeping rather than routine investigation. Moreover, the vignettes described above show the absolute importance of robust and reliable technology. Its failure causes a disproportionate amount of disruption.

Engagement is adequate but lacking and notably balanced with availability, functionality and ease of use. Overall there was a reflected interest and enthusiasm regarding engagement with technologies with the caveats highlighted in the body of this report including but not limited to fitness for purpose, reliability and ease of use.

Sub Questions

**Does the police force have awareness, proficiency and adequate tools with which to understand and recognise the role of information communication technology in managing crime?**

Police officers need to; it almost goes without saying, have an understanding of how their technology is used, how to manage often complex search hierarchies using different and not always compatible technologies, and to do so with, at best, limited time and resources. This study found that the police staff can be said to have intermediate levels of awareness and proficiency. This however varies according to age, experience, scope of duties and length of employment. With respect to adequacy, the tools that were available are predominantly indicated as being outdated, obsolete and or inadequate in one way or another.

The role of technology in managing crime appears to be well recognised, however there is limited acceptance of the role of data and knowledge and indications are that the data collected could be put to better use in managing and building better strategic approaches to work whilst working within existing legislation and policy. In some cases it was apparent that training in the full suite of functionalities offered by software might improve use.

**Does the police force adopt an approach that leverages increased benefit from use of information and communication technology?**

The answer to this question is a partial yes. The police force does not have the means to adopt an approach that builds upon the knowledge worker and knowledge management in a comprehensive
way to reflect the ways of working and the continued role of the traditional police worker in an innovative world. The continuance of benefits from information and communication technologies will require time and effort and depend on the suitability, functionality and appropriateness of tools. There was also some indication that business leaders and policing teams require more capacity building in order to better understand how to align their business models to reflect the essential exchange processes, knowledge transfers and continued learning through tacit diffusion which impact on and can drive their information and communication needs.

There was an apparent need to establish and appropriate the difference between what is offered by suppliers and identifying what officers actually need. There is little evidence that requirements elicitation has involved any close investigation of practical policing at the force to identify and address its own uniqueness. Improving understanding and including junior staff in capacity building exercises would make better use of expertise, and exploit the professional resources available to Bedfordshire police through BCH. Other relevant observations highlighted corporate culture, working ethos, modes and means of rolling out ICT change and the motivational attitudes staff have toward work and efficiency as relevant and impactful on their approach to technology and leverage capabilities.

The ethnographic method has been an enabler for the themes elicited above, bringing a richness to the study that is clear when compared to a quantitative or deterministic study, as noted by other bodies of work such as Greenhalgh and Swinglehurst (2011) who highlight the value of ethnography for examining ICTs in complex social systems. They draw attention to concerns with philosophical assumptions and deterministic research study designs that can limit the consideration of ICTs as part of complex social practices that involve multiple human actors. They go on to suggest that ethnographic evaluation of ICTs is preferable to utilising deterministic experimental studies with positivistic assumptions arguing indeed as this work does and assert that failures in design can lead to poor understanding and representation of the social systems in which the ICTs under investigation exist.

The overall process that enabled answers to these questions was a direct result of engaging with participants and eliciting key points and extracting themes from robust data with the study context as they became clear in answer to the research questions.

Overall the outcomes provide a snapshot that touch on leadership, appropriateness and efficacy including organisational culture and suitability for purpose of ICT tools. The outcomes provide a helpful research contribution in an age where policing services need a careful working balance of the interaction and engagement with technology. They should however be taken in hand as an overview of ICT at Bedfordshire policing and not of policing as a whole. This is particularly relevant when the unique circumstances of Bedfordshire constabulary are taken into account and when the aforementioned issues around decentralised disbursements operations and various statutes are considered. Furthermore, due to confidentiality considerations, some information is touched upon but specifics are not advanced in a way that compromises policing, rather information presented in a way that can be easily understood without need to have specific system names and functions in accordance with the Official Secrets Act 1989 relevant to England and Wales where this study was conducted.

The detail from the research highlights and clarifies issues that affect change, expectations, ideologies and stereotypes and indeed bring to the fore how increasingly difficult it is to police Bedfordshire with limited resources particularly with heightened demands from unconventional places. It highlights
the altogether focussed and diligent job police forces do by engaging tools that are limited in comparison to mainstream profitable organisations and applying them successfully. It makes for a compelling motivation to encourage other social researchers and workplace analysts to bring expertise to bear by exploring unconventional and rarely researched areas of public service

Policing is of course a reactive service that is increasingly working to be proactive. Therefore the trends in one force may well differ from another as these will depend on the types of demands that are made of policing in another county. The reception of this in work study and its facilitation was supported by business leaders at Bedfordshire police force and in feedback, the indications of the value of a workplace study, the scope of the nature of ethnography in uncovering incidentals, related to and or relevant to work processes as well as those pertinent to ICT use were highlighted. There is also scope for further research in the area of new technology implementation and development as well as knowledge management, exploration of stakeholdership and ownership of ICT implementations for frontline staff, practical applications and management of technological implementations within the police force. With respect to this, a short outline of possible further research directions are outlined in the final chapter of this paper with a view to stimulating ideas and understanding of the uniqueness of technology in policing in Bedfordshire and how beneficial studies like this could be if conducted broadly and with increased prevalence across the police force nationally.
Chapter 7
Future research
This section presents an overview possible future research directions that build on this body of work based upon findings and incidentals that were outside the scope of the aims of this thesis

The issues highlighted in this paper are limited to specific the research area within the questions and extend somewhat to incorporate the intricacies of technology and policing in one force. It also enabled the exploration and consideration of further research in the area of technology implementation in policing for all staff focussing on use of technology in policing in action.

In conducting this research, the data that was yielded up provided a significant amount of understanding and knowledge of policing and other areas of study that would bring a better and clearer understanding to bear on technologies, their use in policing and the role of communications and functional technologies in policing.

At the end of my research it was clear that there is more that can be done to acquire and develop a working understanding of the importance, scope and role of functional information and communication technologies in an around the area of emerging technologies such as IoT, ubiquitous systems and more and building on what is known about ICT in policing based on previous studies for the purpose of considering what is specific and relevant to how change and adoption is managed with new technology implementation in policing. There were also elements of observations that gave credence to the possibilities of building on this research by conducting further research in the area of critical information studies to elicit clearer understanding of patterns of working, algorithmic directions and the impact and importance as well as intertwining of information, policy, power and community.

In this research journey it was clear that there needs to be some more engagement of workers and enablement as owners in development projects at the outset. Critical success of information and communication technology use and deployment of technologies rely on appropriately managing the change and adoption of new technologies in policing by engaging the workforce in and as part of the process. More research is needed into how best police can be supported to achieve this and to ameliorate a majority of the issues and problems associated with development, adoption, implementation and successful use technologies in the police force. An exploration of the use and or understanding of the scope of incorporation of strategic teams to functionally guide the technology development process prior to implementation and work to explore how to effectively enable phased in change and adoption is a positive research direction in this respect.

Another emergent theme was the consideration of issues associated with collaborative working between policing and other agencies. In this respect it would be beneficial to consider and explore the development of a collaborative communications and use of technology frameworks that enable beneficial interaction, information transmission and sharing across public services agencies. A study that would consider development of information and communications led policies to guide infrastructure through elicitation of the scope of use of technology in the different agencies is a relevant research route. This would lead to better procedural and infrastructural policy development and capacity building in policing to motivate change and support alongside continued development of systems. The outcomes of this line of research would likely enable better capacity building and shared
interagency policy development engaging and harnessing interdependencies whilst eliminating redundancies for a better and more efficient police service.

Conclusively the data gathered during this thesis process was robust in scope such that subjectively processing a soft systems methodology procedure with some additional work to support veracity and value of data in the current form could support the promulgation of a solutions and recommendations outline which could serve to benefit the police force further. A study of this nature will likely blend the findings of this report into a larger resource and better tool to benefit the police force.

There was a significant benefit derived from working with and around the police force using convenience methods of participant recruitment and capitalising on incidental participants. It yielded an organic set of viewpoints and in conclusion there would be benefit in further research to identify gaps and unknown skill sets with respect to information and communication technologies and to derive from the knowledge base held within intellectual assets which can harnessed and developed whilst retaining current operational roles to diversify workloads and improve job satisfaction. This type of study will be well placed to explore whether technology and use of it in a satisfying way with respect to ease of use and user led technological innovation adoption could limit the turnover and truancy levels within staff and diminish burnout rates. It could also further clarify and build structured itemisation of the ways to create and improve the sense of ownership and connectivity with leadership which enables better change management, implementation development of ICT/IS strategies and tools.

The research directions highlighted above all have potential to support academic knowledge and bring benefit where it is needed. They will also support and enable continued development of solutions that build and promote new ways of working together into policy and practice across the area of information systems planning and use, knowledge management, information sharing, appropriation of resources and record and data management. This in turn will increase value to citizens and maximise resources and enhance working practices in policing as well as contribute to the field of informatics.

Overall, my experience enabled insight into the benefit of continued study of policing and particularly technology in policing to drive better academic attention and in turn a better quality and value of tool, skill and resource development which is sustained and better explored for use in policing.

The outcomes of these emergent areas of research if explored will be beneficial as a whole for policing enabling access to a rigorous reference guide for the implementation of technology in the police force. The detail from these research areas if explored will enable the clarification of issues and recommendation of solutions that address acceptance and change ideologies unique to policing. It will highlight the altogether focussed and diligent job police forces, building and strengthening a case for benefits of enabling research and engaging academia in the evolvement of policing and support continued development to familiarise researchers with the specialised and important task of engaging with modern information and communications technologies in policing nationwide.
8. Bibliography


Chandra, V. & Spencer, P., 2015. *Operationalising analytics to drive value*. s.l.: Ernst & Young LLP.


Crawford, R., Disney, R. & Innes, D., 2015. *Funding the English & Welsh police service: from boom to bust?*, s.l.: Institute for fiscal studies [IFS].


HMIC, 2017. *Use of the police national computer: An inspection of the ACRO criminal records office*, s.l.: HMIC.


ITU, 2016. *The ICT Facts and Figures 2016 ICT data for the world, by geographic regions and by level of development, for number of Individuals using the Internet worldwide*. s.l.: s.n.


Appendices

Appendix 1  Interview, group discussion and observation guide

What types of technology are in use?
What types of technology are available but not in use and why
Are officers at the local police force aware of the types of how to access information about?
Crimes facilitated through information communication technology.
Do police officers understand and have knowledge of the role of information
Communication technology role in perpetuation of serious crime?
Are the limitations to classification of crimes directly linked to levels of awareness of?
Technology led crime?
Does the local police force have adequate tools with which to understand and recognise
Technology led crimes?
Is there a central point of information and reference about serious crimes aided by?
Information communication technology?
Does the current approach within the police force take into account the findings of the most?
Recent policing inspectorate report regarding digital crimes
How can awareness of the role of information communications technology in serious
Crimes are better promoted to police officers and the public?
Are there striking or significant trends and or variations in perceptions and awareness of?
Use of and effect of use of information and communication technology tools on communication and
engagement modes and methods common to and or synonymous with specific groups of officers and
communities, how and why?
Will the police officers benefit from an information system that enables public access and police
access to record intelligence about serious and general cyber crime including enablement of the public
to log experiences.
Appendix 2  Informed consent form

Informed Consent form MSc Information systems Thesis (Please complete this form to participate in the research.)

Project Title technology in policing ICT enabled crime - A study of the use of information and communication technology within Bedfordshire police force.

Researcher Miss Ganiat O Kazeem

About the research
Thank you for your interest in taking part in this research. The goal of this study is to identify the types of information and communication technology used to manage crime and how the police use information communication systems and communication methods to identify serious cyber crime and facilitate prosecution of criminals who use technology to perpetuate crimes.

The study is ethnographic in nature and as a researcher, I will be working with you confidentially either shadowing your actions, interviewing you alone or observing you in a coordinated group discussion where free flowing discussions on the areas of interest will be promoted and encouraged.

It will be looking at trends and patterns that illustrate an overview of the ways that the police engage the public and the limitations that are imposed and or govern the use of ICT which depend on organisational cohesion, cooperation and understanding.

It will build an understanding of the impact of information and communication technology on policing work and the way that cyber enabled crime is managed. It will attempt to understand the role and social affect that impacts on the use of information and communication technology on reporting crime

The very success of this study is reliant on confidence in my commitment to safeguarding your privacy and delivering an overview and understanding of your knowledge and perceptions without bias and without any preconception.

This will of course require your trust and my trust and respect for organisational privacy laws as well as the privacy of your clientele, which will be respected completely throughout the duration of this study including when it is reported.

All information of a personal nature, identifiers and critical law enforcement/prosecution data will be stripped of identifiers and where necessary redacted to the standard required by your organisation.

I will also operate within your health, safety and organisational occupational policies at all times. If you have any questions arising from the information above, please ask the researcher before you to decide whether to join in. You will be given a copy of this Consent Form to keep and refer to at any time.

Participant’s Statement
I agree that:
I have read the notes written above, and understand what the study involves.
I understand that if I decide at any time that I no longer wish to take part in this project, I can notify the researchers involved and withdraw immediately.
I agree that my non-personal research data may be used by others for future research. I am assured that the confidentiality of my personal data will be upheld through the removal of identifiers.
I understand that the information I have submitted will be published and on request, I will be sent a copy. Confidentiality and anonymity will be maintained and it will not be possible to identify me from
any publications. I understand that such information will be treated as strictly confidential and handled in accordance with the provisions of the Data Protection Act 1998.
I agree that the research project named above has been explained to me to my satisfaction and I agree to take part in this study.

Name: 
Signature: 
Email 
Date: 

Appendix 3 Declaration
Name: Miss Ganiat Omolara Kazeem
Course: Master Thesis - 30 ECTS Department of Informatics
Course Code 5IK10E

I am the sole author of the thesis.
I am solely responsible for the entire project.
I am solely responsible for the content in the project report.
I declare that in my/our thesis, I
1. did not re-use my previous work without referring to it
2. did not use others work without referring to their work (e.g. course literature, scientific publications, other types of articles, web sites or lecture material)
3. use the references and quotes in a proper way
4. included all references and resources in a reference list
5. am aware that not citing and using references in a correct way may be considered as plagiarism

Signature

Miss G O Kazeem

Date 05 December 2016
TECHNOLOGY IN POLICING

WHEN
MARCH & APRIL
PRE BOOK SLOTS TODAY

WHERE
KEMPSTON & LUTON POLICE STATIONS
DISCUSSIONS, FOCUS GROUPS & FIELD OBSERVATION

You are invited to participate in one to one discussions, focus groups and shadowing in field to establish the viewpoint of police officers regarding technology in policing.

Participating in this study will help to identify trends and patterns that illustrate EMERGING TRENDS IN TECHNOLOGY USE BY POLICE. It will focus on identifying how the police engage with technologies and the benefits and or limitations that are imposed by, and or govern the use of ICT.

It will also consider the role of the viewpoint of the police officers regarding technology and its impact on organisational cohesion, cooperation and understanding. The outcomes of the study will be anonymised and shared with you and business leaders to improve your working conditions and the organisation.

RESEARCHER: MISS GANIAT KAZEEM, LINNAEUS UNIVERSITY, VAXJO, SWEDEN
Technology in policing – An ethnographic study of the use of information and communication technology within Bedfordshire police force.

Appendix 5  Images of historical artefacts
These artefacts are located at Bedfordshire police HQ and representative of the changing face and inclusivity of police e.g. women over decades.
Appendix 6  Study setting images

Image 1.  Control Room

Image 2.  Custodial transfer/transportation van
Technology in policing – An ethnographic study of the use of information and communication technology within Bedfordshire police force.

Image 3  Custody suite Bedfordshire South

Image 4  Custody Suite Bedfordshire North
Appendix 7  Organisation Structure