Know and Tell: Understanding Knowledge Transfer in the Fire and Rescue Service

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

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Abstract

This thesis seeks to make a contribution to both the theoretical and empirical understanding of knowledge transfer in organisations. In particular, it explores and articulates how tacit knowledge is transferred within (and through) communities of practice. It does so via a single longitudinal case study of Northern Fire, the fourth largest Fire and Rescue Service in the UK. There is a paucity of studies on the UK Fire and Rescue Service and the extant literature is sparse. This study offers a unique insight and perspective into how fire fighters construct knowledge and make sense of their everyday reality within communities of practice. Adopting a qualitative ethnographic approach, this research sets out a detailed exposition of the transfer of knowledge throughout Northern Fire. Focus groups of some 58 fire fighters together with 14 semi-structured interviews of senior management, support staff, HR and IT functions were undertaken. In addition, drawing upon Orr's (1996) ethnographic account of photo-copier repair personnel, participant observation was used to explore the daily working lives of fire fighters. Participant observation examined how Red Watch, a fictional name given to a group of fire fighters, transferred tacit knowledge and skills as a community of practice. The thesis also explores organisational memory loss. It extends our empirical understanding of how knowledge is both forgotten and retained on a both a voluntary and involuntary basis.

The very nature of tacit knowledge can make both transfer and articulation problematic. A significant proportion of the extant knowledge management literature places tacit knowledge into rigid taxonomies or focuses upon means of conversion of one form of knowledge to the other. Similarly, a large corpus of the normative literature on communities of practice depicts these as safe, benign environments where knowledge transfer is often axiomatic. This research offers a more critical perspective of of how communities of practice share knowledge, negotiate power and facilitate participation. A number of discrete theoretical contributions are made in relation to how legitimate peripheral participation, power and trust can impact both positively and negatively on knowledge transfer. This thesis argues that in order to truly understand tacit knowledge there needs to be a greater focus on Polanyi's (1958) original exposition of tacit knowing and

the nexus between knowing and doing. This thesis contends that a dialogic and pluralistic approach is required to understand how tacit knowledge is transferred within communities of practice. Here fire fighters are theorised as thinking professionals who drew upon all forms of knowledge in their everyday praxis.

Glossary of Common Abbreviations	
Abbreviation	**Meaning**
Branch	A colloquialism for a fire fighter's hose.
Branch technique	Techniques and skills of using a hose to fight fire.
ACO	Assistant Chief Fire Officer.
BA	Breathing Apparatus equipment comprising of oxygen tanks, masks, telemetry board and radio controls.
BATA	Breathing apparatus training assessment which is an annual assessment that all fire fighters must pass and be deemed competent to use BA equipment.
CFO	Chief Fire Officer.
DCO	Deputy Chief Fire Officer.

EMOC	Electronic Maintenance of Competence. EMOC's are computer generated tests and assessments on key principles of fire-fighting. Fire fighters must pass and acknowledge receipt of technical bulletins, updates and information.
MDT	Mobile data terminal.
NOG	National Operating Guidelines.
Watch	A group of fire fighters ranging from between 4 and 10 members. Watches work closely together during the same shift patterns and are often denoted by colour (e.g. blue or red).

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Chapter 1: Introduction

1.1 Key Debates Pertinent to this Thesis

This thesis explores knowledge transfer within the UK Fire and Rescue Service. It does so via a longitudinal ethnographic study of the fourth largest Fire and Rescue Service in the UK. The thesis considers how both tacit and explicit knowledge are transferred by fire fighters. It also explores the barriers and enablers to such transfer. Fire fighters operate in groups called watches which have often been established over many years. Drawing upon Orr's (1996) ethnographic study of photocopier repair personnel, the role of communities of practice ("CoP") in facilitating knowledge transfer is laid out. The research seeks to explore the mechanics of CoP and considers how and why a CoP may be an effective means for the transfer of tacit knowledge and skills. It argues that narrative and storytelling are often at the heart of any CoP; moreover it is through this medium that knowledge is shared and ultimately transferred. This study also challenges some of the normative positions on power and legitimate peripheral participation ("LPP") that are taken as being almost apodictic within the knowledge management literature. Factors such as power and conflict may have a profound effect upon knowledge transfer; yet these factors are often a muted voice within the extant literature. The thesis uses a Foucauldian notion of power to explore how power was resisted, negotiated and sometimes contested by fire fighters in their everyday lives.

The research also explores organisational memory and how knowledge is lost both intentionally and unintentionally. This is best contextualised by the huge reduction in real fires in the UK. Fire fighters are fighting fewer fires and hence their experiential knowledge is at risk of decay. This factor is explored in more detail in Chapter five. The findings explore how important organisational memories may be lost over time and suggests mechanisms for ameliorating knowledge decay. They also challenge the normative epistemological assumption that unlearning is a sequential process where something must be unlearnt before new knowledge can be acquired.

A leitmotif of this thesis is the importance of personal knowing enunciated by Polanyi. Arguably a closer and more nuanced interpretation of Polanyi is required

in order to understand knowledge transfer processes more fully (Polanyi,1958). The idea of personal knowing where all forms of knowledge are drawn upon (both tacit and explicit) in the skilful performance of tasks is laid out. It is argued that Polanyi's exposition of tacit knowledge has been misappropriated and misapplied in the management literature. The nomenclature used to describe knowledge as being tacit or explicit is a helpful conceptual tool. However, this research argues that it was never Polanyi's intention to place knowledge into rigid and sometimes inflexible dichotomies. Polanyi emphasised the art of knowing. This draws upon all forms of knowledge that is often manifested in skilful performance and activity. Fire fighters are theorised as thinking professionals who interpret, question and utilise all forms of knowledge in their everyday praxis. On occasion workplace trust and exercising discretion impacted upon the nature of knowledge that was drawn upon. The aim of the thesis is to explore the following primary research questions:

- How do CoP facilitate both explicit and tacit knowledge transfer and in what circumstances.

- How are both explicit and tacit knowledge transferred and why are some transfer mechanisms more successful than others.

- How does organisational memory and the notion of unlearning impact upon successful knowledge transfer.

The three aims and objectives listed above are explored via a longitudinal case study of Northern Fire and Rescue ("Northern Fire"). The research has been conducted using a qualitative ethnographic framework. It has used social constructionism to explore how and why knowledge may be transferred. A purely quantitative paradigm was rejected as being unsuitable for this study. The thesis argues that by its very definition ontologically knowledge is not something that can be easily measured or quantified. It does not discount or devalue the role of

quantitative analysis; rather for this research a qualitative approach was more appropriate. This point is more fully rehearsed and debated in Chapter 4.

Northern Fire is a fictional name given to the fourth largest UK Fire and Rescue Service. This thesis explores how Northern Fire transfers knowledge as an organisation. It also explores the efficacy and effectiveness of Northern Fire's knowledge transfer procedures. There is a focus on the transfer of tacit knowledge amongst front line fire fighters. This is deliberate as understanding how to identify and effectively transfer tacit knowledge within Northern Fire has the potential to save lives. As the number of serious fires has significantly reduced, the case for exploring how to retain tacit knowledge and skills within the fire service becomes more compelling. But the thesis also captures knowledge transfer by senior management during a turbulent period in Northern Fire's organisational history. The research captured how Northern Fire dealt with significant flooding and the largest commercial fire it has tackled since the Blitz. In addition, the research offers a unique (and perhaps unprecedented) account of how fire fighters within CoP share knowledge, negotiate power and construct meaning in their everyday working lives. The thesis seeks to make a unique contribution by understanding and explaining how tacit knowledge and skills are transferred within the UK fire service. It also seeks to challenge some of the normative positions enunciated in the knowledge management literature which are explored below. This research posits that knowledge exists situationally within Northern Fire and it is through a dialogic and pluralistic approach that we can best understand how and why knowledge (both tacit and explicit) may be transferred. It argues against a mechanistic approach to knowledge based upon the rigid taxonomies discussed above.

1.2 Contributions to Knowledge

This study seeks to make a unique contribution to our understanding of knowledge transfer within the UK Fire and Rescue Service. It does so at both an empirical and theoretical level. From an empirical perspective, there is a paucity of studies on knowledge transfer within the UK Fire and Rescue Service. Fire fighters operate within (and through) CoP. Yet what we know about knowledge, its retention, dissemination and transfer is limited. Extant studies have tended to

focus upon the role of decision making in simulated scenarios such as skip fires, house fires or road traffic collisions (Okali et al. 2014; Cohen-Hatton and Honey, 2015; Cohen-Hatton et al. 2015). These are more fully explored in Chapter 2. Alternatively, there has been an exploration of eliciting experts' knowledge in dynamic and fast moving scenarios. The use of critical decision making tools has been utilised to understand tacit knowledge elicitation on the fire ground (Okoli et al. 2014; Okoli et al. 2016). However, the extant literature has not specifically addressed how fire fighters within CoP transfer and retain knowledge or the factors that may act as barriers or enablers to transfer. Similarly, existing literature on the UK Fire and Rescue Service and the Thomas (2016) review of possible changes to fire fighters' employment conditions note the dangers arising from erosion of experiential knowledge. This results from fire fighters attending significantly less real fires and can lead to an erosion of core fire-fighting skills. However, they offer no suggestions as to how the situation might be improved or how organisational memory might be retained. This research has specifically addressed the issue of organisational forgetting and offers an empirical analysis of both voluntary and involuntary memory loss in Northern Fire.

This thesis seeks to make an empirical contribution by offering a unique, multi-layered study of knowledge transfer in the UK Fire and Rescue Service. It explores previously unchartered territory regarding power and knowledge transfer, the roles of CoP in facilitating transfer and also organisational forgetting. The research has adopted a Foucauldian (1977) notion of power relations and used this as a lens through which to understand how power is both deployed and resisted. It also explores how CoP practice deal with mistakes and learn from failure (Baumard and Starbuck, 2005). This thesis augments and develops our empirical understanding of power relations in CoP; it also extends understanding of LPP and notions of 'expert' and 'novice.' In doing so, this research extends, deepens and adds to the existing knowledge management literature from both an epistemic and ontological perspective.

From a theoretical perspective, a contribution to knowledge is made on two principal fronts. Firstly, it theorises the relationship between power and trust in knowledge transfer as a dyadic one. Where trust levels were high knowledge

transfer was more effective; conversely where trust levels were low knowledge transfer was less effective (Lave and Wenger, 1991; Hayes and Walsham, 2000; Heizmann, 2011). Secondly, this thesis makes a theoretical contribution by extending De Holan and Phillip's (2004) typologies of organisational memory loss by adding two further categories. Firstly, organisational memory may be lost on an involuntary basis due to 'lost opportunity.' Here, organisational memory is lost due to the lack of opportunity to participate or practice in work based routines or skills. Memories are lost because the actual opportunity or circumstance to participate in a skill or activity are greatly reduced or abnegated. This adds to the existing typologies of memory decay or failure to capture. Secondly, 'readjustive unlearning' adds to the existing typologies of voluntary or purposeful memory loss. Here organisational memory is reduced or removed by virtue of a process of readjustment; 'new' knowledge replaces or augments existing 'old' knowledge in a dialectic process. This extends De Holan and Phillip's (2004) existing typologies of intentional unlearning and expunging organisational memory to avoid bad habits or mistakes. It also makes a theoretical contribution by virtue of theorising voluntary memory loss as a dialectic process where unlearning is not necessarily precedent to acquiring new knowledge and where existing knowledge helps contextualise and support the unlearning process (Hedberg, 1981; Nystrom and Starbuck, 1984; Klein, 1989).

This thesis presents fire fighters as thinking professionals who displayed independent critical thinking in performance of their duties. They drew upon, interpreted and applied all forms of knowledge (both tacit and explicit) in their everyday praxis. Discretion and resistance were sometimes used when deciding upon the best source of knowledge to draw upon. The notion of 'thinking professionals' acting in CoP and situated in the UK Fire and Rescue Service is a further theoretical contribution. A central tenet of this thesis is that our understanding of knowledge and its transfer has been compromised by a desire to convert tacit knowledge into explicit knowledge or focus on externalising tacit skills to achieve competitive advantage. This research argues that this is a misappropriation and misunderstanding of Polanyi's (1958) exposition of

personal knowing where all forms of knowledge are to be drawn upon rooted in human activity. This is rehearsed in detail in the literature review below.

1.3 Epistemic Perspectives on Knowledge

The question 'what is knowledge' has always occupied a central and fundamental space in philosophical enquiry. It is outside the scope of this thesis to set out a detailed exposition of the nature and content of knowledge. However, it would be incongruous in a thesis exploring knowledge not to clarify how it is to be theorised and defined. The dominant epistemic perspective within Western philosophy is the idea that knowledge is 'justified true belief.' Here the belief that x is true is predicated upon an individual believing that x is true and that such a belief is justified (Russell, 1961). This idea can trace its lineage back to Plato's Meno which addressed the connections between knowledge, truth and virtue. Plato's account of the discussion between Meno and Socrates notes the connection between 'true opinion and knowledge' and how the two concepts are closely connected (Plato, 2004, p.44). Knowledge in ancient philosophy was often perceived as deriving from sense experience; Plato argued that through observation human beings gain experience and in turn knowledge. As philosophical enquiry developed over time, two dominant epistemic categories of knowledge became established. The first perceived knowledge as deriving from rational thought and being a product of the mind. Descartes refined and developed early epistemic thoughts on the nature of knowledge building upon the foundations laid down by Aristotle and Plato. Descartes viewed knowledge through the lens of doubt and noted how everything may be subject to doubt except his own existence. From this Descartes extracted the famous notion of 'I think therefore I am' and the Cartesian distinction between mind and body. In his Second Meditation Descartes notes the importance of reason over sense experience. He uses the example of wax and how its properties, colour and shape change when it is placed near fire and starts to melt. The appearance of objects may confuse human beings and Descartes stressed the importance of reason in construing and explaining the world. The perception of wax is not 'sight, touch or imagination' but rather arises from 'inspection by the mind alone' (Descartes, 2008, p.23).

The idea of knowledge being predicated upon rational thought was fiercely opposed by empiricism. The enlightenment and new scientific discoveries posited that only true knowledge came from sense experience. The British empiricists such as Berkeley, Hume and Locke argued that humans obtain knowledge through their senses. Locke argues that the human mind is essentially a blank sheet or cabinet; true knowledge is derived via experience and experience alone. It is sense experience that will 'let in particular ideas' which will 'furnish the yet empty cabinet' of the mind (Locke, 2014, p.32). To speculate on God, immortality or the soul amounted to metaphysics which could never be proved. Hume bluntly discounted all such ideas as either sophistry or illusion and which should be committed to flames. A Humean analysis of knowledge vests upon 'perceptions or impressions and ideas' and that external objects are only known to humans 'by those perceptions they occasion' (Hume, 2011, p.65). Knowledge and understanding therefore are relative. Hume's account of causation accepts a scepticism that human beings cannot necessarily pinpoint or identify the causes of phenomena.

Any discussion regarding perspectives on knowledge would be impoverished without considering Kant's (2007) epistemic contribution. Kant saw the antinomy between experience and the senses as the origins of true knowledge. In his Critique of Pure Reason he demarcates between a priori and a posteriori knowledge. Knowledge that is a priori derives from rational thought for which experience is not necessary and where the subject and predicate are related. The term 'all bachelors are unmarried' is self-evident and can be established without prior experience by the very definition of the word 'bachelor.' However, knowledge that is a posteriori only comes from sense experience borne out via evidence from the world. Here knowledge does not arise from the meanings of terms or their relations. Hence 'Fred is not a bachelor' cannot be established by rational thought alone; it can only be established empirically via experience. Kant's exposition of knowledge rejects both empiricism and rationalism as being dichotomous and where one form of knowledge is positioned as being more plausible than the other. Kant (2007, p.37) posits that whilst all knowledge 'begins with experience' it does not follow that 'it arises from experience' which echoes

Descartes' scepticism. It is rational thought which supplements and enhances what humans observe and how they construe what they observe. Kant's exploration of how synthetic a priori knowledge may be possible posits that 'things in themselves' are unknowable as humans only know the world as it appears to us and not beyond our own subjective conditions.

The notion that knowledge is justified true belief is not without its criticisms or limitations (Zagzebski, 1994; Turri, 2011). Gettier's (1963) seminal paper draws out the role of luck and false belief in criticising knowledge as amounting to justified true belief. This is supported by the example of A who believes that B will get a job and has ten coins in his pocket. A concludes that the person who gets the job will have ten coins in his pocket. Actually, B does not get the job but A does and he also has ten coins in his pocket. A's knowledge is justified true belief but is based more on luck or coincidence; Gettier notes that an individual may form a belief that is untrue about one individual or object which is true about another individual or object. This thesis adopts the notion of knowledge as justified true belief. It recognises that theorising knowledge through this lens has limitations (as discussed above). However, notwithstanding this knowledge as justified true belief is the dominant epistemic paradigm in Western philosophy. It is also the paradigm adopted in the majority of the extant knowledge management literature (Nonaka and Takeuchi, 1995).

1.4 Synopsis and Introduction to the Thesis Chapters

This section maps out and provides a synopsis of the chapters contained in this thesis. The literature review comprises of two parts. The first part reviews the extant knowledge management literature regarding knowledge transfer. It sets out the various epistemic perspectives on knowledge and its transfer together with an analysis of empirical studies on both knowledge and power. The concepts of both tacit and explicit knowledge are explored and discussed. Polanyi's notion of personal knowing is set out in some detail. This thesis argues that Polanyi's exposition of knowledge and knowing has been misconstrued and misapplied. Polanyi's (1958) focus on personal knowing, utilising all forms of knowledge (both tacit and explicit), is drawn out. Borrowing from Bhaskar, this thesis argues that there is an epistemic falsity in how we have construed and applied tacit knowing

in contemporary organisations (Bhaskar, 1975). The central debates around whether tacit knowledge can be atomised into explicit forms or captured and codified are rehearsed. The objective or entitative perspective of knowledge is enunciated and compared alongside the practice based perspective. There is then a discussion regarding power and how often the extant knowledge management literature has marginalised power and its effect on knowledge transfer. The 'power as resource' perspective is laid out with reference to Luke's (2005) conceptualisation of power comprising of three dimensions. Focuault's (1977) exposition of power is then discussed and how power and knowledge are epistemically fused together.

The second part of the literature review moves on to discuss CoP and how they can help facilitate knowledge transfer. The notion of LPP is explored. Factors such as power and conflict are examined situated within (and through) CoP. There is an examination of how these factors impact upon knowledge transfer. Organisational memory is then explored and examined. There is an exposition of voluntary memory loss and the circumstances and processes that may cause it. Involuntary memory loss or forgetting is then discussed together with its impact upon organisations.

Chapter 4 sets out in detail the methodological approach adopted in this research. The use of a social constructionist paradigm in understanding and interpreting social science research is explored and defended. From an epistemic perspective, this thesis adopts Berger and Luckman's (1966) dialectic approach to the creation of knowledge. From an ontological perspective, the research adopts Cunliffe's (2002) notion of 'language as ontology.' Chapter 4 explores how identities and meaning are constructed through language. The role of case study research is then considered. The use of a single longitudinal case study comprising of participant observation, focus groups and semi-structured interviews is defended. The demarcation between analytic and statistical generalisations are debated. This thesis argues that the purpose of case study research is not necessarily to provide either analytic or statistical generalisations. Rather the raison d'etre of this research is to provide a detailed, vivid and 'thick' description and exploration of knowledge transfer within Northern Fire. Chapter

4 then concludes with an exploration of coding and how the data was thematically analysed before discussion in the three empirical chapters.

Chapter 5 is a contextual chapter that introduces Northern Fire and explains its function and statutory duties. The hierarchical structure of Northern Fire is explained together with its knowledge management practices. The UK Fire and Rescue Service has witnessed significant reductions in real fires together with proposals to change fire fighters' terms and conditions of employment and shift patterns. These avenues are explored together with their impact on Northern Fire. The topographical area in which Northern Fire operates is set out and the fire stations within it are introduced. Key operational decisions taken by senior management during the conduct of the research are examined. This thesis witnessed the introduction of new Breathing Apparatus equipment ("BA") at all 12 stations. The contextual chapter offers a unique vantage point and perspective of its introduction and assimilation within CoP.

The empirical analysis of this thesis comprises of three empirical chapters. Chapter 6 is the first empirical chapter which sets out the findings in relation to the first primary research question. It explores the role of CoP in the transfer of knowledge and the barriers and enablers to such transfer. The chapter is divided into three key sections setting out the empirical data. The first section is a vignette from ethnographical observation conducted during the research. It depicts how Red Watch a CoP of fire fighters in Longworth fire station (a fictional name to preserve anonymity) shared knowledge. Longworth is a 'typical' fire station within Northern Fire that is neither excessively busy nor quiet; it is representative of both age and gender for fire fighters in Northern Fire. The first vignette in chapter six depicts Red Watch during a training exercise in preparation for their formal BA training. It shows how factors like power and conflict impact upon knowledge transfer and how power is resisted and sometimes contested. It highlights the everyday workings of a fire station, how tensions arose and how they were ultimately resolved. The chapter also introduces the idea of fire fighters as 'thinking professionals'. It shows how fire fighters drew upon all forms of knowledge (both tacit and explicit) in the skilful performance of their duties. The chapter then moves forward to consider how senior management as a CoP dealt

with mistakes. It sets out the handover period between the Incoming and Outgoing Deputy Chief Fire Officer ("DCO") and how key operational decisions were dealt with. The chapter then moves forward to consider the notion of LPP within CoP. The normative position of the newcomer slowly moving towards the centre of a CoP and learning from an 'old timer' is explored and challenged. The chapter concludes by discussing conflict and how the reality of CoP in Northern Fire meant that dissensus amongst members was often prevalent.

Chapter 7 sets out the empirical data in relation to the second primary research question. It considers the barriers and enablers to the transfer of explicit codified knowledge in Northern Fire. The sender / receiver model of knowledge transfer within Northern Fire is explored from both an epistemological and ontological perspective. Knowledge was seen as a football that could be passed back and forth with the locus of control always vesting in Northern Fire. From an epistemic perspective, explicit knowledge was viewed in terms of risk and compliance. The chapter explores how the dissemination of knowledge in policy documents, procedures and manuals was used to establish an evidential chain. This mitigated against litigation risks and demonstrated compliance. The efficacy of the sender / receiver model is explored together with how power often facilitated knowledge transfer. This thesis adopts a Foucauldian perspective to theorise power relations and chapter 7 explains the nexus between power and knowledge transfer. It sets out how power relations were sometimes resisted in CoP and how this impacted upon knowledge transfer. The relationship between power and trust in knowledge transfer is then discussed and explored. Again the idea of fire fighters acting as thinking professionals is drawn out. The chapter considers how all forms of knowledge were drawn upon and how fire fighters exercised critical reflexivity in their approach to knowledge and its transfer.

Chapter 8 is the final empirical chapter in this thesis. It sets out the findings in relation to the third primary research question. The chapter explores both voluntary and involuntary organisational memory loss in Northern Fire. It sets out how fire fighters within CoP mitigated the loss of tacit knowledge and skills arising due to a reduction in the number of fires attended. The importance of narrative and storytelling is explored and how narrative acted as a mechanism for retaining

vital organisational memories. The chapter sets out how fire fighting traditions were kept alive via storytelling. It also explores how in some circumstances organisational memories were capable of being articulated and written down. The role of both tacit and explicit knowledge in this process is laid out. The chapter then moves forward to consider deliberate or intentional memory loss within Northern Fire. It documents the adoption of 'new' knowledge in relation to BA training and technique and its relationship with 'old' knowledge. There is an exploration of how fire fighters in CoP unlearn and the barriers and enablers to this process. Again the chapter positions fire fighters as thinking professionals. The process of intentional memory loss is explored as an iterative and dialectical process with fire fighters exercising both critical reflection and judgment. The chapter sets out how intentional memory loss was not a linear and sequential process that always involved the discarding or abandonment of 'old' knowledge. It demonstrates how voluntary unlearning may be perceived as readjusted unlearning with 'old' knowledge assisting and contextualising the acquisition and embedding of new skills and techniques.

Chapter 9 is the final and concluding chapter of this thesis. It sets out the empirical and theoretical contributions made to existing knowledge. This thesis offers a unique and perhaps unprecedented empirical study of fire fighters in the UK Fire and Rescue Service. It broadens and augments empirical understanding of how fire fighters within CoP share and transfer knowledge. The research also makes an empirical contribution to our understanding of power relations within CoP and how power may effect knowledge transfer. A further empirical contribution relates to increasing our understanding of voluntary and organisational memory loss, its causes and prevention. Chapter 9 sets out the empirical contributions in detail and draws together the findings from the previous empirical chapters. It also sets out and explores the theoretical contributions of this thesis. The research makes a theoretical contribution on a number of fronts. From an epistemic perspective it argues for a more nuanced exposition of Polanyi's Personal Knowledge (Polanyi, 1958). It positions fire fighters as thinking professionals who drew upon all forms of knowledge (both tacit and explicit) in the skilful performance of their duties. The thesis rejects a reductionist and binary

approach to knowledge management where knowledge is placed in categories (tacit, explicit, individual or group). It also rejects the privileging of one form of knowledge over the other. The research argues that to understand knowledge transfer there needs to be a reaffirmation of Polanyi's exposition of personal knowing that utilises all forms of knowledge in the skilful performance of tasks. It also seeks to theorise the relationship between power and trust as a dyadic one in knowledge transfer.

The thesis theorises power as being an enabler of knowledge transfer where trust levels are high and conversely as a barrier where trust levels are low. It also seeks to make a theoretical contribution by extending the typologies of involuntary and voluntary memory loss. The thesis makes an epistemic contribution by suggesting that a further typology of involuntary memory loss may arise due to 'lost opportunity'. Here experiential knowledge is lost due to a lack of opportunity to practice and embed vital professional skills. A further epistemic contribution is made by suggesting that deliberate memory loss may be theorised as 'readjustive unlearning'. Here unlearning manifests itself as discarding some elements of 'old' knowledge as a process of readjustment when acquiring new knowledge and skills.

The final concluding chapter sets out the limitations of the research and explores what generalisations may be applicable from the findings. It also addresses the practical implications of the research with particular emphasis on how the findings may augment fire fighter safety. The final chapter of this thesis then draws to a close and sets out some implications for future research together with some general observations and concluding remarks.

Chapter 2: Literature Review – Part One

2.1 Introduction

The literature review in this thesis is divided into two parts. This first part reviews the extant knowledge management literature regarding tacit and explicit knowledge. It also considers the role of CoP in facilitating knowledge transfer and barriers to transfer such as power and conflict. From an epistemic perspective, there are two dominant paradigms regarding the nature and context of knowledge. The first views knowledge as an object that can be passed back and forth often without diminution or dilution. Here knowledge is seen through the lens of Cartesian dualism where knowledge is separate and distinct from individual action or praxis. A positivistic approach to knowledge prevails with a preference on codified, explicit forms of knowledge (Szulanski, 1996; Spender 1996; Swan, 2001; Newell at al. 2009). The second views knowledge through the lens of practice. Knowledge is positioned as being deeply embedded and fused with practice where knower and knowing are inextricably linked (Orlikowski, 2002; Strati, 2007; Eraut, 2007; Nicollini, 2011). Here knowledge cannot be separated from individuals or groups and is both co-created and socially constructed. The epistemology of practice posits that neither form of knowledge is superior or preferred to the other. This chapter critically reviews these two dominant perspectives. It puts forward a third alternative approach to theorising knowledge based upon a closer and more nuanced interpretation of Polanyi's (1958) Personal Knowledge. Rather than focusing upon placing knowledge in rigid categories or viewing it in binary terms, this chapter argues that knowing is an art. Skilful performance draws upon all forms of knowledge both tacit and explicit, embedded in practice and codified by organisations. This chapter draws out critically the deficiencies in the two dominant knowledge management paradigms.

What we know about knowledge transfer within the UK Fire and Rescue Service is limited and opaque. Moreover, there is a paucity of studies in this sphere. The literature review explores extant studies of knowledge transfer in the UK Fire and Rescue Service and identifies gaps in current knowledge and thinking. The role of CoP in knowledge transfer is also explored with particular reference to the

marginalisation of power and conflict in the normative literature. Often CoP are portrayed as harmonious and stable with the apprentice learning from an ‘‘old timer’’ and moving steadily from periphery to core. The CoP model is critically reviewed and the impact of power more carefully considered and laid out. This thesis adopts a Foucauldian notion of power relations where from an epistemic perspective knowledge and power are fused together. The literature review explores the importance of power and its effect on knowledge transfer.

This chapter is structured as follows. Firstly, there is an exposition of tacit and explicit knowledge. Secondly, the literature review moves forward to consider Polanyi’s (1958) idea of personal knowing and how this may provide a better theoretical frame for understanding knowledge transfer. Thirdly, the epistemologies of practice and possession are critiqued and laid out. The literature review then moves forward to discuss and explore extant empirical studies of knowledge transfer in the UK Fire and Rescue Service. The notion of power is unpacked together with its impact upon knowledge transfer. There is a consideration of the role of CoP in facilitating knowledge transfer with particular reference to notions of power and conflict. The chapter then draws to a close with a summary and synthesis of the key points made.

2.2 Personal Knowledge

The genesis of the discourse on tacit knowledge is attributable to Michael Polanyi in his seminal text Personal Knowledge: Towards a Post-Critical Philosophy (Polanyi, 1958). It is worthwhile spending some time exploring some of the key ideas put forward by Polanyi. A leitmotif of this thesis is the argument that Polanyi’s notion of personal knowing has been misconstrued or misapplied in the knowledge management literature. Borrowing from Bhaskar, arguably there has been an epistemic falsity based upon an anthropocentric perspective of knowledge where it is viewed as something that can be captured, codified or converted (Bhaskar, 1975). For Polanyi, a chemist turned philosopher, there was a growing unease with the rise or empiricism as a means of explaining the world and our knowledge of it. Indeed, Personal Knowledge may be construed as a counterpoise or buttress against a purely empirical knowing through observation and a priori theories. Polanyi notes that both the Copernican

revolution and Einstein's theory of relativity are not merely objective and dispassionate scientific discoveries. Rather they embody an element of personal knowing that is passionate, personal and human (Polanyi, 1958, p.15).

In any skilful performance of tasks within an organisation there is an exhibition of both explicit and tacit knowledge. Explicit knowledge relates to that which is easily explained, transferable and in some ways didactic. Tacit knowledge is often difficult to describe, codify or even adumbrate coherently. The University Professor or management accountant accumulates over time a way of doing things, which involves both cognitive and physical skills that are difficult to codify, capture or disseminate. Orr's (1996) ethnographic study of photocopier repair personnel is apposite. Here tacit knowledge was displayed by the skilful diagnosis of technical faults in photocopier machines. Fault diagnosis was often tacit; the sound of the machine or movement of its parts could point to what was wrong. Equally, formal didactic repair manuals helped contextualise knowledge and provide a useful starting point for fault diagnosis.

Polanyi suggests that any skilful performance is 'achieved by the observance of a set of rules which are not known as such to the person following them' (Polanyi, 1958, p.49). The assembly worker following a strict code of practice often displays additional skills and intuition that are neither formalised nor articulated. Polanyi suggests that rules are simply 'maxims' and whilst they may be 'useful' they 'do not determine the practice of any art' (Polanyi, 1958, p.50). Polanyi cites the concert pianist as an example of this. A skilled pianist has her notes in front of her representing the explicit musical knowledge of playing a particular piece of classical music. But it is the 'existence of touch' unique to the pianist which is an act of personal knowing that is tacit by nature (Polanyi, 1958, p.50). If it were simply a case of playing the notes in front of her there 'would be no difference between tyro and virtuoso' both in terms of sound and quality (Polanyi, 1958, p.51). Similarly, Polanyi refers to arts or traditions that 'cannot be specified in detail' and which 'cannot be transmitted by prescription, since no prescription exists' (Polanyi, 1958, p.53). He refers to attempts by man to reproduce a Stradivarius violin. Tacit skills involved in constructing a Stradivarius some two

hundred years ago have subsequently never been replicated or reproduced. For Polanyi this is because no prescriptive knowledge for such an art exists.

Polanyi describes how the swimmer is kept afloat by regulating breathing and hence increasing buoyancy. However, the latter is not necessarily known or appreciated by swimmers or learnt in any manual or textbook. Any enunciation of tacit knowledge must start from the premise that one should 'reconsider' human knowledge by accepting the fact that 'we can know more than we can tell' (Polanyi, 1966, p.27). However, Polanyi does not negate the importance of explicit or codified knowledge as part of personal knowing. Indeed, this is very often of vital importance. Polanyi cites medical knowledge as an example where formal physiological rules are retained just as the messages in a letter are remembered by the recipient. Polanyi's explanation of riding a bicycle is also pertinent (Polanyi, 1958, p.50). A 'simple analysis' of bicycle riding shows us that 'for a given angle of unbalance the curvature of each winding is inversely proportional to the square of the speed at which the cyclist is proceeding' (Polanyi, 1958, p.50). However, the latter does not tell the rider how to ride a bicycle. Formal or didactic rules are helpful and important in our understanding; they help contextualise knowledge and aid its application. The cyclist learns to keep her balance intuitively in a manner which is not explicitly articulated or formulated. Rather there exists an embodiment of skill and praxis. In acquiring a skill Polanyi notes that 'we achieve an understanding which we cannot put into words and which is continuous with the inarticulate faculties of animals' (Polanyi, 1958, p.90). Building upon his earlier medical training, Polanyi (1958, p.101) cites the medical student 'attending a course in the x-ray diagnosis of pulmonary disease.' Over time there is a 'duality of speech and knowledge' whereby the medical student can articulate that which she sees and which was formerly inarticulate (Polanyi, 1958, p.101). Polanyi does not suggest that the formal knowledge from medical training is unimportant or should be marginalised. Rather it is the duality of both forms of knowledge in the skilful performance of an art or practice that are important.

A central tenet of Polanyi's exposition of tacit knowledge and personal knowing is the idea of subsidiary and focal awareness. Polanyi uses the example of driving

a nail with a hammer to illustrate the point. We are aware of the feeling of the hammer in the palm of our hands and with our fingers gripping it. Polanyi in his analysis of 'two kinds of awareness' terms this 'subsidiary awareness' (Polanyi, 1958, p.55). However, it is the nail that remains our main focus of attention. The latter is described by Polanyi as our 'focal awareness' and notes that subsidiary and focal awareness are 'mutually exclusive' (Polanyi, 1958, p.56). Understanding the interplay between our focal and subsidiary awareness is of paramount importance in construing tacit knowledge. Reverting back to the concert pianist (above), if she shifts her subsidiary awareness to focusing upon where her fingers are placed on the piano keyboard her playing is disrupted (Polanyi, 1958, p.56). Polanyi's examples of bicycle riding, piano playing, violin making and radiography have personal knowing and doing at their very heart. The skills and processes demonstrated here are the art of knowing using both explicit and tacit knowledge. They rely upon formal rules or maxims together with tacit skills and knowledge. Skilful performance draws upon focusing upon the task in hand (focal awareness) and our subsidiary awareness.

2.3 Misconceptions and Dichotomies

Having laid out Polanyi's enunciation of personal knowing, this section moves forward to explore some of the misconceptions that have arguably arisen in construing knowledge. This thesis posits that Polanyi's exposition of knowledge has been incorrectly appropriated in the knowledge management literature. Rather than focusing upon the art of knowing, very often tacit knowledge has been theorised through the lens of competitive advantage (Nonaka, 1994; Thompson et al. 2001; Gourlay, 2003; McAdam et al. 2010). In the resource based view of the firm, effective knowledge management is seen as a source of competitive advantage (Blackler, 1995; Brown and Duguid, 1998). With the ability to capture, develop and disseminate tacit knowledge seen as a key differentiator between organisations (McAdam et al. 2007). While explicit knowledge can often be easy to locate and replicate, tacit knowledge may confer competitive advantage (Blackler, 1995). This sentiment is echoed in Lawson and Lorenzi's (1999) empirical analysis of product innovation and collective learning in technology companies. Here tacit knowledge and its diffusion ameliorated the

prospects of success in knowledge intensive organisations. Tacit knowledge within firms can be viewed as essentially unique; it is not readily inimitable and represents the processes, skills and know-how that confer a sustainable competitive advantage over time (Zak, 1999). Both Nonaka and Grant posit that tacit knowledge is arguably an organisation's most prized asset and one which is of significant strategic importance (Nonaka, 1991; Grant, 1996).

A review of the extant literature on tacit knowledge reveals ambiguities and inconsistencies both in terms of paradigm and everyday organisational praxis (Blackler, 1995; Thompson and Walsham, 2004). It tends to have a myopic focus with an emphasis on explicability or alternatively conversion (Nonaka,1994; Gourlay, 2006; Eraut, 2007; Von Krogh, 2011). Blackler (1995, p.1021) posits that there exists a 'compartmentalized and static' approach to understanding tacit knowledge within organisations. Arguably knowledge (and our understanding of it) has been compartmentalised into rigid taxonomies. The latter inexorably results in knowledge being viewed as either embodied, embedded, embrained, encultured or encoded. Thompson and Walsham posit that Blackler's taxonomies of knowledge seek to merge quantitative categories to qualitative attributes. Moreover, to understand tacit knowledge we need to take cognisance of processes and situational perspectives within organisations; to do otherwise 'is once again, to clutch at empty forms' (Thompson and Walsham, 2004, p. 740). However, beyond the simple affirmation of tacit knowledge's importance, there is palpable confusion as to its acquisition, function and explicability (McAdam et al. 2010).

The relationship between tacit and explicit knowledge is often expressed as either a dichotomy or continuum. Knowledge is either tacit or explicit or operates on a continuum between the two (Gourlay, 2006; Collins, 2010; Tsoukas, 2011). Alternatively, the tacit dimension is expressed in terms of knowledge creation and transforming one type of knowledge into another (Nonaka and Takeuchi, 1995).

However, Polanyi posits a reciprocation or duality between both tacit and explicit knowledge comprising two dimensions of one thing. Polanyi notes that there is not a sharp division between tacit and explicit knowledge and that it would be unthinkable to theorise knowledge simply in terms of its explicit component

(Polanyi, 1958). Tsoukas supports this view and posits that all tacit knowledge is rooted in its explicit counterpart; hence the tacit element represents one dimension of knowledge (Tsoukas, 2003). Collins (2010) suggests that Polanyi's paradigm of tacit knowledge has to be construed as a product of its time. Polanyi was writing during a period when science and empiricism had dominant status; explicit knowledge with reference to formal logic, maths and algebra effectively suffocated the idea of the tacit element of knowing. Similarly, normative statements attempting to define tacit knowledge are often obfuscatory and lack theoretical precision. The former because questions regarding the nature of tacit knowledge are often reduced to questions of transfer or the conversion of one form of knowledge into another (Collins, 2010).

McAdam et al. (2007) in their review of the literature identify a number of 'themes' in how tacit knowledge is construed. Tacit knowledge can be thematically described as incorporating skill, experience, intuition and know how. By its very nature tacit knowledge is understood without being expressed and 'automatic' in the sense that it 'requires little or no time or thought' and helps determine how organisations make decisions and influence collective employee behaviour (McAdam et al. 2007, p.45). Nonaka posits that explicit knowledge can be 'expressed in words and numbers' but as such only represents the 'tip of the iceberg' of all possible human knowledge; tacit knowledge however is 'deeply rooted in action, commitment and involvement in a specific context' (Nonaka, 1994, p.16).

Joia and Lemos ague that knowledge can be divided 'into two distinct types' with any division being dependent upon 'how much it can be structured and codified' (Joai and Lemos, 2010, p.410). Nonaka and Von Krogh (2009, p.635) suggest that conceptually tacit knowledge is a 'cornerstone in organisational knowledge creation theory.' The tacit element is 'unarticulated and tied to the senses' and involves 'physical experiences, intuition or implicit rules of thumb' (Nonaka and Von Krogh, 2009, p.635). They differentiate the two forms of knowledge by suggesting that explicit knowledge is easily captured and codified and that the process of knowledge conversion 'explains how tacit and explicit knowledge interact along a continuum' (Nonaka and Von Grough, 2009, p. 635).

There is a general acceptance that tacit knowledge derives from a priori experience and is heavily contextualised in terms of its generation (Leonard and Sensiper, 1998; Haldin-Herrgard, 2000; Davenport and Prusak, 2003). Gourlay, in his review of empirical studies of tacit knowledge, posits that 'we lack adequate theory' and that there are 'conflicting claims about the concept' (Gourlay, 2006, p.60). The characteristics of tacit knowledge have been described as personal, difficult to articulate, job specific, informal and sometimes inferred (Sternberg, 1997; Eraut, 2000; Gourlay, 2004). Tsoukas and Vladimirou posit that the concept of organisational knowledge is 'much talked about but little understood' (Tsoukas and Vladimirou, 2001, p.973). Taking cognisance of Polanyi's premise of personal knowing and doing, Tsoukas and Vladimirou 'fuse' this with 'Wittgenstein's insight that all knowledge is, in a fundamental way, collective.' Accordingly, the raison d'etre of knowledge management (to include any tacit element) is a 'dynamic process' of turning unreflective practice into a reflective one and by so doing 'elucidating the rules guiding the activities of that practice' (Tsoukas and Vladimirou, 2001, p.975).

If Polanyi enunciated the theoretical and philosophical structure of tacit knowledge, it was Nonaka and Takeuchi (1995) who sought to apply that structure within a managerial and organisational setting. Their seminal The Knowledge Creating Company sought to demystify tacit knowledge and give it a quotidian managerial context. Nonaka and Takeuchi posit that knowledge is 'created through the interaction between tacit and and explicit knowledge' and from this one may 'postulate four different modes of knowledge conversion' (Nonaka and Takeuchi, 1995, p.62). The first mode of conversion arises where tacit knowledge is shared via a process of socialization. Here the 'key to acquiring tacit knowledge is sharing experience' (Nonaka and Takeuchi, 1995, p.63). The apprentice learns from a master and the worker on a production line learns from colleagues. Nonaka and Takeuchi cite the example of the Matsushita Electrical Company's development of a home bread-making machine. To capture the mechanics of fine bread making, company employees volunteered to learn from a master baker in a local hotel. The concept of 'twisting stretch' in the kneading of dough arose via 'socializing' the 'head baker's tacit knowledge through

observation, imitation and practice' (Nonaka and Takeuchi, 1995, p.64). The second mode of conversion results from making tacit knowledge explicit; this is achieved via 'externalization' where tacit knowledge is articulated into explicit concepts. Nonaka and Takeuchi (1995, p.65) posit that this is 'often driven by metaphor and analogy' and a 'commitment to the creative process.' The third mode of conversion involves combining explicit knowledge into knowledge systems. Here individuals 'exchange and combine' knowledge through media such as documents telephone conversations of computer networks which in turn can 'lead to new knowledge' (Nonaka and Takeuchi, 1995, p.67). Finally, explicit knowledge may be made tacit. This involves a process of internalization as a 'process of embodying explicit knowledge into tacit knowledge' (Nonaka and Takeuchi, 1995, p.69). Essentially this amounts to learning by doing; explicit knowledge is verbalized, expressed in diagrammatic form or recounted via narrative. Nonaka and Takeuchi (1995, p.69) posit that 'documents or manuals facilitate the transfer of explicit knowledge to other people' and assist in the internalization of tacit knowledge.

Nonaka and Takeuchi's exposition of tacit knowledge has been subject to much criticism and debate. Arguably the notion of 'converting' one form of knowledge into another is the very antithesis of personal knowing enunciated by Polanyi (Cook and Brown, 1999; Tsoukas, 2001; Gourlay, 2006; Hislop, 2013). Gourlay (2006, p.61) questions whether tacit knowledge can ever be converted into an explicit form; this is because 'in so far as tacit knowledge is unconscious or even ineffable' it cannot be amenable to any empirical investigation. Tsoukas (2009, p.942) is equally skeptical of Nonaka and Takeuchi's claim that tacit knowledge is capable of conversion and suggests that a 'more fine-grained, process-orientated account' is required. Some 15 years after Nonaka's (1994) seminal paper on the dynamic theory of knowledge creation, Nonaka and Von Krogh (2009) responded to criticisms of Nonaka and Takeuchi's original theory. They argued that from an epistemic perspective tacit and explicit knowledge may be better conceptually distinguished as existing on a continuum. Further, the notion of 'conversion' may be seen both empirically and theoretically as simply an interaction of both tacit and explicit knowledge.

2.4 Strings and Things

Collins uses strings as a metaphor to describe how knowledge can be transferred or transmitted. The way a 'string impacts on an entity' depends on 'the relationship between them' (Collins, 2010, p.17). Thus the transfer or exchange of knowledge can be viewed just like the transfer of sound down a telephone line. For Collins a central tenet or perspective of tacit knowledge is understanding the barriers that stop tacit knowledge becoming explicable. Tacit knowledge can be sub-divided into three principal categories. These are relational, somatic and collective which co-exist as a continuum (Collins, 2010 p.11). The 'weaker' the tacit knowledge the more likely it can be explicable and articulated. 'Sitting next to Nellie' in the workplace might be a way of learning from her; Nellie's tacit knowledge is 'weak' in the sense that it could be made readily explicable and formally articulated with some time or effort (Collins, 2010, p.20). Tacit knowledge may not be revealed by the knower to preserve secrecy, just like Silas Marner hoarded gold. Alternatively, the tacit element may simply turn upon a 'failure to appreciate someone else's need to know' (Collins, 2010, p.110).

Relational tacit knowledge is that which is entirely capable of being explicated and articulated. However, for some reason a barrier whether emanating from an organisation, culture or individual praxis stymies the transfer process. Reverting back to the string analogy (above), in cases of weak tacit knowledge the 'sender and receiver have enough cultural similarity for a string to afford the intended meaning to the receiver if the string was long enough' or if the sender knew how to lengthen the string (Collins, 2014, p.86). Conversely 'strong' tacit knowledge is often very difficult (if not impossible) to articulate or disseminate; it is embedded deeply in organisations or society and as such difficult to extract, codify or capture. Collins argues that collective tacit knowledge amounts to the 'irreducible heartland of the concept' (Collins, 2010, p.11).

With regard to somatic tacit knowledge (STK) Collins suggests that this relates to physical or mental knowledge that is (in principle) capable of transfer and articulation. The tacit element emanates from 'the way it is inscribed in the material of body and brain' (Collins, 2010 p.11). An example would be chess playing whereby a computer could compute and permeate all possible

manoeuvres in a chess game. However, humans could not comprehend this due to the physical limits of their cognitive capacity. Somatic affordance tacit knowledge relates to knowledge that only humans can exercise due to their physiognomy. Collins refers to Polanyi's example of bicycle riding or driving a car in traffic; it is entirely possible for a computer or machine to articulate the art of bicycle balancing or car driving. However, actively driving or cycling in busy traffic at the heart of the social milieu is something a machine is incapable of doing. This type of somatic affordance knowledge relates to the idea of tacit knowledge that humans (but not machines) can execute by virtue of the attributes of individual physiognomy (i.e. body and mind).

2.5 Epistemologies of Practice and Possession

Having defined both tacit and explicit knowledge, this section moves forward to explore the competing epistemic positions regarding knowledge. There are two key perspectives of how we might theorise knowledge. The first views knowledge through a lens of possession, codification and the separateness of knowledge from the knower (Nonaka and Takeuchi, 1995; Szulanski, 1996; Cook and Brown 1999; Newell et al. 2001). The second views knowledge through a lens of practice. Knowledge is viewed as being inseparable from individuals and manifests itself through their everyday praxis (Brown and Duguid,1991; Orr, 1996; Orlikowski, 2002; Eraut, 2007; Corradi et al. 2010).

Eraut's (2000) conceptual paper on non-formal learning and the importance of tacit knowledge in professional work is apposite. Eraut (2000, p.113) posits that in the context of professional work there exists 'two parallel definitions of knowledge.' The first is 'codified knowledge' which includes public or propositional knowledge which is given status via 'educational programmes, examinations and courses' (Eraut, 2000, p.114). He demarcates codified knowledge sharply from 'knowing how.' This is defined as more personal knowledge that is cognitive by nature and which 'a person brings to a situation that enables them to think and perform' (Eraut, 2000, p.114). The difficulties in theorising knowledge in terms of epistemologies of practice or possession are acknowledged by Eraut. The 'limitations' in making tacit knowledge explicit are 'formidable' and indeed much of the discourse in the literature is 'ill-informed if

not naïve' (Eraut, 2000, p.134). By way of example, Eraut (2000, p.119) notes that his own empirical studies of knowledge and skills revealed many employees could not readily articulate 'the nature of the competence and expertise' that enabled them to perform their jobs. This included a tacit element that was often difficult to precisely define.

Schultze and Stabell's (2004) conceptual paper on contradictions in knowledge management is a useful starting point. It posits that there are 'discourses' around the various epistemic positions on knowledge rather than universally applicable paradigms. A framework of four discourses are put forward. The neo-functionalist discourse theorises knowledge as 'an object that can be owned, bought and sold' (Schultze and Stabell, 2004, p.557). This reinforces Cartesian duality where knowledge is separable and distinct from individuals. The constructivist discourse paints an assumption that organisations are harmonious and inherently stable. Knowledge is shaped and constructed within communities. The critical discourse positions itself as being 'anti-organisational' and sees knowledge as a separate entity through which power and control can be exerted. The final discourse is a dialogical one where knowledge is viewed as a discipline that recognises the positive aspects of power and knowledge creation (Schultze and Stabbell, 2004).

Arguably the neo-functionalist perspective of knowledge has assumed a dominant status within the knowledge management literature (Grant, 1996; Szulanski, 1996; Newell et al. 2001; Thompson and Walsham, 2004). Here knowledge is viewed as entitative and possessory by nature rendering it relatively easy to be transferred within organisations. Cook and Brown (1999, p.381) refer to the latter as the 'epistemology of possession'; knowledge is viewed as being objective, value free and separable from individuals. Marabelli and Newell (2012) also note the dominance of the structural/cognitive perspective that sees knowledge as a commodity capable of transfer both individually, organisationally and within groups. Similarly, Thompson and Walsham's (2004) empirical study of a global software company note the dominance of the entitative perspective on knowledge. They highlight the commercial risks in sidelining or ignoring Polanyi's exposition of the importance of tacit knowing. This may result in 'misguided capital investments' or 'disastrous consequences for intra-organisational

interaction' (Thompson and Walsham, 2004, p.726). Nonaka and Takeuchi note the 'paradox' of the traditional Western epistemology of knowledge in contrast to the more holistic Japanese perspective. Under the Western paradigm knowledge is seen as an object to be utilised whilst ignoring its 'subjective, bodily and tacit aspects' (Nonaka and Takeuchi, 1995, p.49). However, somewhat ironically whilst noting the importance of the tacit dimension of knowledge, Nonaka and Takeuchi's focus vests solely upon its capture and codification.

This section now moves forward to explore the practice based perspective of knowledge. This gained traction in the early 1990's with the idea that there exists a 'bridge' between learning and innovation situated within practice (Brown and Duguid,1991). This echoes Cook and Brown's (1999) sentiment of a 'generative dance' between all forms of knowledge (both tacit and explicit) that shores up the differences in the various epistemic perspectives of knowledge. The practice based perspective is a polysemic one which embraces a number of factors (Orlikowski, 2002; Gherardi, 2006; Strati, 2007; Eraut, 2007; Nicolini 2011). There is a rejection of the separation of knowledge from the individual (Marabelli and Newell, 2012). Rather there is a recognition that practice is the 'locus of learning and knowledge' (Corradi et al. 2010, p.268). Sole and Edmondson (2002, p.18) posit that the practice based perspective rejects the idea of a 'rational-cognitive view of knowledge' and note that knowledge is situated in doing, contextualised and historic.

Orlikowski's (2002) empirical study of a large software company in the Netherlands noted the importance of knowing by doing. Knowledge was situational and embedded in every day practice and exchanges amongst colleagues. Here knowledge was not 'static' but rather an ongoing accomplishment that was recreated and reconstituted in practice. Thompson and Walsh's (2004) empirical study of a global software company noted the importance of context in the practice based perspective. Building upon Blackler's (1995) taxonomies of knowledge discussed above, knowledge and its context within organisations was deemed to be an inseparable and fundamental element of knowing. This sentiment is echoed by Marshall and Rollinson (2004, p.72) who

posit that knowing may be portrayed as ‘socially situated, distributed, provisional, revisable and inseparable from action.’

Eraut’s (2007) longitudinal study of workplace learning for early career professionals in nursing, engineering and accountancy notes the importance of situated and socio-cultural knowledge. Eraut (2007, p.406) highlights how it is important for the practice based perspective of knowledge to tackle ‘the challenging nature of performance.’ Here the performative element of knowledge is a central issue. He posits that professional knowledge viewed through the lens of practice has certain ‘distinct but interconnected elements’ (Eraut, 2007, p.406). There needs to be an assessment of clients and situations together with a decision on what course of action is needed to be taken. Such action needs to be pursued together with a metacognition of the individual, others and the general progress of a problem, project or situation. Here performance embedded in practice is achieved via the interconnectivity of these factors.

Strati’s (2007) empirical study of sawmills, roofing firms and back office functions posits the idea of ‘sensible knowing.’ Here knowledge is fused with skilful practice and ‘springs from the perceptive-sensory functions of individuals’ and their ‘aesthetic judgment’ (Strati, 2007, p.75). Sawmill workers exhibited tacit knowing through sensory perceptions of sawdust through their fingertips. Nicolini’s (2011) empirical study of medical workers and how they exchanged knowledge via telephone is also germane. Here using ethnography and interviews over a three year period the study considered how ontologically knowing shifted from individual activity to medical practices and their relationships or sites. Nicolini (2011, p. 617) notes that the ‘idea of practice as the site of knowing’ confers a much clearer depiction of knowing where the site of such knowing is situated in skilful practice. Marabelli and Newell’s (2012) commentary paper draws together the various epistemic perspectives on the practice based perspective of knowledge. It questions how knowledge can be managed if it is embedded in practice and puts forward three alternatives. The first suggests practice based knowledge can be better managed if there is a focus on sharing practices that help foster the recreation of knowledge in different contexts. The second approach accepts that knowledge often vests ontologically in the individual;

hence when new or different types of knowledge become embedded in practice attempts at managing it need to recognise this. The final, and perhaps more radical approach, is the fact that the practice based perspective is 'not fully controllable; it is unpredictable, emergent and embodied in ongoing actions' (Marabelli and Newell, 2012, p.27). This needs to be accepted and understood in any attempt to manage such knowledge. Drawing upon Nicollini's empirical study of telemedicine (above), Marabelli and Newell cite the use of a 'therapy sheet.' This acted as a mediator to help facilitate translation of knowledge from one context to another in construing patient data. The use of mediators is suggested as a tool for management that might help aid and mitigate risk of knowledge sharing in collaborative networks.

2.6 Extant Studies on the UK Fire and Rescue Service

This section moves forward to consider existing research regarding knowledge transfer in the UK Fire and Rescue Service. As a general observation, there is a dearth of empirical studies in this area. What we know about the 'how' and 'why' of knowledge transfer within the UK Fire and Rescue Service is extremely limited and opaque. The extant literature may be usefully divided into two main streams. The first stream relates to cognitive decision making processes in simulated fire environments. Here, the focus of the literature explores how fire fighters and Incident Commanders make decisions in tackling fires in simulated rescue environments. The second stream of literature relates to the UK emergency services as a whole. It considers how police officers and ambulance workers share knowledge. This section considers each stream in turn and identifies gaps in knowledge and our understanding of knowledge transfer in the UK Fire and Rescue Service.

Cohen-Hatton and Honey's (2015) empirical studies of goal-orientated training of Incident Commanders in simulated fires is a good starting point. The study considered how Incident Commanders made decisions with the information made available to them in simulated fires. Incident Commanders wore cameras on their helmets to record their reactions to 33 simulated incidents, namely skip fires, house fires and road traffic collisions. The normative position adopted by Incident Commanders in training manuals and operational guidance is to gather

information regarding a fire first, then decide upon a plan of action and execute that plan. However, in reality once information was gathered by fire fighters they often proceeded to instigate a particular course of action and missed out the evaluation process. Cohen-Hatton and Honey (2015, p.395) found that 'decision making in operational contexts often occurs without reflective processes' such as formulating a plan to tackle a fire. Alternatively, plans are 'reliably formulated and evaluated through reflective processes' but these are difficult to pick up on and identify from Incident Commanders' behaviour at the incident ground (Cohen-Hatton and Honey, 2015, p.396). Goal-orientated training was found to affect decision making processes. Making appropriate interventions when reflexive and reflective processes were absent (e.g. stepping back from implementing a rescue without thinking it through first) was recommended to improve fire fighter safety and praxis. Whilst the study refers to 'reflexive processes and practices' the importance of tacit knowledge in the cognitive processes displayed by Incident Commanders is not established or explored. Further, the impact of those processes on the transfer of knowledge on the incident ground is also not addressed. Equally, the study did not address power and its effect on goal orientated decision making processes. Incident Commanders operate within a command and control structure so understanding the role of power in reflective and reflexive decision making may be an important factor.

Okoli et al.'s (2014; 2016) empirical analysis of 10 Nigerian and 7 UK fire fighters with experience of incident command control is also apposite. Here a critical decision method (CDM) tool was used to explore and understand how experienced fire fighters used knowledge (both tacit and explicit) in time pressured and fast moving fire environments. The research asked participants to 'walk through' a memorable and serious incident they had previously attended. The CDM model was used to elicit how cues were used to trigger tacit memory at key decision points. Factors like the temperature or the colour of smoke were identified as cues that aided experts' decision making processes on the fire ground. The research highlighted the importance of novice fire fighters learning from more experienced colleagues and also of realistic training opportunities such as 'live burns' or fires. However, the research did not discuss the role of

CoP in knowledge transfer. This is notwithstanding the fact that fire fighters operate and share knowledge within their own CoP. Equally, the study did not address how tacit or experiential knowledge is actually transferred or the barriers to such transfer. Nor did it consider how existing tacit knowledge or skills could be retained. The study noted the reduction in the number of fires attended by participants. Yet whilst acknowledging the decrease in fires the study did not address organisational memory and the challenges of maintaining it. Okoli et al.'s (2014; 2016) study focused solely on senior fire fighters with experience of assuming incident command roles; it did not consider support staff, emergency response workers or senior management for example and how such roles are important in transferring knowledge.

There are only a few empirical studies on knowledge transfer within the public sector (McAdam and Reid, 2000; Riege and Lindsay, 2006; Gory, 2008). This is also prevalent with regards to other 'blue light' emergency services in the UK such as the police force. Seba and Rowley's (2010) empirical analysis of knowledge transfer (and more particularly knowledge sharing) in the UK police force is apposite. A case study of four UK police forces comprising of 10 semi-structured interviews with police officers was utilised to explore knowledge sharing. The empirical findings note the importance of sharing valuable knowledge and the possible impact of greater knowledge sharing on organisational performance. The effect of power on knowledge sharing was highlighted together with the importance of tacit knowledge; neither of these factors were explored and are highlighted by Seba and Rowley as potential areas for future research.

2.7 Power

A striking feature of contemporary knowledge management literature is the notable absence of any credible discussion on power and the concept risks marginalisation to almost a footnote (Nicollini, 2007; Karreman, 2010). A cursory glance through Easterby-Smith and Lyle's seminal text Handbook on Organizational Learning and Knowledge Management reveals the paucity of academic debate on the nexus between power and knowledge management (Easterby-Smith and Lyle, 2011). Whilst notions of conflict, power and politics are

referred to in the corpus of the main text, there is no chapter dedicated to the topic. Moreover, there was just one reference to Foucault's dialogic or dissensus based perspective on power (discussed below). Yet power matters and its resistance and deployment may have a significant impact upon knowledge transfer. Tight managerial control and strict monitoring of the labour process often ignores or marginalises the value of tacit skills and knowledge possessed by employees. A large amount of knowledge exists in workers' heads; harnessing and mobilising such experiential knowledge becomes much more important in the new 'knowledge economy' and wider service sectors (Warhurst and Thompson, 1998; Frenkel et al. 1999; Thompson et al. 2001; Brown and Hesketh, 2004). Here expert 'knowledge workers' may resist power in the form of management instruction or use their own technical knowledge to further their own agenda (Kelly, 2006). Similarly, service sector workers may elect to do the very minimum to get by unnoticed and choose not to use or draw upon their own experiential knowledge (Thompson et al. 2001). The use of power to elicit and facilitate tacit knowledge transfer is explored further below.

There has been a growing body of work dealing with how communities of practice facilitate knowledge sharing (Amin and Roberts, 2008; Hughes et al. 2008); equally a great deal of academic attention has been paid to the role of information technology systems in knowledge transfer initiatives (Chiravuri et al. 2011; Ho et al. 2011). However, the interconnectivity between power and knowledge is often underexplored and this is problematic given that 'the effects of power are diverse, making it a highly complex factor in knowledge sharing' (Willem and Scarbrough, 2006, p.1344). Pfeffer observes that organisations are almost ostrich like in the hope that by 'ignoring the social realities of power and influence we can make them go away' (Pfeffer, 1992, p.30). Karreman (2010) echoes this sentiment by noting that within knowledge intensive firms the actual social realities of power are not properly understood. Often a harmonious view of organisations is portrayed where prevailing social order is upheld and conflict is minimal (Hislop, 2013, p.251). This echoes Schultze and Stabbell's (2004) notion of the consensus versus dissensus perspective discussed above. Here the notion of stable, harmonious organisations prevails. In addition, the normative position

adopted by the literature has often ignored Foucault's discourse on power / knowledge and his dialogic viewpoint (Karreman, 2010). To ignore the nexus and interconnectivity between power and knowledge is arguably a myopic perspective; if knowledge is power then arguably we cannot simply choose to ignore it or hope that it fades away (Foucault, 1977; Liao, 2006; Heizmann, 2011). This section is structured as follows. Firstly, there is an exploration of the early theories of power and how power has been theorised as a resource. Secondly, there is an exposition of Foucault's notion of power / knowledge and the dialogic perspective. Thirdly, there is a synthesis of how power is portrayed in the extant literature and its effect upon knowledge transfer.

2.8 Power as A Resource

Bell's (1973) influential The Coming of Post Industrial Society noted the shift in society from one which manufactured goods to one that provided services. Bell's depiction of early 1970's America and the inexorable pivot from manufacturing to services is more an expression of presentiment than a dystopian vision. Here the majority of employment is found in the service sector and one which amounts to no more than 'a game between persons' (Bell, 1973, p.127). At the heart of Bell's analysis is the rise of the knowledge worker positioned within a new 'knowledge economy.' In this new post-industrial society managerial control in hierarchical structures still remains (Tsoukas, 2000; Contu and Wilmott, 2003). However, the locus of control shifts somewhat as the 'expert' worker derives power from her knowledge and in some circumstances decides when to use or withhold it. The debate as to the extent to which knowledge workers have more control and greater autonomy is both contested and fluid (Flemming et al. 2004; Marshall and Rollinson, 2004). Equally, the suggestion that the majority of workers are now 'knowledge workers' has also been disputed. Many jobs are still low skilled, often mundane and require little technical expertise (Warhurst and Thompson, 1998; Thompson et al. 2001). Felstead et al. (2009) note how the term 'knowledge worker' has become so ubiquitous that the term has lost meaning. Moreover, the nomenclature may be unhelpful in accurately describing the actual role or job performed by workers. There is a 'broad' and 'overlappping'

distinction between two types of knowledge work (Felstead et al. 2009, p.112). The first is founded upon creating information or ideas which add value to organisations whilst the second hinges upon actual activities performed by workers and the qualifications and skills necessary to do certain jobs.

Thompson et al. (2001) are critical of the suggestion that suddenly everyone has become a knowledge worker. Their empirical analysis of call centre work and service sector work demarcates between 'knowledge work' and 'knowledgeability in work.' It is the latter that is more important than technical skills or didactic knowledge often found in professions or skilled occupations like IT. They posit that 'interactive' service sector work draws upon tacit skills and know-how that exist outside the traditional labour process and organisational structures. Here a focus on 'empathy to create rapport with customers' and the 'aesthetic capacities and attributes of employees' becomes more important and readily apparent (Thompson et al. 2001, p.937). The challenge for organisations is mobilising tacit skills and knowledge. Moreover, management has 'lost the capacity to effectively utilise' such knowledge and this brings the notion of power into more sharp relief (Thompson et al. 2001, p.928). Management may deploy power in an attempt to mobilise or harness tacit knowledge that exists in peoples' heads; equally such power may be resisted and contested and thus rendering knowledge transfer ineffective. This thesis recognises that power is alluded to in the extant literature. However, it argues that the effect of power on mobilising tacit knowledge remains marginalised and epistemically under developed (Blackler, 1995; Eraut, 2000; Thompson et al. 2001; Liao, 2006; Heizmann, 2011).

Orr (1996) notes how photocopier repair personnel navigate the rules and procedures of a big organisation with their own technical practice. The technical skills to do the job, diagnose faults and keep machines running confers some degree of power and autonomy. Power as a resource expresses itself in the 'directive procedures' contained in Xerox's manuals and repair policies (Orr, 1996, p.108). However, ultimately it is the expert power of technicians (both individually and collectively) that decides how to interpret and apply these policies and satisfy customers.

Sewell's (2005) conceptual paper notes how traditional labour process theory has tried to manage the indeterminacy of labour by strict managerial control. However, in the new world of knowledge work the indeterminacy of knowledge eclipses this and the key issue is capturing and harnessing knowledge in workers' heads. Managing 'complex relations of power, control and subjectivation' is paramount (Sewell, 2005, p.686). Arguably therefore the shift to service industries and the rise of knowledge work makes the deployment, resistance and negotiation of power more complex and nuanced. Understanding power matters; understanding the way it manifests and influences knowledge transfer is of significance too (Marshall and Rowlinson, 2004).

In Bell's exposition of a post-industrial society 'information becomes a central resource, and within organisations a source of power' (Bell, 1973, p.129). Moreover, what counts 'is not raw muscle power, or energy, but information' and the role of the professional with technical knowledge becomes central (Bell, 1973, p.127). The link between power and knowledge becomes an important one. Who holds power, how it is deployed, resisted and negotiated becomes a central issue in organisations (Kelly, 2006; Muzio and Kirkpatrick, 2011; Muzio et al. 2011; Fincham, 2012). As discussed above, experiential knowledge is something also held by workers in low-skilled service sector jobs and power may be deployed to unleash this. Here workers may choose to mobilise their 'knowledgeability in work' or shut down and do the very minimum required (Thompson et al. 2001, p.923).

This section now moves forward to discuss early discourse which theorises power as a resource. This is attributable to French and Raven's study of the acceptance of a new supervisor by female office workers (French and Raven, 1958). They posit two taxonomies of power that devolve either generically or legitimately from office. The latter defines legitimate power as 'that power which stems from internalized values in P which dictate that O has a legitimate right to influence P and that P has an obligation to accept this influence' (French and Raven, 1958, p.400). The former suggests that power in a generic sense equates to 'potential influence of some individual or group O over an individual P' (French and Raven, 1958, p.400). French and Raven enunciate five typologies of power

namely, reward, coercive, legitimate, reference and expert. Reward power amounts to deploying financial reward to align behaviours whilst coercive power is the ability of management to punish those who do not comply with organisational dictat. Legitimate power is that which is derived from legitimate authority, whilst reference power is attributable to influence over subordinates who wish to emulate or replicate certain traits or abilities of management. Finally, expert power is derived from particular skills, abilities or technical competence.

Kelly's (2006) conceptual paper notes how knowledge may be theorised as a power resource. The deployment of power requires legitimacy and this is closely linked with trust. Power as a resource may be viewed in two categories, namely administrative and technical. Administrative power derives from the access to (and control over) organisational information. Here 'organisational knowledge and sharing this knowledge is giving away the basis for power' (Kelly, 2006, p.129). Technical power arises from technical and IT based knowledge that is possessed by only a handful of individuals. Kelly notes how IT professionals in organisations have power by virtue of technical knowledge that others do not have. This 'dynamic' is applicable in many organisational settings 'ranging from scientists, lawyers and academics to engineers, mechanics and plumbers' (Kelly, 2006, p.128). Fincham (2012) notes the heterogeneity of 'expert labour' situated within knowledge intensive and technical occupations. He posits that Reed's (1996) taxonomies of expert labour deriving from traditional professions (law and accountancy), general management (management itself) and 'new' knowledge workers (IT and HR) 'remains too narrowly focused' (Fincham, 2012, p.208). This could be ameliorated by 'developing a framework for differentiating among the main clusters of expert labour' (Fincham, 2012, p.209). Again, power becomes a key issue arising from, for example, occupational controls over work (traditional professions) or occupational control shared with managerial control (IT or management consultancy). Fincham's analysis of expert labour mirrors Bell's (1973) analysis that technical skills in postindustrial societies form an important base of power in organisations.

The idea of 'power as a resource' is also apparent in Luke's (2005) influential text Power A Radical View. Building upon Polsby's (1963) earlier work, Luke's

theorises power as arising from three faces or dimensions. The first dimension of power arises from behavior in decision making and the conflict that arises from making certain choices. Here from an epistemic perspective power is pluralistic and based upon behaviour. Ontologically it derives from conflict and arises when two views clash and one group or individual secures their own objectives. Luke's (2005, p.18) notes a 'focus on behaviour in the making of decisions over key or important issues as involving actual, observable conflict.' Similarly, Hales views power resources as 'those things which bestow the means through which the behaviour of others may be influenced and modified' (Hales, 1993, p.18). This is also prevalent in Heywood's definition of power as 'a question of who gets their way, how often they get their way and over what issues they get their way' (Heywood, 2004, p.124).

The second dimension of power notes the absence of non-decision making in the first dimension; power often expresses itself by controlling an agenda and deciding what is or is not included (Reed,1996; Hales, 2000; Edwards and Collinson, 2002). Luke's, accepting a qualified criticism of the first dimension, suggests the second dimension arises from 'the ways in which decisions are prevented from being taken on potential issues over which there is an observable conflict of (subjective) interests' (Lukes, 2005, p.25). The importance of mobilising bias to influence decision making is important in ways 'that are neither consciously chosen nor the intended result' of individuals' own personal choices (Lukes, 2005, p.25).

Edwards (2006) cites the examples of a strike or grievance to illustrate the first and second dimensions of Luke's exposition of power. An overt expression of power like a strike is an example of the first dimension. Here conflict is observable and springs from absolute behaviour and decision making (the decision to withhold labour). However, a grievance is more subtle and subjective and the raising of a grievance may be attributed to non-decision making.

Luke's third and final dimension of power resiles somewhat from a perspective based upon behaviour that is predicated by conflict. Luke's offers his own critique of the first two dimensions as having too much of a 'behavioural focus' and accepts that conflict may be 'latent'. Conflict may be potential only and 'never in

fact be actualised' (Lukes, 2005, p.28). Edwards (2006) notes how the second and third dimensions of power merge somewhat. The third dimension theorises power as an ability to act against the interests of those who hold no power. Some four decades have now passed since the original publication of Luke's radical view on power. Luke's in his 2005 version accepts some of the limitations and criticisms of his notion of power. Luke's (2005, p.109) acknowledges the 'reductive and simplistic' notion of power he articulated as being binary and expressed as 'power over'. This ignores the 'manifold ways in which power over others can be productive, transformative, authoritative and compatible with dignity' (Lukes, 2005, p.109). Edwards (2006) posits that Luke's exposition of power may only be construed as a partial one. The productive or transformative elements of power, whilst referred to by Lukes, are not further developed or enunciated clearly. More fundamentally 'ideological power is a key issue' that could have been further explored (Edwards, 2006, p.574). Indeed, whilst Luke's references the mobilisation of bias and more subtle expressions of power (non-decision making) yet again these remain under developed and only partially theorised. Heizmann's (2011) study of HR professionals knowledge-sharing in a large multi-national Australian insurance company is apposite; it illustrates the sometimes malign nature of power dynamics. Heizmann considered the rivalry and contradictory claims made by regional and corporate HR professionals and how conflicting claims were made questioning each other's legitimacy. Similarly, Liao (2006) utilised the resource-based model of power to examine how managers were able to influence and shape their subordinates knowledge-sharing behaviours. Liao used French and Raven's typologies of power (discussed above) as a theoretical model to assess how they impacted upon research and development workers' willingness to share knowledge in three Taiwanese computer companies. Perhaps unsurprisingly the nexus between reward and knowledge sharing was unproblematic with reward being one way of facilitating the latter; interestingly the nexus between power and knowledge sharing was addressed indirectly with reference to trust, reference and expert power.

2.9 Foucault: A Dialogic Perspective of Power

Having discussed the notion of power as a resource, this section moves forward to consider Foucault's exposition of power (Foucault, 1977). Foucault's contribution to the discourse on power may be seen as 'revolutionary' and having 'turned on its head much thinking about the state-society relation' (Leggett, p.44, 2017). As a general observation, the Foucauldian concept of power is the very antithesis of theorising power in reductionist terms as one individual exerting influence over another. It departs from Luke's three dimensions of power (discussed above) as being perceived in terms of behaviour and conflict. Foucault views power as manifest and dispersed, productive and embedded within dialogue. Power is not a 'thing' to be possessed and used by individuals or the state. Rather power manifests itself in power relations permeating society and expressing itself in a capillary like network. From an epistemic perspective power and knowledge are fused together with each having a symbiotic relationship with the other.

Grugulis and Knights (2000, p.15) helpfully divide Foucault's work into 'three distinct yet interrelated phases' namely the archaeological, genealogical and ethics of the self. The archaeological and genealogical phases are perhaps the most pertinent when exploring Foucault's construct of power. Foucault notes the importance of language as a vehicle to transfer meaning and the archaeological canon of his work looks at how words and statements used in knowledge change over time. A point of departure in understanding Foucault's analysis of power is his explanation of what power is not (Foucault, 1990). Power is not a 'a general system of domination exerted by one group over another' (Foucault, 1990, p,92). Foucault's aim was to 'cut off the head of the king' and theorise power as not emanating from the state or sovereignty but running through society and shaping it (Foucault, 1976, p.89). At its heart is discourse and Foucault posits that power relations cannot be 'established, consolidated nor implemented' without the 'functioning of a discourse' (Foucault, 1977, p.93). Here knowledge and power become inextricably linked. Foucault observes that there is little point in 'dreaming of a time when knowledge will cease to depend upon power' but rather 'it is impossible for knowledge not to engender power' (Foucault, 1977, p.52).

Power is viewed from the perspective of 'the penetration of regulation' into the minutiae of everyday life and the 'capillary functioning of power' (Foucault, 1979, p.198). Thus power expresses itself often at end or terminal points, in operating manuals, accounting procedures or the processing of hospital patients (Leggett, 2017, p.43). Power (1997) notes how power can often be expressed in audit and verification processes. These have moved beyond the realms of traditional accounting and finance permeating areas such as schools, local government and GP surgeries. Here audits are 'generally indirect methods of control' for the processing of risk (Power, 1997, p.140). Whether the 'audit explosion' is actually beneficial to society or simply an 'industry of empty comfort certificates' is a moot point (Power, 1997, p.123). However, the nexus between the audit process and power is something that should not be ignored.

Felstead et al. (2009, p.193) in their discussion of productive work systems note the importance of 'exposing the power relations that characterise all sectors of the economy.' The requirement for supermarket store managers to use a 'symbol gun' to monitor stock levels of goods on shelves is apposite. Here the 'symbol gun' is used as an example to illustrate the deskilling of managers and the control of work based autonomy. However, one may also view the use of 'symbol guns' through a more Foucauldian lens. The 'symbol gun' does not represent a binary view of power exercised by head office over store managers. Rather, power is more subtle and nuanced; it expresses itself in a capillary fashion and is productive, resisted and contested. Store managers made decisions about when and how to intervene in the ordering process, making more localised decisions that were context and knowledge based. Adopting a Foucauldian notion of power relations perhaps helps position its deployment and resistance more sharply. Here power relations may be seen within the context of the 'indeterminacy of productive systems' and the plurality of perspectives and priorities of individuals in both vertical and horizontal stages of production (Felstead, et al. 2009, p.184).

As discussed above, the extant management literature has tended to define power somewhat narrowly (Fiol et al. 2001; Shen and Cannella, 2002). However, there has been a recognition of the multi-faceted nature of power within organizations (Clegg, 1989; Clegg and Hardy, 1996; Covaleski et al. 1998;

Lawrence et al. 2005). A number of authors have specifically alluded to Foucauldian concepts of power within the general corpus of human resource management literature (Townley, 1994; McKinlay and Starkey, 1998; McKinlay et al. 2010). However, there is a paucity of research on the impact of Foucault's construct of power on knowledge management generally and in particular tacit knowledge transfer (Yanow, 2004; Roberts, 2006; Liao, 2006; Heizmann, 2011). Marshall and Rollinson's (2004) ethnographic study of power relations involving problem solving initiatives in the telecommunications sector is pertinent. Here power and knowledge were explored in the context of the practice based perspective of knowledge discussed above. They note how insights around the practice based perspective and the idea of power / knowledge centre 'around the concept of enactive sensemaking' (Marshall and Rollinson, 2004, p.72). Problems and conflict were solved by resolving struggles over meaning amongst project workers. Here there was a 'move beyond' privileging power over knowledge (or vice versa) and a consideration of 'how they are mutually constituted' (Marshall and Rollinson, 2004, p.85).

2.10 Summary

This section has laid out the demarcation between the two competing epistemic perspectives of power. Power may be theorised as a resource that can be deployed. It may arise from an administrative or technical base or manifest itself as one group having power over another (Lukes, 2005; Kelly, 2006). The resource based view of power may be seen as being reductionist and viewing power in binary terms (Edwards, 2006). As an alternative, power may be theorised through a Foucauldian lens (Foucault, 1977). Here power manifests itself in the power relations that permeate society. It may express itself in a capillary like fashion at terminal or end points such as financial audits or hospital records (Power, 1997). Power is not viewed as something possessed by one individual to be exerted over another; power is discursive, productive and interstitial by nature. Power and knowledge exist together and are mutually constituted. Whilst power is accounted for in the extant literature, this thesis argues that its discussion is muted. Moreover, there is a paucity of empirical studies using Foucault's concept of power / knowledge and the impact of power

on knowledge transfer (Marshall and Rollinson, 2004; Liao, 2006; Heizmann, 2011).

Bell's (1973) exposition of knowledge workers in post-industrial society has been used to illustrate the importance of understanding power in the new knowledge economy. The debate revolving around whether we are now all knowledge workers exhibiting more autonomy and control is a much contested one (Frenkel et al. 1998; Thompson et al. 2001; Sewell, 2005; Fincham, 2012). However, the importance of power, its negotiation and resistance in organisations is arguably a debate that cannot be ignored. The successful mobilisation of tacit knowledge and skills within the workforce may often turn upon the deployment of power and its resistance. The second part of the literature review now moves forward to discuss CoP and how they might facilitate knowledge sharing within organisations. It also considers both voluntary and involuntary organisational memory loss.

Chapter 3: Literature Review – Part Two

3.1 Introduction

A substantial corpus of the extant literature on knowledge management is attributable to the role of CoP within organisations. CoPs are often viewed as an effective mechanism for both knowledge transfer and innovation processes, operating outside formal managerial hierarchies and rigid organisational structures (Roberts, 2006; Fuller, 2007). CoPs can help facilitate knowledge management initiatives generally and more specifically the transfer of tacit knowledge deeply embedded in work based practices (Eraut, 2007). Very often the space occupied by CoP is viewed as a benign, almost utopian one where like-minded individuals freely share knowledge and best practice for the benefit of both individual and organization (Strati, 2007; Nicollini, 2011). The latter is often predicated on the notion of the apprentice being able to observe and learn from the skilful 'master' with a seamless and inexorable dissemination of skill and knowledge. However, the reality of the efficacy of a CoP as a means of sharing knowledge may be complex and problematic. The former arises from the tension between agency and the free space occupied by CoP, whilst the latter emerges from often conflicting notions of care, authenticity and trust of actors operating within a CoP (Unwin, 2007; Jewson, 2007).

This section seeks to critically evaluate the construct of CoP with particular reference to the sharing and dissemination of tacit knowledge within the workplace. This section is structured as follows. Firstly, the notion of CoP is defined and explored. Secondly, there is a discussion of the essential characteristics of CoPs and how they might be utilised as a vehicle for tacit knowledge transfer. The role of a CoP in the workplace is then laid out. Thereafter the role of CoPs as a paradigmatic model for knowledge management is critiqued and challenged with some brief conclusions drawn.

3.2 Communities of Practice

The notion of individuals coming together to share knowledge, disseminate best practice and forge an independent and autonomous identity comprises the foundations upon which CoP are built (Brown and Duguid, 1991; Lave and

Wenger, 1991; Wenger, 1998). The CoP approach to the management of knowledge has become an increasingly popular one in a broad range of organizational settings (see, for example, Mork et al. 2010; Bettiol and Sedita, 2011). A central tenet of the CoP literature is the notion that work based knowledge and everyday praxis are inseparable; this echoes Polanyi's notion of connoisseurship where the art of knowing is just as much an art of doing (Polanyi, 1958, p.52). CoP have captured the popular zeitgeist of viewing the contemporary knowledge based organisation as benign, pluralistic and essentially stable (Brown and Duguid, 1991; Wenger, 1998). A critical review of the CoP literature arguably reveals a certain myopia and commercial naivety in the efficacy of the CoP model as a means of transferring knowledge and skills in the workplace. There exist a number of theoretical lacunae in the literature on both a macro and micro level. As a general observation, a critical review of the knowledge management literature reveals a failure to sufficiently theorise substantive changes in the workplace and the concomitant effect upon the CoP model (Brown and Duguid, 1991; Jones, 2006). At a macro level the labour market has arguably changed radically since Lave and Wenger (1991) first enunciated their seminal account of situated learning; globalization, technology, zero-hours contracts and the atomisation of labour processes in the workplace have all had an impact upon CoP. On a micro level constructs of power, conflict and authenticity have significant and profound effects on what is actually meant by 'community' or 'practice' and how these terms are construed by organisations and employees in everyday praxis (Gherardi et al. 1998; Reynolds, 2000; Gherardi, 2009).

3.3 Communities of Practice: Essential Characteristics

The genesis of the extant literature on CoP is attributable to the seminal work of Lave and Wenger; the latter builds upon the construct of shared practices enunciated by Suchman (Suchman, 1987; Lave and Wenger, 1991). Lave and Wenger emphasise the situated nature of learning in their empirical analysis of midwives, tailors, naval quartermasters and non-drinking alcoholics. Here learning is situated and reconstituted through practice amongst communities of practitioners. They define a CoP as 'a set of relations among persons, activity

and world, over time and in relation with other tangential and overlapping communities of practice' (Lave and Wenger, 1991, p.98). Whereas Hislop (2013, p.155) defines CoP more succinctly suggesting that they are simply 'informal groups of people who have some work related activity in common.'

A central tenet of CoP is the idea that knowledge and meaning are socially constructed often within the complex and fluid milieu of the work based environment. Berger and Luckmann echo this sentiment by noting that 'knowledge must concern itself with whatever passes for 'knowledge' in a society, regardless of the ultimate validity or invalidity' (Berger and Luckmann, 1966, p.15). The knowledge of Orr's technicians often amounted to what they, situated within a CoP, construed as technical or repair knowledge. This was irrespective of the praxis of other technicians or the instructions enunciated in repair manuals (Orr, 1996). Within CoP there exists no demarcation between knowledge required to do a particular job and everyday praxis. Orlikowski describes the nexus between work and practice as 'reciprocally constitutive' so that it becomes nonsensical to discuss knowledge and practice as mutually exclusive terms (Orlikowski, 2002, p.250).

Von Krogh posits a typology of CoP that shares certain 'characteristics' and through which members develop 'a shared and deep sense of identity through intense and sustained communication' (Von Krogh, 2011, p.412). Working together over a period of time members of a CoP develop 'a shared identity, language, artifacts, norms and values' and here work-based learning is facilitated via observation and imitation resulting in the sharing of knowledge (Von Krogh, 2011, p.413). Bettiol and Sedita's (2011) empirical analysis of creative industry workers in Italy is both apposite and illustrative here. A group of young, talented graphic designers and architects based in Turin formed 'TURN' to 'share experiences and information about their professions' (Bettiol and Sedita, 2011, p.472). The idea was to build and establish professional communities in Turin and ameliorate the city's economic prospects following the decline of the automotive industry. TURN epitomizes the typology of CoP adumbrated by Von Krogh; members share similar values and norms, forge shared identities and (ultimately) transfer knowledge.

A fundamental axiom of CoP is the process of LPP. Here a novice participates in a work based activity under the guidance of a 'master' or someone with particular skills or expertise. Slowly and sequentially the novice moves from the periphery to the core of the CoP. This is facilitated by a process of observing, learning, and doing. At its heart is the idea of 'becoming a full participant in a sociocultural practice' (Lave and Wenger, 1991, p.29). It is important to note how LPP starts with situated learning which is a 'transitory concept' or 'bridge' towards full participation in work based practice (Lave and Wenger, 1991, p.24). Lave and Wenger note how newcomers generate both identity and motivation as they move towards full participation in a centripetal manner.

There is a danger in taking a reductionist approach to LPP and isolating key elements such as 'legitimacy' or 'participation.' Lave and Wenger posit that each element is 'indispensable in defining the others' (Lave and Wenger, 1991, p.35). Moreover, there is no such thing as illegitimate participation; peripherality by its very nature suggests 'multiple, varied, more or less engaged and inclusive' ways of participating in the acts of a CoP (Lave and Wenger, 1991, p.36).

LPP has an established lineage with occupations such as bakers or farriers before the Industrial Revolution learning vicariously through the practice of others. The farrier would learn how to shoe a horse and the baker how to bake bread by observing and learning. As skills and expertise developed the baker or farrier would move from the periphery to the core and become a valued member of a team or profession. Mork et al. (2010, p.576) note that LPP 'plays a crucial role, allowing novices to participate in a practice by doing simple but productive tasks' within a CoP. The ambit of the CoP model has now expanded beyond traditional industries or crafts and include virtual 'remote' workers and also the unemployed (Beck, 2007; Jewson, 2007). However, CoPs may be less effective in transferring skills and knowledge outside of stable organisational structures where freelance or 'zero hours' contracts limit the contact novice workers have with experts (Grugulis and Stoyanova, 2011).

It is noteworthy that LPP within a CoP is not contingent upon a didactic process of learning or acquiring knowledge. Learning is situated within a CoP and becomes a diachronic process. Brown and Duguid (1991, p.48) observe that LPP

'escapes the problems that arise through examinations of learning from pedagogy's viewpoint.' Rather learning is situated and contextualised within a CoP. A concomitant of the latter makes 'the conditions of learning, rather than just abstract subject matter, central to understanding what is learned' (Brown and Duguid, 1991, p. 48). The efficacy of LPP has been subject to much criticism (see, for example, Contu and Willmott, 2003; Roberts, 2006; Felstead et al. 2009; Grugulis and Stoyanova, 2011). LPP does not exist within an ideological vacuum; changes in the modern workplace, constructs of power, conflict and authenticity arguably have a profound impact here. These are discussed and explored further below.

3.4 CoP and the Workplace

Orr's (1996) ethnographic study of the challenges and tribulations facing photocopier repair technicians at Xerox is apposite here. Technicians form their own communities of practice whose locus occupies a space neither explicitly acknowledged nor encouraged by management (Orr, 1996, p.15). At the heart of the CoP is the primacy of narrative and situated learning. Story telling amongst technicians helps disseminate knowledge and forge common identity. Orr observes that 'narrative forms a primary element' of practice for technicians (Orr, 1996, p.2). Moreover, diagnosis of the causes of machine malfunction is facilitated via narrative. The swapping of 'war stories' amongst technicians helps them become 'masters of the black arts' of dealing with both troublesome machines and demanding customers (Orr, 1996, p.2).

Technicians meet informally at cafes and restaurants to discuss problematic machines, the causes of malfunctions and how best to effect repairs. Orr describes a lunchtime meeting where Alice discusses a problematic machine with colleagues. Her machine suggests a 'self-test error' but Alice remains unconvinced and asks Fred for help in diagnosing what could be wrong (Orr, 1996, p.39). Technical discussion ebbs back and forth; Fred insists that Alice 'can do it and knows enough about this machine' and moreover 'that she has got do it herself' (Orr, 1996, p.41). Whilst this approach may seem almost Darwinian, Orr notes that failure is not an option for technicians. To trade in an existing machine for a new one is an admission of abstract failure since it 'involves

claiming that one cannot cope with the machine' (Orr, 1996, p.44). Here the CoP will ultimately help Alice, but not until such time as Alice has exhausted all possible remedies. Orr notes that 'diagnosis is a narrative process' and that the narrative Alice has articulated regarding the machine failure is an incoherent one (Orr, 1996, p.43). Together all the other technicians during their lunchtime discussions create 'a coherent narrative form the pieces Alice has brought' (Orr, 1996, p.43). Ultimately the solution to fixing the errant machine vests in deferring to Fred's analysis; Alice needs to conclude the discussion regarding the obvious and immediate problem with the machine before moving to the more complex diagnosis she has articulated (Orr, 1996, p.43). This example of the problematic machine and the search for a solution to fix it exemplifies the CoP at work. Here like-minded technicians come together to share experience and meaning; the process of fixing the machine is often heuristic, deeply embedded in both the knowledge and practice of the individual (Alice) and the wider community of technicians. It echoes Lave and Wenger's notion of the situated nature of work placed learning. It also highlights the 'relational character of knowledge and learning' (Lave and Wenger, 1991, p.33). Alice and Fred construct knowledge of machines and diagnose faults together; knowledge is socially constructed and interpreted.

3.5 Epistemological Assumptions

This section posits that from an epistemological viewpoint the CoP practice based perspective of knowledge offers a more fecund and benign environment for knowledge transfer. In particular, CoP ameliorate opportunities for successful transfer of 'sticky' tacit knowledge deeply embedded in both individuals and organisations. The sharing of work based experiences, technical challenges and best practice within a community can act as a catalyst for successful knowledge transfer (Bettiol and Sedita, 2010). As discussed above, there are two dominant epistemological paradigms within the knowledge management literature. Firstly, the objectivist paradigm posits the primacy of explicit knowledge; knowledge is viewed as possessory by nature, readily transferrable and with a rigid demarcation between knowing and doing (Szulanski,1991; Schultze and Stabell, 2004). The practice based perspective of knowledge is the antithesis of the latter.

Here knowledge is deeply rooted in practice and socially constructed; tacit and explicit components are viewed as symbiotic with neither having hegemony over the other (Strati, 2007; Nicollini, 2011; Hislop, 2013).

It may be useful at this juncture to adumbrate the characteristics of tacit and explicit knowledge and provide some work-based examples. To recap, explicit knowledge is that which is often codified, easily articulated and transferred (Szulanski, 1991; Collins, 2007). Explicit knowledge is often understood by the 'transmitter / receiver' model; knowledge is easily capable of transfer whether from individual to individual or parent company to subsidiary (Szulanski, 1991). Explicit knowledge privileges itself over its tacit component (Nonaka,1991). Knowledge is viewed as possessory by its very nature and as such separates organisational knowledge from worker's everyday activities. Tacit knowledge is the antithesis of the latter and may be defined as 'knowledge that is nonverbalized, or nonverbalizable, intuitive, unarticulated' (Hedlund, 1994, p.75). Tacit knowledge and cognitive processes are often intertwined with intuition, gut instinct and heuristics.

The Operations and Training Manual utilized at McDonalds (known by employees as 'the Bible') is illustrative of explicit knowledge and its codification. The Manual describes in detail the labour process of making beef burgers, toasting buns, adding gherkins and calibrating the consistency of milkshakes (Leidner, 1993; Ritzer, 2004). The latter is a good example of explicit knowledge and its transfer within the workplace. Workers at McDonalds follow the Manual in a didactic and non-negotiable manner. The explicit knowledge required to do the job is separate (and independent from) the worker supported by technology and materials (buzzer, bells and pre-programmed machines etc.). As such it is readily transferrable whether at a McDonalds site in Leeds or Lisbon. Here the focus is on tight managerial control and also control over the labour process. As Ritzer observes the global success of 'Mcdonaldization' vests upon 'efficiency, calculability, predictability and control' (Ritzer, 2004, p. 12).

Similarly, the technicians in Orr's ethnography are urged to follow a manual entitled 'Principles of Operation' promulgated by Xerox and used as a way of diagnosing common faults and errors in photocopying machines (Orr, 1996, p.

108). It is a moot point as to whether the manual confers any real benefit to technicians in the field; the manual does however convey the explicit knowledge required to understand the basic workings and mechanisms of the majority of machines. However, it is the tacit knowledge of technicians deeply embedded in practice, shared experiences and articulated via narrative that aids diagnosis. Indeed Orr observes that 'the practice of diagnosis is done through narrative, and both diagnosis and process are preserved and circulated among the technicians through war stories, anecdotes of their experiences' (Orr, 1996, p.105).

CoPs adopt a practice based perspective of knowledge where skilful performance in the workplace is based upon knowing and doing (Cook and Brown, 1999; Nicollini, 2011). From an epistemological perspective, CoPs avoid binary oppositions or dichotomies where knowledge is either tacit or explicit and where explicit knowledge is privileged over its tacit component. Rather knowledge is viewed as comprising both a tacit and explicit component which is deeply embedded in work place performance (Schultze and Stabell, 2004). The CoP perspective of knowledge echoes Polanyi's exposition of the practice of skills (Polanyi, 1958, p.49). For Polanyi there is no rigid demarcation between explicit and tacit knowledge. Moreover, the very purpose of skilful performance is 'achieved by the observance of a set of rules which are not known as such to the person following them' (Polanyi, 1958, p.49).

Orr's description of the exchange between technician and customer when a photocopier has jammed illustrates the deep interconnectivity between knowledge and everyday praxis (Orr, 1996, p.115). Orr notes the 'richness and variety of information sources available for diagnosis' of the problematic machine (Orr, 1996, p.117). The technician has the narrative of the customer, the didactic and explicit knowledge articulated in company repair manuals and the 'community memory of technicians' to establish the cause of the jam (Orr, 1996, p.117). The technician manages to diagnose the problem and fix the recalcitrant machine. However, he can neither verbalise nor articulate precisely how he has identified the fault when pressed for an explanation. Orr wants an explanation and notes 'the difficulty of producing one suggests the extent to which the information was embodied in the technician' (Orr, 1996, p.117). The latter is

illustrative of the CoP perspective on knowledge and its nexus with skilful performance enunciated by Polanyi. Here the technicians' everyday praxis and knowledge are inextricably fused together; the diagnosis of faulty machines is identified via both tacit and explicit knowledge components built up over time.

Felstead et al.'s (2009) analysis of the introduction of County Talk by Shire County is illustrative here. County Talk is a call centre established by Shire County for the processing of customer enquiries and queries regarding a broad range of Council services. The raison d'etre was to rationalise and streamline enquiries; rather than having a piecemeal atomised service the new model would deal with all calls from one contact centre (Felstead et al. 2009, p. 38). A large proportion of the work of County Talk involved 'routine, predictable and closed encounters with callers' (Felstead et al. 2009, p.38). However, interaction with customers often extended beyond the scope and parameters of 'fast knowledge' which predominantly 'was extracted from the back office and locked into systems and procedures' (Felstead et al. 2009, p.47). Very often the advice given to callers involved an element of tacit knowledge; contact center workers would use cognitive skills to fully grasp the true nature of enquiries and signpost callers to other relevant departments (Felstead et al. 2009, p.48). Here empathy, discretion and knowledge of the eligibility criteria for certain services all helped to 'fill in the gaps' left by the didactic and perhaps inflexible guidelines for dealing with callers' queries enunciated by Shire County. The call handler's everyday praxis at County Talk reflects the epistemology of the CoP model; knowledge is both tacit and explicit, there is no demarcation between knowing (giving advice) and doing (taking physical calls) and where workplace knowledge exists at both an individual and collective level.

3.6 Critical Perspectives of CoP

This section moves forward to offer a critique of the CoP model. The normative position enunciated within the knowledge management literature portrays CoPs as safe, harmonious and stable entities. However, examining CoP through a more critical lens reveals a number of theoretical lacunae. The impact of labour process theory on CoPs is often marginalised or simply ignored (Contu and Willmott, 2004; Roberts, 2006; Felstead et al. 2009). The sub-division and

allocation of work based tasks together with tighter managerial and technological controls exerts a powerful and arguably malign influence upon the CoP model. Orr's (1996) photocopier repair personnel acting as a CoP occupy a conflicted territory within a hierarchical organisation. Management at Xerox tolerate the existence of the CoP so long as customers are happy and the work of service gets done. Yet there exists an 'existential crisis' at the heart of service work undertaken by the CoP (Orr, 1996, p.158). The inherent unpredictability of when machines will break down and the challenges management face in controlling the work of repair personnel is readily apparent.

Lave and Wenger's (1991) notion of CoP is anchored via situated learning. The novice acquires knowledge and skills from the expert and participates in the activities and praxis of the CoP. However, the concepts of novice, expert and LPP upon closer scrutiny reveal a number of theoretical weaknesses. In order for the novice to acquire skills and knowledge there needs to be an experienced 'old timer' to learn from in the first instance. Grugulis and Stoyanova's (2011, p.349) empirical study of a TV production company notes a 'theoretical lacuna' in CoP theory. There exists a 'missing middle' whereby trainees were not able to consult or learn from more experienced TV producers. Geographical factors and the actual modality of freelance TV production work exacerbated the difficulties in the novice immersing themselves in the practice of the CoP. Similarly, Lave and Wenger (1991) have perhaps adopted a romantic perspective of the omniscient 'old timer'. The learning trajectory of novices as they move towards full participation can often be more problematic and nuanced than Lave and Wenger originally anticipated (Eraut, 2000; Fuller and Unwin; 2004; Jewson, 2007). Fuller and Unwin's (2004, p.32) empirical analysis of apprenticeships in steel companies challenges the assumption that 'expertise is equated solely with status and experience' in the workplace. The learning trajectories of steel apprentices often resulted in the novice sharing expertise and knowledge with the 'old timer'. Accordingly, the 'pedagogical relationship is not all one way' with apprentices helping 'old timers' to learn new skills and gain new knowledge (Fuller and Unwin, 2004, p.40). Fuller (2007, p.25) notes the inadequacy of LPP in facilitating learning trajectories. There is a tendency to focus on an 'inbound

journey from newcomer to ‘old timer’’ that ignores different trajectories resulting in full participation.

3.7 Power and Community

Roberts (2006, p.626) notes that the CoP model is ‘not without its weaknesses and limitations.’ Arguably, one of those limitations is the failure to address adequately the impact of power upon CoP generally and more particularly in relation to knowledge transfer. The notion of power and conflict and their effect upon CoP has been acknowledged in the literature (see for example, Brown and Duguid, 2001; Handley et al. 2006; Roberts, 2006). However, notwithstanding the latter, the dialectic regarding both power and conflict arguably remains marginalised and under theorised. More specifically notions of whether power dynamics inhibit the transfer of tacit knowledge are largely unexplored; or comprise part of a general discussion on the effectiveness of CoP as a vehicle for knowledge transfer per se (Duguid and Brown 1991; Jones, 2006). It is not that Lave and Wenger (1991) have not alluded to the importance of power dynamics in their study of situated learning. Indeed it is difficult (if not impossible) to learn a practice in the workplace and move from this position to ‘become an (identified) member of a community of practice when power relations impede or deny access to its more accomplished exponents’ (Contu and Willmott, 2003, p.285). Lave and Wenger (Lave and Wenger, 1991, p.42) echo this sentiment and note that ‘hegemony over resources for learning’ may result in alienation and the ability to participate fully in the praxis of the CoP. Hegemony over resources and alienation are both the antecedents and consequences of the exercise of power. Moreover, the idea of power is certainly identified by Lave and Wenger in their examination of situated learning; however the construct is neither fully developed or sufficiently theorised. Mork et al.’s study of urologists and non-urologists piloting new keyhole surgery techniques is a case in point (Mork et al. 2010). Existing members of the CoP felt threatened that the new surgical techniques would challenge their authority and medical expertise. Ultimately they withdrew from a collaborative research project to retain control over ‘their’ knowledge and practice in this area. Similarly, Felstead et al.’s exposition of the clashes between GP’s and nurse practitioners is apposite (Felstead et al. 2009,

p. 63). Nurses at Mid City elected to stop carrying out routine tasks such as baby weighing so as to free up time to develop other types of services. This resulted in ‘a series of acrimonious exchanges and meetings’ until (eventually) the GP’s acquiesced and accepted the change (Felstead et al. 2009, p.78). The latter challenges the facticity of the normative position that CoP are harmonious entities with essentially quiescent members. Similarly, Mork et al. (2010) posit that Lave and Wenger underestimate the importance of looking at the structure of power in organisations and how it is effectively embedded; whilst this is referred to by Lave and Wenger the debate is taken no further.

Power dynamics impact upon CoP at various levels and arguably power can have a profoundly negative impact upon legitimate peripheral participation (Roberts, 2006). Skilled, established and powerful members of a CoP will wield more power and control than the ‘novice’ on the periphery of the group. Progression from periphery to core may be thwarted or usurped by unequal and dominant power bases within a CoP. Taking a broad and holistic organisational perspective, Roberts notes that power dynamics within CoP may result in community members failing to develop or progress further than ‘a position of peripheral participation’ (Roberts, 2006, p.627). Moreover, power also impacts upon meanings in the workplace; meaning may simply be a duplication of dominant power sources.

3.8 Learning and Forgetting

This section considers the dynamics of organisational memory and how memory may be lost on a voluntary and involuntary basis. The creation, capture and transfer of knowledge has been a main focus of the normative literature. As Huber (1991, p.88) notes the literature on acquiring knowledge is ‘voluminous and multi-faceted.’ Conversely, how organisations forget and why has received much less attention (Easterby-Smith et al. 2004; Thompson; 2007; De Holan and Phillips, 2011). Further, there are relatively few empirical studies of unlearning within the extant literature (De Holan and Phillips, 2004; Tsang and Zara, 2008). Organisational memory loss is theorised from two main perspectives. The first arises where an organisation forgets how to do something it was once proficient or skilled at (Tsang and Zahra, 2008; Massingham, 2009; Howells and

Scholderer, 2016). De Holan and Phillips (2011) refer to the Hotel Lutetia in Paris as an example of this. During the German occupation in the Second World War the Hotel Lutetia hid all its fine wines in a cellar and pretended that they no longer existed. Once the war had ended the hotel embarked upon retrieving the wines and trying to remember its old inventory and knowledge of fine wines. Here organisational memory of the wine cellar had been forgotten. Staff had forgotten their knowledge regarding fine wines, their descriptions and differences.

The second type of forgetting arises when knowledge is deliberately expunged from organisational memory. This may arise from organisational change (Klein,1989; Akgun et al. 2007; Becker, 2010). Alternatively, it may spring from a desire to avoid competency traps where existing stocks of knowledge are viewed as regressive or barriers to performance (Klein, 1989; Akgun et al. 2007; Casey and Olivera, 2010). There is an element of organisational serendipity at play where 'forgetting the right things at the right time' can have a strategic advantage for companies (De Holan and Phillips, 2004, p.423). The dominant perspective here is intentionality; ontologically there is a deliberate discarding of 'old' knowledge in favour of 'new' knowledge where unlearning occurs before learning (Hedberg, 1981; Nystrom and Starbuck, 1984). The facticity of a linear, sequential approach to unlearning or theorising unlearning as a sub-set and precursor to learning is contested (Klein, 1989; Howells and Scholderer, 2016). Unlearning may occur before acquiring new knowledge but it may not. Equally unlearning may be seen as ontologically different to learning and not subsumable under the general banner of organisational learning and the acquisition of new knowledge (Tsang and Zara, 2008; Hislop et al. 2014). This section is structured as follows. Firstly, there is an exploration of involuntary organisational memory loss. How organisations forget unintentionally is discussed and also the ontological factors that may cause such loss. Secondly, deliberate or voluntary memory loss is laid out. How organisations deliberately discard knowledge is explored together with some of the epistemic misconceptions within the extant literature.

3.9 Forgetting and Involuntary Memory Loss

Unintentional organisational forgetting may be seen as 'accidental or unwanted' and arising from a 'degradation of the stocks of organisational knowledge' (Fernandez and Sune, 2009, p.621). Dierickx and Cool (1989) use the bathtub metaphor and posit that organisational memory is similar to water levels in a bathtub. Water that 'leaks' out of the bathtub represents a loss of valuable stocks of organisational knowledge; conversely water that flows back in replaces and replenishes organisational memory. Whilst this analogy is useful it has limitations as organisational memory loss is complex and the process of forgetting is often misunderstood (Klein, 1989; Howells and Scholderer, 2016). In some circumstances this may be beneficial to organisations whilst in others it may be damaging (Fernandez and Sune, 2009; De Holan and Phillips, 2011; Hislop et al. 2014). Baumard and Starbuck's (2005) empirical analysis of 14 strategic failures in a large European telecommunications firm notes the importance of learning from failure and not necessarily past success. Here organisational learning can be 'dangerous and ineffective' particularly when organisations do not learn from their mistakes (Baumard and Starbuck, 2005, p.295). They note that the 'learning that should follow failure' often does not occur and when it does 'it often teaches the wrong lessons' (Baumard and Starbuck, 2005, p.295). The lesson here is not necessarily forgetting past mistakes but to learn from them. Here 'unlearning successes may be a prerequisite for learning from failure' (Baumard and Starbuck, 2005, p.296).

From an epistemic perspective, historically involuntary memory loss has been linked with organisational learning curves. Empirical studies suggest positive relationships between experience and production (Argote et al. 1990; Darr et al. 1995; Benkard, 2000). The more a task is repeated the greater productivity and conversely 'reversals in productivity can be attributed to organisational forgetting' (Thompson, 2007, p.908). Darr et al.'s (2000) empirical analysis of pizza franchises noted how knowledge stocks were almost fifty percent lower at the end of the month. Similarly, Benkard's (2010) empirical analysis of memory loss in aircraft manufacturing noted a depreciation of almost 3 percent each month. De Holan and Phillips (2004, p.426) posit that forgetting may be perceived as

arising from ‘two distinct dimensions’ depending upon the intentionality of forgetting as a process and how new (or recent) the forgotten knowledge was. From this premise conceptually organisational memory loss may be placed into four taxonomies. Firstly, involuntary or accidental organisational forgetting may arise from a failure to capture new knowledge. Secondly, it may arise in circumstances where innovations or knowledge have decayed over time. Thirdly, voluntary or intentional memory loss may be attributed to the deliberate removal of disruptive knowledge before ‘it becomes deeply embedded in the organisation’s stock’ (De Holan and Phillips, 2004, p. 426). The fourth and final category arises when organisations purposefully remove ‘old’ knowledge to replace it with ‘new’ knowledge. De Holan and Philips (2004, p.426) perceive this final mode of forgetting as ‘perhaps the most important from a strategic perspective’ but note the practical difficulties inherent in trying to remove deeply embedded organisational knowledge.

From an ontological perspective, involuntary organisational memory loss has often been attributable to personnel turnover. Knowledge ‘walks out the door’ as key or important personnel leave organisations. As Carly (1992) observes, often when people leave ‘the lessons of history are lost, knowledge disappears, the institution’s memory is reduced’ (Carly, 1992, p.20). However, how knowledge loss is prevented or knowledge decay ameliorated is not particularised. There is a general observation that hierarchies in organisations can ‘buffer the organisation from the effects of turnover’ and act as ‘information warehouses’ to prevent knowledge loss (Carly, 1992, p.42). Carly notes that her paper offers a theoretical exploration of personnel turnover and knowledge loss but not necessarily a more practical analysis of how knowledge loss might be prevented when employees leave.

Massingham’s (2008) empirical analysis of EngServ, a company providing technical risk services to the Australian Department of Defence, is apposite. Whilst some individual exits may amount to no more than ‘ripples on a pond’ the importance of lost structural and relational capital are noted (Massingham, 2008, p. 541). Structural capital ‘packages’ human capital and enables organisations to reuse and deploy it; relational capital arises from relationships with suppliers,

stakeholders and strategic partners. Massingham posits that ontologically loss of human capital is one possible source of forgetting. However, this may also cause or result in losses of both structural and relational capital within organisations. Paradoxically losing personnel may actually have a 'positive impact' because remaining employees may 'develop the confidence to fill some of the gaps' left by so called 'indispensable employees' (Massingham, 2008, p.543). His empirical analysis of personnel turnover at EngServ considered its impact on surviving or remaining employees. A conceptual model to assist managers in identifying 'high' and 'low' risks of lost social capital in organisations is put forward. However, the how and why of knowledge loss arising from personnel turnover and how this might be prevented is not addressed. Massingham (2008, p.558) notes the limitations of a 'positivist paradigm' in trying to assess the impact of knowledge loss and the difficulties in assigning an actual value to knowledge that is neither replaced or replenished.

Adopting De Holan and Phillip's (2004) taxonomy of organisational forgetting (above) a further cause of involuntary memory loss is a failure to repeat a once successful process or innovation. This may be the inability of a successful Michelin starred restaurant that forgets how to repeat previous culinary successes or a hotel that fails to replicate a great event or gala (Rao et al. 2003; De Holan and Phillips, 2004). Equally, from an ontological perspective involuntary memory loss can arise from a failure to capture knowledge. Here knowledge may derive from another organisation, or arise from product innovation, but despite having entered into an organisation memory is lost before it can be successfully embedded (De Holan and Phillips, 2004). Whilst placing the possible causes of involuntary organisational memory loss into categories may be helpful, the causes and circumstances of forgetting remain opaque (Easterby-Smith et al. 2004; Fernandez and Sune, 2009; Becker, 2010). De Holan (2011, p.302) notes that organisational forgetting and memory are 'important, appealing and dangerous concepts' that need further clarification both empirically and also theoretically. What we know regarding the 'how' and 'why' of organisational forgetting is limited; so too are the number of empirical studies regarding involuntary memory loss.

3.10 Intentional Forgetting: Voluntary Organisational Memory Loss

Having laid out and explored the literature regarding accidental memory loss this section moves forward to discuss deliberate or intentional knowledge loss. The dominant perspective here is the idea that knowledge is purposefully and intentionally removed from organisational memory. Often this occurs as an antecedent to new learning and is seen as a manageable process (Hedberg, 1981; Nystrom and Starbuck, 1984; Klein, 1989; Hislop et al. 2014). Hedberg (1981, p.18) posits that unlearning is intentional and a 'process through which learners discard knowledge.' There is an acknowledgement that organisations that unlearn too slowly exhibit 'a crucial weakness' as knowledge grows but 'becomes obsolete as reality changes' (Hedberg, 1981, p.3). Similarly, Nystrom and Starbuck (1984, p.53) note how organisations can become 'complacent and learn too little' and that in order to survive 'organisations must unlearn.' Unlearning here is viewed through the lens of organisational crisis. Their empirical analysis of American corporates which learnt to innovate revealed that managers needed to listen to dissenting voices, experiment and exploit opportunities. Unlearning is perceived as antecedent to learning; before new ideas can take root organisations must 'unlearn old ones by discovering their inadequacies and discarding them' (Nystrom and Starbuck, 1984, p.53). Terminating the employment of senior managers was seen as a mechanism for unlearning. This helped to 'erase the dominating ideas' and also become 'receptive to new ideas and to symbolise change' (Nystrom and Starbuck, 1984, p.53).

Huber (1991) notes the importance of behaviours in the process of unlearning. The use of the word 'unlearning' serves 'primarily to emphasis a decrease in the range of potential behaviours' (Huber, 1991, p.104). This echoes Akgun et al.'s (2007, p.798) ontological definition of unlearning as 'the changing of beliefs, routines and physical artifacts.' Again, Huber shares the common view that unlearning occurs before learning and the acquisition of new knowledge. He notes that unlearning 'opens the way' for new learning to occur in the first place and highlights the damaging effects of organisational memory loss and 'especially with respect to the retention of tacit knowledge' (Huber, 1991, p.105).

However, Huber's analysis offers no suggestions as to how the loss of tacit knowledge within organisations might be stymied or prevented.

Tsang and Zahra's (2008) detailed conceptual paper notes how the extant literature has focused almost exclusively on learning and the acquisition of new knowledge. This results in an imbalance where understanding of unlearning has withered and received much less attention. However, how we conceptualise unlearning remains unclear and somewhat opaque. In reviewing the literature, some 34 definitions of unlearning are presented with conflicting ontological and epistemic perspectives. Unlearning may be seen as the deliberate discarding of knowledge, values or beliefs (Hedberg, 1981; Klein,1989; De Holan and Phillips, 2004; Akgun et al. 2007). This may not necessarily involve 'new' knowledge replacing 'old' knowledge (Hedberg; 1981; Nystrom and Starbuck, 1984). It may also involve a value judgement; giving up knowledge that is perceived to be inferior, anachronistic or no longer useful to organisations (Nystrom and Starbuck, 1984). Tsang and Zahra suggest that definitions of unlearning are heterogeneous, diverse and lacking in clarity. Ontologically the more dominant perspective is that unlearning involves the intentional discarding, abandonment or erasure of existing stocks of organisational knowledge. A distinction is made between discarding knowledge that may result in changes to behaviours and discarding actual routines. Tsang and Zahra (2008, p.1450) define unlearning as 'the discarding of existing routines.' This is situated within the context of organisational change processes where no value judgment is placed on knowledge and where unlearning and learning are distinct (but closely related) concepts. Unlearning is presented as 'two distinct types of organisational change processes' and where such change may be continuous or episodic (Tsang and Zahra, 2008, p.1450). The connection between organisational change and unlearning is a recurrent one within the literature (Prahalad and Bettis 1986; Huber, 1991; Cegarra-Navarro and Moya, 2005; Hislop et al. 2014). Becker's (2010) empirical analysis of an Australian company undergoing significant change in its information technology systems also highlights the nexus between unlearning and organisational change. Here change was facilitated by unlearning; organisational change processes could become more successful if

organisations ‘put in place a change management process that took into account unlearning’ (Becker, 2010, p.252). Again, Becker posits that unlearning involves giving up certain behaviours or ‘relinquishing old ways’ of doing things (Becker, 2010, p.252). From an epistemic perspective, unlearning is theorised as a process whereby ‘old’ practices are given up either before or simultaneously with the acquisition of new ones.

Klein (1989) offers an interesting perspective of unlearning that challenges the normative positions discussed above. Here the epistemic orthodoxy that unlearning precedes learning and is subsumable under it (or exists as a subset of learning) is challenged. Organisations and individuals do not necessarily unlearn existing routines, behaviours or knowledge before acquiring new knowledge. Equally, unlearning as a process is arguably distinct from learning and the two should be viewed separately. The ontological premise that unlearning involves the deliberate discarding of knowledge is also critiqued. Klein (1989, p.292) posits that the ‘unlearning model vastly underestimates human potential.’ It therefore fails adequately to identify idiosyncratic human behaviours which may lead to ‘some highly dysfunctional consequences’ (Klein, 1989, p.292). Situated within the context of organisational change, four types of organisational unlearning are enunciated. These manifest themselves at both an individual and organisational level. From an individualistic perspective, unlearning may be classed in terms of ‘extinction’ and ‘replacement’. Extinction relates to the extinguishing of undesirable knowledge from individuals. However, whether individual knowledge can effectively be ‘wiped out’ is challenged; rather it is through the ‘retention and re-evaluation of knowledge’ that extinction and new learning are made possible (Klein, 1989, p.293). Secondly, unlearning may occur via the dissemination of new knowledge that replaces ‘old’ knowledge. At the organisational level, unlearning may be classified as either ‘exorcism’ or ‘salvation.’

The exorcism model revolves around the ‘managerial purge as a process of discarding knowledge’ (Klein, 1989, p.296). This echoes Nystrom and Starbuck’s (1984) perspective (discussed above) where unlearning is facilitated by removing poorly performing senior executives to avoid organisational crisis. Finally, the

‘salvation’ model removes ‘inappropriately behaving individuals’ and replaces them with a ‘saviour’ type manager who guides organisations towards prosperity (Klein, 1989, p.297). At the heart of Klein’s analysis of unlearning is the idea that unlearning is parenthetic. Unlearning may be seen as placing old routines or knowledge in parenthesis with new knowledge. Accordingly, by theorising unlearning as a parenthetic process ‘obsolete behaviours can be addressed as well-chosen, adaptive sets of responses, but to conditions that no longer obtain’ (Klein, 1989, p. 300). Klein cites the impact of fuel scarcity on American car manufacturers to illustrate the point. A reliance upon manufacturing large cars that use huge amounts of fuel can be placed in parenthesis to producing smaller more fuel efficient cars. Learning new fuel technologies and forgetting ‘old’ ones to make more efficient cars is an example of parenthetic unlearning. Here ‘old’ knowledge sits in parenthesis with new knowledge; it does not necessarily replace it or occur before new learning takes place.

Howells and Scholderer (2016) note how Klein’s (1989) notion of parenthetic learning is a dissenting view that runs contrary to the normative literature. The dominant perspective regarding unlearning is that it is ‘an empirical and manageable process independent and precedent to learning’ (Howells and Scholderer, 2016, p.444). They are critical of this perspective and suggest that unlearning originates from Hedberg’s (1981) appropriation of the term from psychological literature. Effectively our understanding of unlearning has been compromised by adopting a psychological term used for metaphorical purposes within the management literature. As such, this position is not ‘empirically warranted’ (Howells and Scholderer, 2016, p.459). Borrowing from Kuhn, unlearning is understood more productively and with more epistemic accuracy if it is viewed in terms of theory change. Organisations and individuals unlearn where ‘new knowledge that did not fit an established theory’ resulted in changes in understanding (Howells and Scholderer, 2016, p.459). When old knowledge is no longer compatible with new knowledge this may be better understood as either learning, theory change or the discarding or adoption of new practices and behaviours.

3.11 Summary

The first and second parts of this literature review have reviewed the extant knowledge management literature on knowledge transfer, CoP and organisational memory loss. Polanyi's (1958) exposition of knowledge has been discussed and explored with an emphasis on personal knowing. There is a tendency to focus upon converting tacit knowledge into explicit knowledge or theorising knowledge through a lens of competitive advantage (Nonaka and Takeuchi, 1995; Gourlay, 2006). Similarly, knowledge is often placed into conceptual or theoretical taxonomies such as an epistemology of practice or possession (Schultze and Stabell, 2004). A leitmotif of this thesis is the notion of personal knowing where all forms of knowledge (both tacit and explicit) are drawn upon in skilful performance and human activity. This thesis argues that this is the essence of Polanyi's exposition of personal knowing and a more faithful interpretation of his approach to understanding knowledge where humans often know much more than they can formally articulate or write down. The gap in our understanding of how knowledge is transferred within the UK Fire and Rescue Service has been highlighted. In particular, extant studies of the UK Fire and Rescue Service do not consider tacit knowledge, power or the role of CoPs to facilitate such transfer (Okali et al. 2014; 2016; Cohen-Hatton and Honey, 2015; Cohen-Hatton et al. 2015).

The literature review has also highlighted some of the deficiencies in the CoP perspective on knowledge transfer. It has explored and challenged the concept of LPP as a means of moving from periphery to core (Lave and Wenger, 1991; Orr, 1996). Similarly, it has laid out and challenged the novice / expert dichotomy where novice members of CoP are deemed to move in a centripetal manner and where learning new skills and knowledge is deemed to be a one-way process (Fuller and Unwin, 2004). There has been a detailed review and exploration of how power and its deployment may effect knowledge transfer (Liao, 2008; Heizmann, 2011; Contu, 2014). The deficiencies in Luke's (2005) exposition of power have been discussed and critiqued. The arguments in favour of adopting a Foucauldian notion of power relations have been laid out together with an enunciation of the Foucault's (1977) dialogic and pluralistic perspective on power.

The literature review has discussed and explored how organisations forget on both a voluntary and involuntary basis. Power's (1997) notion of the audit society has also been enunciated and where power in a Foucauldian sense is often expressed via the audit process.

The concept of involuntary memory loss has been set out together with the possible causes of accidental organisational forgetting (De Holan and Phillips, 2004). The idea that deliberate or purposeful memory loss is subsumable and a subset of acquiring new knowledge has been explored and critiqued (Hedberg, 1981; Nystrom and Starbuck, 1984). Based upon this review of the extant literature, the following specific questions will be addressed in this thesis:

- How do CoP facilitate both explicit and tacit knowledge transfer and in what circumstances.

- How are both explicit and tacit knowledge transferred and why are some transfer mechanisms more successful than others.

- How does organisational memory and the notion of unlearning impact upon successful knowledge transfer.

The thesis now moves forward to discuss and explore the methodology employed and research philosophy utilised in this research.

Chapter 4: Methodology

4.1 Introduction

This chapter adumbrates the research philosophy that underpins this thesis. It also sets out the methodology adopted for the collection and analysis of data together with the ethical issues pertinent to the research. The epistemological perspective adopted is influenced by a social constructionist paradigm; knowledge in Northern Fire is both constructed and construed through shared meanings, interaction, language and culture (Berger and Luckmann,1966; Cunliffe, 2002; Burr, 2003; Cunliffe, 2008). Fire fighting manuals, operations procedures and BA training represent one side of knowledge (Polanyi, 1958). However, the other side of knowledge is co-constructed by individual fire fighters in everyday praxis (Shotter, 1993; Danermark et al. 2002; Cunliffe, 2002; Gergen, 2015). Accordingly, the 'ontological variant' of this position means that reality 'itself' is a social construction (Alvesson and Skoldberg, 2009, p.35).

From an ontological perspective, this research stresses the centrality of a pluralistic and dialogical approach to meaning and sense making (Wittgenstein, 1953; Bakhtin, 1986; Cunliffe, 2002). Arguably it is via language that fire fighters make sense of their world and also their surroundings (Shotter, 1993; Gergen, 2015). A positivistic theory of a singular, objective knowledge fastened upon event regularities and a hypo-deductive or 'covering law' model is rejected (Shottter, 1993; Danermark et al. 2002; Kuhn, 2012). The thesis posits that a critical realist perspective is unsuitable. This is because the notion that ontologically complex phenomena can be explained away by causal powers, tendencies and mechanisms that may or may not be exercised is arguably simplistic and lacks theoretical precision (Fleetwood, 2001; Archer, 2003; Hesketh and Fleetwood, 2006).

This chapter is structured as follows. Firstly, the key axioms of social constructionism are explored and defined. Secondly, the epistemological and ontological tenets of social constructionism are enunciated. The latter are situated and applied to the contextual study of knowledge transfer within Northern Fire. Thereafter there is an exposition of the limitations of adopting a social constructionist paradigm in qualitative research. The approach to coding

qualitative data is then set out together with a discussion of ethical issues underpinning the research.

4.2 Social Constructionism

Arguably the dominant paradigm within the normative management science literature is the notion that reality is 'out there' and can be measured objectively (Shotter, 1993; Cunliffe, 2008; Gergen, 2015). A positivistic perspective where 'good knowledge' is viewed as something which accurately captures processes and systems as means of understanding organisational phenomena has obtained almost hegemonic status (Alvesson and Skoldberg, 2003; Cunliffe, 2008; Travers, 2008). However, the facticity of this approach has been challenged over the years with a rise in using qualitative research methodologies to help explore and understand social phenomena with greater depth and texture (Garfinkel, 1967; Derrida, 1976; Clifford, 1986). Travers acknowledges the sometimes adversarial divide between qualitative and quantitative research paradigms both generally and when using case studies. However, such a divide can be bridged and a qualitative mode of enquiry may assist with the practical, societal and in some instances political utility of research projects (Travers, 2008, p.13).

4.3 Key Tenets

Social constructionism is not a unitary paradigm but rather embraces a number of different ontological and epistemic perspectives (Shotter, 1999; Alvesson and Skoldberg, 2003; Hosking, 2011). The roots of social constructionism may be traced back to a broad and eclectic range of social science disciplines including phenomenology, anthropology and symbolic interactionism (Mead, 1934; Merleau-Ponty, 1968; Schutz, 1970). In essence social constructionism posits that reality and knowledge are socially constructed (Berger and Luckmann, 1966; Shotter, 1993; Burr, 2003). This is achieved via a complex interweaving of human agency, language, interaction and everyday praxis (Watson, 1994; Weick, 1995). Accordingly, the world and its institutions amount to a 'humanly produced, constructed objectivity' (Berger and Luckmann,1966, p.78).

A key axiom of social constructionism is the notion that social reality is not something that is separate from us, but rather social reality is co-constructed by

human interaction (Cunliffe, 2008). A growing number of studies on leadership note how there has been a challenge to 'the privileging of a researcher-imposed view of leadership' in favour of looking at leadership through the lens of social constructionism (Fairhurst and Grant, 2010, p.172). The latter is the antithesis of the essentialism of a positivistic mode of enquiry (Cunliffe, 2002; Cunliffe, 2008; Alvesson and Sklodberg, 2009). Borrowing from Winch, the social constructionist paradigm can act as 'underlabourer' to cleave an alternative pathway to understanding the nature of social reality (Winch,1958, p.5).

4.4 Relationships and Consensus

Gergen's analysis of the key axioms of social constructionism is apposite and instructive. Gergen posits that the manner in which humans construct their own world is dependent upon relationships and reaching a consensus or agreement on what constitutes phenomena. Moreover, it is 'within these relationships that we construct the world in this way or that' (Gergen, 2015, p.4). This does not mean that social constructionism denies reality or leads inexorably to the conclusion that nothing is real unless (and until) people agree that it is. Rather, Gergen notes that when we describe death, the body or the sun we are 'speaking from a particular standpoint or tradition of understanding' (Gergen, 2015, p.5). Accordingly, when considering what we mean by 'death' one can view this biologically (physical termination of self), religiously (ascension to heaven) or in terms of legacy (a corpus of published works existing in perpetuity) Social constructionism does not posit that death does not exist; rather situationally and via communication we 'construct the world in which we live' (Gergen, 2015, p.6). Gergen, building upon the framework enunciated by Burr and Hacking, suggests four key axioms of a social constructionist paradigm (Hacking, 1999; Burr, 2003; Gergen, 2015). Firstly, how the world is explained and understood is not reducible to 'what there is.' As Yeats observed, it is man who created death. Secondly, relationships and their outcomes are central to how and why we understand phenomena. The modality of the later is language and how we interpret words and attribute meaning. Thirdly, constructions of reality or knowledge gain significance via social utility. Adopting Wittgenstein's notion of the 'language game' it is through the medium of language situated in society that words attribute

meaning (Wittgenstein, 1953). Hence financial nomenclature like liquidity, amortisation and depreciation are all part of the financial 'game' played in Western capitalistic society (Wittgenstein, 1953).

Finally, Gergen posits that values are 'created and sustained' within forms of life (Gergen, 2015, p.12). Hence as humans coexist certain values and norms are created and become implicit to everyday life. Gergen notes that societal rules are developed. Moreover, it is from 'relationships that we foster our vocabularies, assumptions and theories about the nature of the world (including ourselves)' (Gergen, 2015, p.13).

4.5 Epistemic and Ontological Perspectives

Berger and Luckmann's seminal text The Social Construction of Reality (1966) is arguably the genesis of contemporary social constructionism. The idea that knowledge is socially constructed represents a coherent synthesis of Durkheim's 'social facts' with Weber's notion of verstehen or understanding in helping explain and understand phenomena (Durkheim, 1952; Weber, 1958). In essence, Berger and Luckmann contend that people construct their own world simultaneously as the world makes them (Fairhurst and Grant, 2010). Moreover, knowledge is a social product anchored by social relativity and process. What may be construed as 'real' to a Tibetan monk is very different to what amounts to being 'real' for an American businessman (Berger and Luckmann,1966, p.15).

From an epistemic perspective, the validity or invalidity of knowledge is irrelevant as what matters is 'whatever passes for knowledge' in any given situation. Knowledge is created via a 'continuing dialectical process' between externalisation, objectivation and internalisation (Berger and Luckmann,1966, p.78)

It is noteworthy that Berger and Luckmann make no claim as to the ontological status of the institutional world. Notwithstanding the 'objectivity that marks the social world' no ontological status is conferred separate to the human activity that produced it in the first instance (Berger and Luckmann,1966, p.78). This cuts through 'dualistic polarities' prevalent in the social sciences where dichotomies exist ontologically between subject and object (Knights, 1997; Grugulis and Knights, 2001). By way of example, for the social constructionist sociology or

feminism are not polarised as between the individual and society or men and women respectively. Rather the latter are understood and explained via a continuous dialectic process of human activity and praxis.

From an ontological perspective, it is language and the use of storytelling and narrative in 'everyday discursive practices' through which reality is constructed (Cunliffe, 2002, p.130). This thesis posits the notion of 'language as ontology' to explain and explore how fire fighters construct their own reality through language, shared meanings and understandings (Bakhtin, 1986; Shotter, 1993; Cunliffe, 2002). The latter is the antithesis of utilising language as epistemology where singular meanings are attributed and which are 'consistent across contexts' (Cunliffe, 2002, p.130). Shotter (1993) observes that a main component of human reality is language; this research posits that it is via situated dialogue that meanings are constructed within Northern Fire. Communication and language occupy a central space in the co-construction of meaning. A corollary of the latter means that language does not reflect or mirror reality but rather actually comprises it (Fairhurst and Grant, 2010). This thesis contends that from an ontological perspective the lived experience of fire fighters is created and constructed through language and every day discursive practice. The latter is based upon a pluralistic and dialogical approach.

4.6 Methodology

The methodology employed in this thesis is a single (instrumental) case study of Northern Fire. The research adopts Stake's position where the emphasis is on the 'uniqueness' of the case study. Here the focus is to particularise and not generalise so that the 'first emphasis is on understanding the case itself' (Stake, 1995, p.8). An in depth study of Northern Fire was undertaken to provide a rich and detailed account of how knowledge was both transferred and construed. Data was collected via a combination of participant observations, focus groups and semi-structured interviews. Triangulation was achieved through a detailed review of Northern Fire's formal knowledge management literature and individual fire fighters' records held on EMOC files. An inductive approach has been adopted throughout with data being collected and then analysed thematically to help generate theory (Stake, 1995; Yin, 2009; Saldana, 2016).

Data collection commenced on 01 November 2015 and concluded on 23 May 2016. Fire fighters operate within a Watch comprising of between 4 and 10 individuals. A total of 12 focus groups comprising of 58 fire fighters were conducted at separate Watches within Northern Fire over a broad geographical location. All focus group interviews were recorded with full permission. As stated above, the thesis documents how Red Watch shared and transferred knowledge as a CoP. It captured Red Watch's training in preparation for a formal assessment on its use of BA equipment. Participant observation of Red Watch occurred for the period February 2016 until May 2016. Observations of Red Watch took place during formal training exercises and seminars leading up to their BA assessment on 23 May 2016. The author also participated in the first part of the BA assessment and joined Red Watch in a 'live burn' controlled fire wearing a full BA set. This is more fully discussed in the ethnographic section below.

In addition, 14 semi-structured interviews were conducted with senior management and key staff within emergency response and support functions. The ACO, DCO and Director of HR were all interviewed. Managers within the Fire Protection Department and the Emergency Response Team were also interviewed. In addition, staff and managers within procurement, IT and administrative support were interviewed.

The thesis sought to capture the transition period when the retiring DCO stepped down and was replaced. The research documents the transfer of the outgoing DCO's tacit knowledge before leaving Northern Fire. The new DCO was interviewed during the transition period and kept a diary of tacit knowledge transfer during the handover period. The collection of rich data from multiple sources has enabled the research to provide a detailed analysis of knowledge transfer in Northern Fire. Multiple perspectives from very senior managers through to front line fire fighters and emergency response call handlers throws light upon how knowledge was both co-created and constructed situated within (and through) CoP.

The case study of Northern Fire comprises of the following elements:

- The use of participant observation to understand *how* and *why* knowledge was transferred by Red Watch as they prepared for a formal assessment on BA equipment. A schedule of the BA participant observations is annexed at Appendix C. The actual assessment criteria for the BA assessment is annexed at Appendix G. In addition, fire fighters at Brinkworth fire station were observed between November 2015 and May 2016. Participant observations occurred on an ad hoc basis during weekends and evenings and each lasted for an average period of two hours. All ethnographic observations were noted and set out in ethnographic field-notes which were subsequently uploaded to Nvivo (version 11) and fully analysed.

- Focus groups of 12 individual Watches within Northern Fire and covering its entire geographical area. Some 58 fire fighters participated and comprising of 44 fire fighters, 10 Station Managers and 4 Group Managers. The focus groups were conducted in a broad and diverse range of Fire Stations ranging from busy stations based in the city centre to smaller, more rural stations. A detailed schedule of the focus groups is annexed at Appendix A.

- A review of formal knowledge management literature and systems promulgated by Northern Fire. This comprised of a review of all core policies and operational guidelines (including the NOG) on BA, casualty care, hazardous materials and ventilation procedures. A copy of Northern Fire's BA procedure is annexed as Appendix E. The majority of this documentation was circulated by Northern Fire's intranet system that all fire fighters had access to. Access to individual fire fighters' EMOC's was granted to explore individual learning and development. The latter also assisted in triangulation and construct validity (discussed below).

- The shadowing of the DCO during a handover period when his incumbent retired from Northern Fire. This occurred during handover meetings between November 2015 and January 2016. Meetings were recorded and then fully transcribed with consent; detailed field-notes were also taken as part of the data collection

process. The thesis explores how tacit and explicit knowledge were transferred prior to (and during) the transfer period.

- 14 semi-structured interviews were conducted across the entire support function of Northern Fire to give the research depth. As discussed above, semi-structured interviews were conducted with the Emergency Response Team, Fire Protection and Departments, HR and also Policy Development and Procurement to capture their views on knowledge transfer within Northern Fire. A schedule of all semi-structured interviews is annexed at Appendix B.

The thesis utilised a single longitudinal case study comprising of ethnography, focus groups and semi-structured interviews. This is because the latter are congruent and arguably isomorphic with a qualitative research philosophy. Understanding how and why tacit knowledge is transferred is best explained situationally and through a dialogical and iterative process (Stake, 1995; Kvale, 1996; Yin, 2009; Gergen, 2015). The following argues that the modality of semi-structured interviews and participant observation facilitate a deeper and more nuanced elucidation of knowledge transfer within Northern Fire than a positivistic or critical realist methodology.

This section is structured as follows. Firstly, the efficacy of case study research is explored and explained. Thereafter the limitations of case studies are set out from the perspectives of validity, reliability and generalizability. Secondly, the use of ethnography is explored and in particular the use of participant observation to understand organisational phenomena. Thereafter the role of semi-structured interviews and focus groups are adumbrated together with some of the limitations of these mechanisms for collecting qualitative data. Finally, the ethical parameters of the research are set out and discussed.

4.7 Case Studies

This research has utilised a single instrumental case study approach to help explain how and why knowledge was transferred within Northern Fire (Stake, 1995; Kvale, 1996; Yin, 2009). The research philosophy underpinning this thesis is based upon a social constructionist paradigm; knowledge in Northern Fire is

socially constructed through social interaction, culture, language and meaning (Berger and Luckmann, 1966; Shotter, 1993; Cunliffe, 2002; Cunliffe, 2008). Accordingly, from an epistemic perspective, the use of a case study is congruent with best understanding and explaining the how and why of knowledge transfer within Northern Fire (Stake, 1995; Kvale, 1996; Yin, 2009). The focus of the thesis is to achieve an in depth understanding of knowledge transfer within Northern Fire. This research adopts Stake's paradigmatic framework that the use of case studies is to aid interpretation of complex phenomena and where the focus is on particularisation and not generalisation (Stake, 1995, p.8). Borrowing from Stake, the emphasis is on 'uniqueness' and achieving an in depth understanding as opposed to a 'collection of descriptive variables' (Stake, 1995, p.2). This marks an epistemic departure from the positivistic means of case study research that seek to emulate the scientific enquiry and methodology of the natural sciences and transpose or fuse them into social science research (Eisenhardt, 1989; Hammersley, 2007; Yin, 2009). The latter does not mean that we cannot generalise; rather this thesis argues that the focus of inquiry should be based upon what Stake describes as 'petite generalisations' that may arise from interpretation and the co-construction of knowledge (Stake,1995, p.37).

This section is structured as follows. Firstly, case studies are defined and their role within social science research explored. Secondly, epistemological perspectives relating to construct validity and analytical generalisability are discussed. Thereafter the limitations of case study research are rehearsed together with an exposition of the ways of ameliorating methodological rigor via case study research.

4.8 Case Study Method

Case studies may be used to explore and explain complex phenomena within a real life setting or environment (Flyvbjerg, 2011; Yin, 2014). Yin posits that the case study can be used as a vehicle to understand 'complex phenomena' from which one can establish 'holisitic and meaningful characteristics' of real life events (Yin, 2009, p.4). Clear boundaries of what is to be studied and the methodology to be employed in the case study need to be clearly defined from the outset (Eisendhardt, 1989; Eisenhardt and Graebner, 2007; Yin, 2009). A

case study may be used to explore a single unitary phenomena or alternatively case studies may be multiple (Yin, 2009). Whyte's seminal study of Italian immigrants in 1940's America to Van Maanen's exposition of retelling tales from fieldwork are examples of the broad and eclectic range of social science case study research (Whyte, 1943; Van Maanen,1988). Creswell argues that the qualitative case study achieves depth and detail by virtue of robust data collection over a period of time (Creswell, 2013). Alternatively, the case study may be viewed as a research strategy that helps elucidate dynamics that are present within single settings (Eisenhardt, 1989). Travers posits that qualitative lines of enquiry like the case study can demonstrate practical, political and intrinsic values. Moreover, they facilitate a 'curiosity about social life' and everyday human activity (Travers, 2008, p.14).

4.9 Epistemological Perspective

Epistemological and ontological considerations have significant impact upon case study design. How the researcher views the nature of reality and the generation of knowledge are paramount (Stake, 1995; Eisenhardt, 1989; Yin, 2009). Yin's epistemological position is a positivistic one. He notes that the case study is a means of 'investigating an empirical topic' using a rigorous and scientific methodological procedure (Yin, 2009, p.21). This mirrors both Hammersley's and Eisenhardt's broadly empirical perspectives on both case study research and also design (Eisenhardt, 1989; Hammersley, 2007).

Yin demarcates between analytic generalisation and statistical generalisation in the context of a single case study (Yin, 2009, p.15). Yin notes the difficulties in seeking to generalise from a single case study by using the analogy of trying to generalise from just one single chemical experiment. Yin posits that if the intention is to generalise then the same principle from 'multiple sets of experiments' can be used with 'multiple case studies' (Yin, 2009, p.19). Yin demarcates between analytic and statistical generalisation. The former may be achieved using a single case study where the intention is to build upon or generalise theory. The latter would not be achievable by a single case study as it would not be possible to 'enumerate frequencies (statistical generalisation)' due to the size of the sample (Yin, 2009, p.15).

Adopting Yin's epistemological viewpoint, the researcher is a dispassionate observer and the subject matter of the case study can be discovered a priori from a reductionist perspective (Yin, 2009). From an ontological perspective, Yin posits that reality is 'out there' and that organisational phenomena can be reified and objectified (Yin, 2009). Travers notes the importance of epistemology in case study research. Moreover, that 'every researcher brings some set of epistemological assumptions' to the research process (Travers, 2008, p.9). Travers refers to both Durkheim and Weber as a means of explaining the different approaches to case study research from a positivistic to broadly interpretivist epistemological perspective or paradigm.

4.10 Case Study Validity

Having defined the case study and enunciated its epistemological and ontological criteria, this section moves on to consider some of the problems associated with traditional case study research. The rich and varied modality of case studies can lead inexorably to questions of the reliability, accuracy and validity of their findings (Eisenhardt, 1989; Hammersley, 2007; Yin, 2009; Flyvbjerg, 2011). Hammersley notes that the 'perennial issue' of the criteria by which qualitative case study research should be judged can prove problematic (Hammersley, 2007, p.287). Rather than enunciate a single set of criteria, Hammersley advocates the development of 'guidelines' to judge the efficacy and rigor of case study research (Hammersley, 2007, p.289).

Eisenhardt's (1989) seminal article on constructing theory from case study research is both apposite and instructive. She constructs a 'roadmap for building theories from case study research' (Eisenhardt, 1989, p.532). Eisenhardt's roadmap adumbrates the process of theory building from commencement of research to entering into the field and constructing a hypothesis. She notes the opportunity of 'positioning theory building from case studies into the larger context of social science research' (Eisenhardt, 1989, p. 533). This positioning of theory acts as a counterpoise to ameliorate criticism of case study research as being subject to personal bias and a lack of analytic generalizability. The latter represents an acknowledgement of the strengths and weaknesses of the case

study approach. Moreover, how best to ameliorate the veracity of case study findings to achieve parity with more empirical methodologies.

Flyvbjerg adumbrates five key misunderstandings regarding case study research and argues that actually 'social sciences may be strengthened by the execution of a greater number of good case studies' (Flyvbjerg, 2006). The notion that case studies generate less robust findings than other methodologies (including positivistic ones) is arguably misconstrued. Flyvbjerg argues the latter on a number of fronts and posits that it is dubious as to whether a priori knowledge is to be considered more valuable than interpretivist or socially constructed knowledge. Secondly, it is myopic to suggest that problems of generalisation completely stymy any contribution to broader scientific knowledge. The inductive versus deductive analysis is perhaps an intellectual cul-de-sac and case studies can be used to both test and generate hypotheses. Furthermore, case studies do not necessarily reinforce the preconceptions or notions of the researcher and hence contaminate the data obtained. Furthermore, it is perhaps fallacious to assert that one cannot summarise or develop general theories or propositions from case studies.

Yin posits four general criteria for judging the quality of case study research design (Yin, 2009, p.9) Firstly, he notes that 'construct validity' can help in eliminating possible bias or subjectivity in case study research. Using multiple sources of data can help ameliorate the position and eliminate (or reduce substantially) personal bias in the collection and analysis of data. Secondly, Yin notes that in explanatory case studies where causal factors of how and why an event has occurred there needs to be 'internal validity'. The latter means ensuring that evidence converges and all possible rival explanations and possibilities have been considered before making any conclusions from the data. External validity vests upon being able to confidently conclude as to whether a case study's findings could be applied elsewhere. Yin uses the example of a study regarding neighborhood change and whether this could be generalised to other neighborhoods (Yin, 2009, p.43). Finally, he notes the importance of reliability in case study research. If another researcher undertook the same procedures employed would she obtain similar results? The emphasis here is not replicating

the original findings but rather ensuring that if the same methodology was employed the same findings and conclusions would be arrived at (Yin, 2009, p.45).

This thesis rejects the use of case studies as a purely positivistic means of enquiry (Eisenhardt, 1989; Hammersley, 2007; Yin, 2009). Rather this research adopts a constructionist perspective where the case study is used as means of generating depth of understanding of complex phenomena (Stake, 1995). However, the thesis seeks to achieve methodological rigor and avoid differing theoretical, methodological or value assumptions that may sometimes be prevalent in case study research (Hammersley, 2007). The thesis utilises Yin and Eisenhardt's methodological framework for ensuring parity with more scientific means of enquiry. By way of example, construct validity has been achieved by using multiple sources of data to verify findings. The comments made by Red Watch during both participant observations and interviews was compared and contrasted with formal knowledge management documentation on individual fire fighter's EMOC's. Triangulation of other data sources such as the National Operational Guidelines has also been implemented to test construct validity. Similarly, detailed ethnographic notes of participant observations have been compiled and all interviews have been transcribed verbatim. The latter have been placed on NVivo (version 11) and coded using thematic analysis to ensure reliability as enunciated by Yin (2009) and also Saldana (2016). The coding process is more fully described below.

4.11 Ethnography: Overview

Participant observation was used as a means of understanding how knowledge was transferred within Northern Fire. As stated above fire fighters work within a Watch of between 4 and 10 individuals. A Watch is essentially a CoP and participant observation facilitated a close and in depth account of fire fighters' daily lives. This research has borrowed from Orr's (1996) ethnographic study of photocopier repair personnel and how they transferred knowledge and worked together within a CoP. The writer observed and participated in the training undertaken by Red Watch as they prepared for a formal assessment on their use of BA equipment and techniques. The formal assessment criteria for the BA

assessment is annexed at Appendix F. Red Watch were observed at Longworth Fire Station which was identified at the start of the research as being a typical station within Northern Fire. It was representative of all stations in terms of gender, size and the experience of front line fire fighters.

Participant observation of Red Watch commenced in February 2016 and concluded on 24 May 2016 when Red Watch were formally assessed on their BA techniques. All members of Red Watch were successful in passing their BA assessment. The writer participated in a 'live burn' simulated fire as part of the participant observation process. This enabled the author to experience firsthand the challenges of the assessment and adds both depth and authenticity to the ethnographic process (Orr, 1996).

Borrowing from Cunliffe, the research seeks to occupy a 'room with a view' to paint a vivid and detailed description of Red Watch during the training programme (Cunliffe, 2008). The thesis adopts a realist approach to ethnography to understand how 'living with and living like' fire fighters results in an interpretative understanding and appreciation of their world (Van Maanen, 1988, p.6). This section is structured as follows. Firstly, there is an exposition of what we mean by ethnography and its fusion of sociological and anthropological principles. Secondly, the taxonomies of ethnographic research posited by Van Maanen are explored. Thereafter the limitations of participant observation are discussed with reference to Northern Fire.

4.12 Ethnography

The modality of ethnographic research allows the researcher to achieve depth and depict organisational or cultural phenomena via narrative in a rich, compelling and very personal manner (Van Maanen, 1988; Orr, 1996; Cunliffe, 2010; Jarzabkowski, 2015). The latter perhaps offers a counterpoise to perhaps more superficial and febrile positivistic data obtained via surveys and questionnaires (Alvesson, 2003). However, ethnographic research is by no means a panacea; its efficacy may be compromised by inter alia notions of reliability, validity and accuracy (Cunliffe, 2008; Cunliffe, 2010; Jarzabkowski, 2015).

A key axiom of ethnographic research is the immersion of the researcher 'in the field' and connecting with the worlds of others. Thus the researcher finds herself 'subjecting the self, body, belief, personality, emotions and cognitions' to others (Van Maanen, 2011, p.219). Jarzabkowski et al. (2015, p.4) posit that the leitmotif of ethnography is 'the close observation of and involvement with people in particular social settings' to help explain and extrapolate certain phenomena. Watson echoes this sentiment and notes that ethnography is a method which 'draws upon the close observation with people in particular social settings' and looking at the cultural framework within which conversations and actions occur (Watson, 2011, p.202).

There is arguably an inexorable connection with ethnography and a broader social constructionist perspective; the researcher looks at informants' language, culture, artifacts and meaning to understand and explain cultural phenomena (Berger and Luckmann, 1966; Merleau-Ponty, 2014). A corollary of the latter is that phenomena (including the self) 'cannot be adequately understood apart from the particular social context' in which they are shaped (Berger and Luckmann,1966, p.68). It is the role of the ethnographer to dive into the world of others and retrieve a pearl; the challenge is presenting the data obtained in a compelling and convincing manner (Van Maanen, 1988; Biddle and Locke, 1993). Ethnography traces its lineage back to pioneering studies where researchers would immerse themselves in the world of ancient tribes and cultures. Descola's study of Jovaro Indians in the Amazon basin is apposite and also illustrative of this approach (Descola, 1996). In nascent ethnographic studies the Oxford don (atypically male) would immerse himself in some ancient primitive society and aim to generate a thick, vivid and rich description (Hannerz, 2003). More contemporary examples include Jarzabkowski et al.'s detailed ethnographic study of the practice of the reinsurance industry over a three-year period (Jarzabkowski et al. 2016). Ethnography has also been used to explore and understand a plethora of complex organisational phenomena. These include Kondo's (1990) study of life in a Japanese sweet factory and Orr's (1996) study of the lived experience of Xerox photocopy repair personnel discussed in the preceding literature review.

Van Maanen in his seminal text Tales of the Field (1988) posits that ethnography is a synthesis of both fieldwork and culture. The latter results in a 'written representation of a culture' that carries with it 'serious intellectual and moral responsibilities' (Van Maanen, 1988, p.1). Ethnography is conceived through observation but born via writing; culture or practice are both created and determined by the results of ethnographic writing (Van Maanen,1988, p.6).

Having defined ethnography (above) it is important to establish how ethnographic research is undertaken in the field. Ethnography is undertaken by participant observation ("PO") of which there are four taxonomies. The latter comprise of complete participant, complete observer, observer as participant and participant as observer (Monahan and Fisher, 2010; Brannan and Oultram 2012). The ethnographer who adopts the role of complete participant does not reveal the true purpose of their research and takes part in the activities of the group being researched. The complete observer also does not reveal the purpose of their research but does not take part in group activity (Monahan and Fisher, 2010; Brannan and Oultram 2012). The observer as participant will reveal the nature of the research undertaken but will not necessarily take part, whilst the participant as observer will both take part and reveal their identity and the scope and parameters of their research (Monahan and Fisher, 2010; Brannan and Oultram 2012). These taxonomies of being a PO are presented in the normative literature as being separate and dichotomous. The reality is that the demarcation between being a participant as observer and observer as participant can be both fluid and contested (Van Maanen, 1988; Orr, 1996). The researcher can easily stray from a position of observation to actual participation and vice versa. Further, ethical issues can potentially arise when a 'scout that is sent to a strange and possibly hostile field to spy on natives' and then report this back to management or the wider world (Monahan and Fisher, 2010, p.358). However, self-reflexivity and the notion of the ethnographer being self-reflexive and contemplating upon her work in the field and its impact may mollify these effects (Cunliffe, 2008).

For ethnographic research to have maximum impact (and arguably parity with positivistic research methodologies) it needs to be both plausible and convincing (Biddle and Locke, 1993; Cunliffe, 2010). Language and the strength of the

narrative places a central role in the latter; the author needs to convince the reader that she has ‘been there’ and existed meaningfully in ‘the field’ (Watson 2011; Van Maanen, 2011). Biddle and Locke posit that narrative is the driver of conveying the lived experience of the researcher (Biddle and Locke, 1993). The latter is achieved via ‘three dimensions’ pursuant to which an ethnographic text will convince when it is both authentic, plausible and critical (Biddle and Locke, 1993, p.597). Van Maanen’s description of participant observation at an urban police agency in America is both compelling and authentic. Van Maanen describes the duties of police sergeants and demarcates their responsibilities with those of patrolmen. Evocative descriptions of doing as little as possible to get by or deviating from the rules together with sobriquets like ‘Hats-on-Harry’ or ‘Edward-who-never-goes-out’ capture the essence of life at the station (Van Maanen,1988, p.58).

The author’s own experience of waiting around (and observing everyday life at) Fire Stations is apposite. Very often colloquialisms vividly captured the lived experiences of what it was like to work in the front line of the Fire Service. Expressions like ‘tellin’ sprog tales from lamppost’ to illustrate more senior members directing new recruits or ‘cleveland branch’ to denote how best to roll out a fire safety hose help to prove authenticity and reinforce that the writer has ‘been there’ and witnessed events first hand. The writer experienced the trials and tribulations of Red Watch as they prepared for their formal BA assessment. Formal training exercises at the Fire Station and classroom seminars on BA were all attended for the period February 2016 to 24 May 2016. The writer participated in a ‘live burn’ controlled fire training assessment with Red Watch as part of their formal BA assessment. This involved wearing a full BA set, entering a fire box where temperatures exceeded 600 degrees centigrade and working with Red Watch to extinguish the fire. The latter arguably adds depth to the research and gives the ethnographic element authenticity establishing that the researcher had really ‘been there’ and experienced the working life of front line fire fighters (Van Maanen, 1988; Orr, 1996).

4.13 Interviews

The meticulous and persistent interviewing technique demonstrated by the late Sir David Frost in his interviews with President Nixon are perhaps the high watermark of good interviewing (Frost, 2007). Through perseverance, acuity and constant probing questions, ultimately Nixon acquiesced in his involvement with Watergate. Interviews are the most common and perennial data collection technique and it is the aim of this section to explore their veracity and validity.

The role of the interviewer has shifted somewhat as qualitative research techniques have developed over time. The interviewer has moved from a position of rigidity and holding power over the interview to a more reflexive and co-constructive knowledge creating process (Heyl, 2001; Gubrium and Holstein, 2012). Hence the interviewer has moved from being almost a 'miner' or 'digger' trying to excavate information to the role of a 'traveler' whose purpose and trajectory is to meet and interact with people during the interview process (Kvale, 1996). Accordingly, the interviewer assumes the role of 'a working narrative partner' where 'the subject behind the interviewer is fully engaged in the coproduction of accounts' (Gubrium and Holstein, 2011, p.33).

The term 'interview' is a generic one and interviews may be placed into a number of taxonomies. The latter include reference to 'standardised' or 'non standardised' interviews or 'structured,' 'non structured' and 'in depth' interviews (Court and Abbas, 2013; Brinkmann and Kvale, 2015). The structured interview is almost positivistic with the researcher asking a set number of questions, which engender a certain type of response. Answers can then be analysed and presented empirically. This aligns with Alvesson who posits, inter alia, that the structured interview is neopositivist and a vehicle to establish truth that is context free and where the leitmotif of the interview is its objectivity and neutrality (Alvesson, 2003).

The semi-structured interview is much more fluid and allows a greater interplay between participants. Questions may be positioned around certain themes or axioms; these are analogous to a Russian Doll where further questions are posed dependent upon the responses given. The latter aligns with Alvesson's notion of a 'romantic' interview where the interaction is meaningful and ideas, feelings and

intentions of the interviewee are explored (Alvesson, 2003). The unstructured interview affords the interviewee to set forth and 'tell their story' or adumbrate their perception of organisational events or phenomena with little or no interaction with the interviewer. The type of interview to be used depends very much upon the research design and methodology employed. By way of example, a series of semi-structured interviews may be used to supplement data obtained from an initial questionnaire or survey (Teddlie and Tashakkori, 2009). This thesis has used both semi-structured interviews and focus groups as a means of understanding how knowledge is transferred within the Fire Service. From an ethical perspective, interviews have been recorded with consent being obtained at the start of each interview. The entire process was explained in detail and interviewees were told of their right to withdraw from the project. The recording of interviews was also initially negotiated and agreed with the Fire Brigade's Union on the proviso that participant identity would be protected via anonymisation.

Semi-structured interviews have centered around four key areas of discussion namely tacit knowledge, explicit knowledge, organisational memory and CoP. A research briefing note outlining the main discussion topics was sent via email to all participants before either interviews or focus groups took place. A copy of the research briefing note is annexed at Schedule D. A list of supplemental questions was then prepared. By way of example, when discussing communities of practice, sub questions around power dynamics within groups were explored.

The modality of the semi-structured interview allows for a maximum flexibility, which allows the interview to ebb and flow as discourse develops and unfurls. However, this perhaps renders the semi- structured interview open to criticism on the grounds of potential bias. Interviewees may elicit responses that are superficial or cautious; alternatively they may proffer a response they think the interviewer wants to hear (Gobo, 2011; Irvine, Drew and Sainsbury, 2012). Equally, participation bias may arise from the time and effort commitment required to contribute with the concomitant effect of reduced numbers of willing participants. Alvesson's localist approach to the research interview arguably remains both apposite and effective (Alvesson, 2003). He posits that the research

interview can bridge the gap between neopositivism and romanticism by adopting a localist approach. Alvesson (2003, p.16) notes that ‘people talk with their bosses, they serve customers, they drive trucks’ and they also participate in interviews. Thus a localist perspective is a situated one whereby the interviewer is not simply reporting external events. Rather, the interview process is ‘producing situated accounts’ that are ‘drawing upon cultural resources in order to produce morally adequate accounts’ of phenomena (Alvesson, 2003, p.17). The interviewer’s own bias may be counterpoised by self-reflexivity on both a personal and cultural issues (Denzin, 2001; Court and Abbas, 2013). Applying the latter to the author’s own research, the painful effects of recent industrial action have not been forgotten by front line fire fighters. Hence by being reflexive and open about this via specifically mentioning ill feeling towards management and its effect upon knowledge transfer was a way of countering both personal and interviewee bias (Denzin, 2001).

4.14 Focus Groups

This research has utilised focus groups as a mechanism to explore and understand key issues facing the Fire Service. Participants were asked the same questions as those who took part in the semi-structured interviews discussed above. Supplemental questions were also asked to engender responses on issues such as recent industrial action over proposed changes to shift patterns and the use of new BA equipment when entering burning buildings. The latter was undertaken to broaden the discussion and also add depth to the research (Boddy, 2005; Krueger and Casey, 2009).

Historically focus groups have been used to gauge political opinions or conduct market research (Krueger and Casey, 2009; Tracy, 2014). A focus group may be defined as a ‘group interview that focuses upon a particular issue, product, service or topic’ and where open participation and discussion are actively encouraged (Saunders et al. 2016, p.420). Boddy (2005) notes that the nomenclature used to describe focus groups needs to be clear and precise. Often the term ‘focus group’ is used interchangeably with ‘group interview.’ The latter is a more generic discussion amongst a group whilst the former has clearly identifiable issues to be discussed and often with a moderator or chair to facilitate

the discussion. Tracy notes that focus groups are a useful and pragmatic means of interviewing a large number of participants relatively easily. Moreover, they can act as a 'mini interaction laboratory' where the researcher is able to observe how people interact together and articulate ideas (Tracy, 2014, p. 168). Focus groups were used in this research as fire fighters operate in Watches and hence it was sensible and pragmatic as a means of data collection. It was possible to conduct the focus group in one sitting with multiple participants; some 58 fire fighters were interviewed in total. Equally, focus groups are particularly useful in discussing shared experiences and challenges (Tracy, 2014). This is particularly relevant to fire fighters who have often worked together in Watches over many years and have developed close professional bonds and allegiances.

Conducting focus groups successfully can be challenging and in particular ensuring that all participants contribute to the discussion with no single individual dominating the interview (Kvale, 1996; Boddy, 2005; Tracy, 2014). Saunders et al. (2016, p.420) note the importance of a 'moderator' or 'facilitator' to ensure boundaries of the topics under discussion are maintained and also to avoid 'leading the group towards certain opinions.' The author's experience of conducting focus groups in this research was a positive one. Participants wanted to engage in critical debate and discussion on issues they felt were important to them both personally and professionally. They viewed participation in the focus groups as a means of articulating their opinions which were often critical of senior management. No single individual dominated any discussion and there was a healthy and robust debate in each of the 12 focus groups that were conducted (Kvale, 1996; Krueger and Casey, 2009; Saunders et al., 2016).

4.15 Coding

This section now moves forward to discuss the process by which data was coded and categorised in this research. All interviews were recorded with participants' consent and then fully transcribed and uploaded to Nvivo (version 11). Notes of participant observation conducted during the period of observing Red Watch were also fully transcribed and uploaded to Nvivo. The thesis has adopted Saldana's (2016) approach to coding. This was undertaken on a first and second cycle basis. Codes were used to capture the 'summative, salient, essence

capturing' parts of interview transcripts and ethnographic field notes (Saldana, 2016, p.4). The first cycle of coding sought to establish common themes and patterns that arose from the data (Bernard and Ryan, 2010; Grbich, 2013). Saldana's method of arranging the data systematically and dividing, grouping and ordering it to 'consolidate meaning and develop explanation' was adopted (Saldana, 2016, p.9).

Saldana notes how data can be coded initially on a first cycle basis and then the process can be repeated and refined as a second cycle. This is a mechanism for refining codes that are ascribed to the data and moving from individual codes to actual categories and then themes. By way of example, the first cycle of coding ascribed codes such as 'legitimate peripheral participation,' 'power' and 'trust' to interview responses to questions on communities of practice. These codes were developed during the first cycle of coding and then placed under the general theme 'communities of practice.' Similarly, the data on organisational memory was initially coded as 'forgetting,' 'deliberate forgetting' and 'accidental memory loss' under the general theme of 'organisational memory loss.'

Saldana notes the danger in 'coding for themes' and argues that this approach is misleading; a 'theme can be an outcome of coding' but should not be something that is itself coded (Saldana, 2016, p.15). By way of example, 'tacit knowledge' was a code adopted in the research and 'difficulties with transfer' arose as a theme. Saldana posits that first cycle coding amounts to 'processes that happen during the initial coding of data' (Saldana,2016, p.68). The thesis adopted a first cycle of coding approach to break down the data systematically, ascribe meaning and look for themes and patterns that emerged from the data. A second cycle of coding was then undertaken which drew upon 'analytic skills' such as 'classifying, prioritising' and 'integrating' the data (Saldana, 2016, p.69). During the second cycle of coding a decision was taken to use in vivo coding where appropriate. The reason for this was that using participants' actual words as codes augments the social constructionist research philosophy discussed above. It uses and recognises the 'voice' of participants which can be a powerful tool in making sense of and interpreting qualitative data (Saldana, 2005).

The requirement for validity, accuracy and repeatability as being the hallmarks of good social science research were noted above (Eisenhardt, 1989; Stake, 2005; Yin, 2009). A process of triangulation was undertaken when the second cycle of coding was completed. Fire fighters' individual EMOC's were examined for all 17 fire stations. A comparison was made with the information held on the EMOC system and the themes generated via the second cycle of coding. By way of example, where power was identified as a theme that may inhibit knowledge transfer, EMOC's were checked. This was to ascertain if power had been a factor in fire fighters' completion or non-completion with on-line courses and seminars on areas such as BA techniques or road traffic collision procedures.

4.16 Ethical Issues

This section discusses the ethical framework that underpins the research and explores how ethical issues were complied with. An initial approach was made to the ACO of Northern Fire by email and asking him for an opportunity to conduct the research. Negotiations regarding access commenced in late August 2015. Previously Northern Fire had engaged with a PhD researcher in relation to suicide amongst fire fighters as a result of attending catastrophic events. The preliminary research findings proved problematic and the research was terminated. The research did not progress to completion and had proved problematic particularly in relation to confidentiality issues. Against this backdrop the ACO stipulated that the names of participants and the organisation must be completely anonymised. The pseudonym 'Northern Fire' was adopted as a fictional name for the fire service where the research was conducted. Participants in the research were not referred to by name but described by their job title, gender and the number of years' experience they had. By way of example, a Station Manager with seven years' experience was described as 'Station Manager, male, 7 years' experience.'

The author gave two formal presentations to the Management Board of Northern Fire setting out the scope and parameters of the research. Access was formally granted following a Senior Management meeting at the end of October 2015. A Memorandum of Understanding was drafted by Northern Fire's solicitor and signed by both the author and ACO. This was followed by a Non-Disclosure

Agreement which contained a specific confidentiality agreement incorporating the confidentiality issues discussed above. A quid pro quo of allowing access was the requirement to generate a Management Report setting out the research findings and making recommendations for improving knowledge transfer within Northern Fire. The Management Report was formally presented to the Management Board of Northern Fire by the author on 4 April 2017. A number of recommendations flowing from the Management Report were subsequently adopted by Northern Fire. These are more fully explored in the final discussion and conclusions chapter at the end of this thesis.

Northern Fire is heavily unionised and meetings were held with both Unison and the Fire Brigade's Union explaining what the research involved and how confidentiality of participants would be maintained. Both Trade Unions were satisfied that appropriate steps would be taken to protect the identity of participants during the conduct of this research. All interviews were recorded with full consent of those involved. Participants were informed at the start of interviews that they were being recorded and that they had the right to withdraw consent if they chose to. In addition, participants were also informed that they could request a copy of the interview transcript which would then be provided. This thesis adopts a deontological approach to ethics based upon the overarching Kantian principle of not doing any harm to others (Louden, 1986; Dierksmeier, 2013). Consent issues were fully complied with on this basis and in conjunction with the ethical framework of Leeds University Business School. Ethical approval from Leeds University was granted to conduct the research by its Ethics Committee.

4.17 Summary

The methodological approach in this research was informed by a social constructionist paradigm to understand and explore knowledge transfer in Northern Fire. It has argued that a positivistic approach would be unsuitable. From an epistemic perspective, this thesis posits that knowledge is socially constructed through shared understandings, language and culture (Gergen, 2015). A flat, positivistic ontology based upon event regularity has been disregarded as amounting to a limited and superficial means of understanding knowledge and its transfer. Similarly, a critical realist paradigm has been rejected

on the basis that transfactual powers, tendencies or mechanisms that may or may not be exercised is imprecise and confusing (Bhaskar,1975; Archer, 2003; Hesketh, 2006). A single case study has been adopted to generate a rich, thick description of Northern Fire. The intention of the study was particularisation and not statistical generalisation. The thesis adopts Stake's (1995) notion of petite generalisations. Here case study research findings may be capable of some analytic generalisation but where the main driver of the research was to particularise.

The research has used semi-structured interviews, focus groups and participant observation as means of data collection. It has borrowed from Yin's (2009) empirical framework to ensure validity in the collection, analysis and interpretation of the data. All interviews were fully recorded and uploaded to Nvivo. Saldana's (2016) first and second cycle coding approach was utilised to code and categorise the data. Ethical issues were fully complied with and participants' consent to being recorded during the conduct of interviews was obtained. This thesis now moves forward to introduce Northern Fire, its organisational structure and operational activities in the following contextual chapter.

Chapter 5: Northern Fire and Rescue

5.1 Northern Fire and Rescue Service

This chapter introduces Northern Fire and Rescue Service ("Northern Fire") which is a fictional name given to a Fire and Rescue Service based in the North of England. As discussed in the previous methodology chapter, the real identity of the service has been changed for confidentiality purposes. Northern Fire is the fourth largest fire service outside London. It operates within a large and diverse geographical area comprising of a mix of open countryside and also high density cities. Northern Fire has just recently been subject to industrial action with many fire fighters striking against proposed changes to both pension provisions and shift patterns. Industrial relations with senior management remained febrile during the conduct of this research; Northern Fire faces substantial budget cuts until 2020. The latter has resulted in a freeze on the recruitment of front line fire fighters until 2020. In addition, several fire stations were reorganised and restructured in 2015 merging some fire stations and closing others to save costs. This section is structured as follows. Firstly, there is a discussion of the changing environment in which fire fighters operate. Calls for reform of standard terms and conditions of employment are explored and laid out. Secondly, issues regarding negotiating access and the commercial efficacy of conducting the research are discussed. Thirdly, Northern Fire's broad topography is enunciated. Fourthly, Red Watch a fictional name given to a group of fire fighters, is introduced and discussed. Thereafter, Northern Fire's Management Structure is explored with reference to changes in senior management which occurred during the conduct of the research. Two key decisions taken by senior management regarding the negotiation of a key contract and the sale of surplus land are then discussed and explored. The contextual chapter then draws to a close with some general conclusions and observations made.

5.2 Changing Landscape of the UK Fire and Rescue Service

In 2016 the Home Secretary (now Prime Minister) set out sweeping proposals for reform of the UK Fire and Rescue Service (May, 2016). Mrs May articulated a vision of the Fire Service with better working conditions, improved Trade Union

relations and an end to the perceived toxic culture of poor diversity, bullying and harassment. More controversially Mrs May suggested that reforms already made to the UK Police Force could be used as a template and basis for change in the Fire and Rescue Service. Joint collaboration with other emergency services was mooted to improve efficiency and save costs. By way of example, the ambulance service could share both technology platforms and premises with the fire service. This would arguably result in substantial savings to operational costs. Moreover, greater thought needed to be given to staffing levels; despite a substantive decrease in operational activity of some 42 percent headcount had remained static (May, 2016).

Many of these themes are echoed in the Thomas Review (2016) of the UK Fire and Rescue Service. The Thomas Review is the first major review of the UK Fire and Rescue Service since Professor Bain's review some fifteen years previously (Bain, 2002). It notes the heterogeneity of how recruitment, reward and governance policies are applied and interpreted in the UK Fire and Rescue Service. However, often some brigades interpret and apply standard policy in very different ways. This is incongruous as the UK Fire and Rescue Service utilise the same 'Grey' and 'Green' Books setting out terms and conditions of employment and operate within standard National Operational Guidance ("NOG") frameworks to ensure parity and consistency. These are more fully discussed below.

The Review sets out three major areas for reform namely the working environment, conditions of service and management structures. A culture of bullying and harassment was seen as prevalent in many UK Fire and Rescue Services. This was exacerbated by poor levels of trust in management and a lack of communication with front line fire fighters. The Review noted that 2 out of every 5 fire fighters in the 21 stations that formed the review claimed to have been bullied or harassed. Despite many Fire and Rescue Services claiming to promote equality and diversity, the Review suggests that there is still a paucity of women fire fighters in nearly all brigades and recruitment of ethnic minorities was alarmingly low. There was a huge resistance to change and brigades were reluctant to embrace new technology. Often individual Fire and Rescue Services

will decide to trial new technology and then make a decision as to whether to implement this. This can result in a mosaic like roll out where different stations are using different pieces of technology at different times. This can pose operational difficulties when neighbouring fire services assist each other or collaborate during emergencies. Fire fighters from one brigade may be unfamiliar with the technology used by another.

Northern Fire was one of the last UK Fire and Rescue Services to use new telemetry boards to calculate oxygen levels for BA teams (see below). The Thomas Review comments that it would be bizarre if NHS hospitals undertook their own clinical trials before prescribing drugs to patients; yet this type of practice is often undertaken by the Fire and Rescue Service. Frequently new technology is trialed first and then a decision taken as to whether to use it going forward. If new technology is then not adopted or abandoned the cost implications in terms of wasted expenditure can be extremely high (Thomas Review, 2016).

The second key area explored by the Thomas Review relates to fire fighters' terms and conditions of employment ("Terms"). Employees in the UK Fire and Rescue Service have their Terms governed by the 'Grey' and 'Green' Books. The Grey Book applies only to front line fire fighters whilst the 'Green' Book applies to all other staff including emergency response call handlers, IT and back office employees. Senior management and other Principal Officers have their respective Terms governed by a complicated set of rules known as the 'Gold' Book. The Review argues that this is antiquated, often ignored and should be scrapped.

The legal position of the 'Grey' and 'Green' Books is a curious and conflicted one. One interpretation is that they are both national Terms for all UK fire fighters and have legitimacy conferred by the Fire Brigades Union. Whilst not a Statutory Instrument, they are a legally enforceable collective agreement. An alternative position is that they provide only a framework from which individual fire services may negotiate local terms and conditions. Fire fighters under the 'Grey' Book in London may well have different pay and reward structures and annual leave entitlements to their counterparts in Bristol (Thomas, 2016). Northern Fire has negotiated locally and its 'Grey' Book staff enjoy better pension contributions and

annual leave entitlement than their ‘Green’ Book colleagues. On the face of it this seems logical as the role of a front line fire fighter is arguably very different to that of someone working in HR for Northern Fire. However, during the research this disparity between pay and benefits for ‘Green’ and ‘Grey’ Book staff could be a cause of resentment.

The Review notes that the substantive reduction in fires being attended by fire fighters prompts a serious reconsideration of how Fire and Rescue Services are delivered. For the period 1999 to 2000 Fire and Rescue Services in England attended 929,573 incidents whilst for the period 2015 to 2016 528,691 incidents were recorded (Home Office, 2016). An ‘incident’ is defined as either a fire, false alarm or non-fire related incident (Home Office, 2016). Accordingly, in the last 15 years there has been a 57 percent reduction in the number of incidents attended by fire fighters. However, notwithstanding this reduction the way fire services are delivered and aligned with public need has not changed. The Thomas review argues that radical change is necessary and that staff rota or duty systems need to be altered. UK Fire and Rescue Services employ fire fighters on either a ‘whole time’ or retained duty basis. A ‘whole time’ fire fighter works as a full time fire fighter and is employed on this basis. Shift patterns vary but typically fire fighters work an 8 day cycle with 2 days followed by 2 nights with 4 days off. Retained fire fighters are very much akin to reservists in the Territorial Army who already have full time jobs. They work on a part-time basis and are recruited to supplement shift patterns or fill in where necessary. Northern Fire’s retained fire fighters must be able to reach their designated fire station within 5 minutes and reside within the local area. They often work during evenings and weekends to accommodate their existing work commitments.

The reduction in fires has been a direct result of improved fire safety and the sophistication of fire resistant materials in many household products such as sofas and bedding. However, the model for delivering fire services is much criticised as being too expensive and not aligned with actual need. The Thomas Review argues that there should be an increased use of retained fire fighters and a decrease in the numbers of those employed on a full time basis. This would arguably allow fire brigades to align fire fighters with need at peak times or

periods where activity is anticipated to be high (Bonfire night or public holidays). Northern Fire has resisted proposals by senior management to change its Terms. Industrial action occurred in 2014 when the Fire Brigades Union recommended striking over changes to occupational pension schemes for front line fire fighters. Changes to service delivery were mooted but never implemented or formally put forward. Northern Fire elected to place a freeze on recruitment of 'whole time' fire fighters until 2020 in order to save costs. The effect of this on knowledge transfer is explored more fully below.

The final main proposal for reform relates to the quality of management and leadership within the UK Fire and Rescue Service. The Thomas Review is critical of the academic qualifications required for senior leadership and management roles. It recommends the immediate raising of academic standards and the implementation of leadership development schemes for those fire services that do not currently operate such programs. In addition, the Review recommends a 'fast track' scheme whereby those with formal management qualifications could be fast tracked to senior leadership or management roles within the UK Fire and Rescue Service. Of the 12 stations where focus groups were conducted during this research, only one Station Manager had an undergraduate degree. Similarly, only the incoming DCO had a management qualification (diploma in management studies) whilst many senior managers did not have any formal qualifications having 'come up through the ranks.'

5.3 Negotiating Access

As discussed in the methodology chapter, negotiations for access commenced in August 2015 with access being formally granted in November 2015. Access was authorised and commissioned by the ACO to explore how Northern Fire transferred knowledge and to ascertain what the barriers and enablers to transfer were. A quid pro quo of granting access was the author providing a detailed Management Report setting out the key findings of the research. Northern Fire were concerned with three primary issues. Firstly, a loss of experiential knowledge within the service. This had arisen from a freeze on recruitment which resulted in no new probationary fire fighters being recruited. This, combined with an ageing workforce and a growing number of fire fighters reaching retirement

age, meant that the loss of tacit and experiential knowledge within Northern Fire was a serious concern. Secondly, as discussed above there has been a significant decrease in the number of incidents attended by UK fire fighters. Northern Fire welcomed any decrease in house fires due to a focus on fire prevention and protection within its geographical area. However, it noted that many fire fighters may start to experience skills fade as a result of this particularly when combined with a freeze on recruitment. Fire fighters had lost the opportunity to practice and hone their fire-fighting skills as the number of fires had significantly declined.

The age of austerity has meant that Northern Fire has not recruited any full time fire service personnel since 2009 and budgetary constraints mean that only a small number of fire fighters will be recruited in 2020. The practical consequences of the latter mean that there is a huge loss of front line fire-fighting experience within Northern Fire. Many experienced fire fighters will either retire shortly or elect to take voluntary redundancy. Running in parallel with this is the absence of new recruits and the relative inexperience of those fire fighters recruited in 2009. Accordingly, the loss of tacit knowledge within Northern Fire has been identified by senior management as major issue for the service. Thirdly, the ACO wanted to establish how effective the transfer of explicit codified knowledge was within the service. Northern Fire relies heavily upon the sender / receiver model of transfer discussed in the previous literature review. However, the efficacy of this in successfully transferring knowledge had not been empirically researched or ascertained.

5.4 Topography

Northern Fire provides Fire and Rescue Services over a geographical area of some eight hundred square miles and with a total population in excess of two million. It has a total of 43 fire stations and the area is divided into 5 districts. Northern Fire is a recognised statutory Local Authority deriving its legal status from the Fire and Rescue Services Act 2004 and also the Civil Contingencies Act 2004. As such it has 22 elected Council Members who are appointed each year at Council meetings. Members advocate and vote upon issues such as fire safety, budgets and strategic issues. The number of members are appointed pro rata to

the population numbers in each of the five geographical districts in Northern Fire. Appointments may be extended by voting at Council meetings. As at July 2016 Northern Fire had 13 Labour, 6 Conservative and 3 Liberal Democrat Members. One of the recommendations of the Thomas Review (2016) was to limit or curtail the influence of Council Members on operational matters and business of UK Fire and Rescue Services. It noted that having fewer Council Members might ameliorate realpolitik from decisions on key issues facing communities in areas such as fire prevention or budgetary issues.

Northern Fire's stated ambition is to make the area it serves safer. This is facilitated by four key strategic priorities. The first is to deliver a proactive and sustained fire prevention and protection program. Some £5.9 million of a total budget of £93.5 million for the financial year 2010/11 was spent on fire protection visits and educational programs to enhance fire safety awareness. The second key priority is to provide a fast and effective response service. Thirdly, Northern Fire is ensure diversity within its workforce and provide a safe working environment. The final strategic priority is ensure value for money in the provision of Fire and Rescue Services and manage public resources prudently.

The topography in which Northern Fire operates is mixed and diverse. There are dense urban areas with high-rise flats, industrial warehouses, university buildings and student accomodation. There are also geographically remote areas that comprise of acres of moorland interspersed with abandoned mills and factories. By way of example, Fire Station A serves a sleepy rural community that borders on a vast expanse of open moorland and countryside. The population is relatively affluent with a large number of elderly and retired individuals. The number of fires each year has reduced drastically; in 2010 there were 138 fires whereas in 2015 there were only 58 fires. In contrast Fire Station B is situated in a large city with a substantial population many of whom are students. It will be called out to 120 serious incidents each year, manage fire safety visits to shopping centers and commercial office buildings. In light of the recent terror attacks in Paris, a substantial investment has been made by Northern Fire in training fire fighters to deal with acts of terrorism. Fire station B was actively engaged in training to prepare for acts of terrorism. Red Watch (see below) participated in a 'live burn'

assessment on BA techniques on 24 May 2016; part of that exercise was locating casualties resulting from a terrorist type attack.

5.5 'Red' Watch

Fire fighters operate within a Watch which comprises of between 4 and 10 fire fighters. A Watch will often have been together for several years with the same fire fighters and is essentially a CoP. The fire fighters in any Watch will form strong bonds and allegiances. They eat, sleep and train together for prolonged periods of time whilst on duty. When entering a building a Watch will use a 'buddy system' with one fire fighter checking the breathing and safety apparatus of the other. The 'buddy system' is an example of the close bonds and ties that build up over time between fire fighters; members of a Watch look out for each other and are protective over individual's safety and well-being.

The thesis offers a unique and rare insight into Red Watch via participant observation. Red Watch were located at Longworth Fire Station which was chosen as it is represents an 'average' station in Northern Fire in terms of age, gender and experience. Red Watch were observed between February 2016 and May 2016. In particular, the thesis captures the training undertaken by Red Watch on new BA equipment. The latter is formally referred to as the 'breathing apparatus training assessment' known colloquially as 'BATA.' Fire fighters must pass BATA each year to be deemed competent to fight fires or 'ride the truck' (i.e. drive a fire engine). Northern Fire has made a significant multi-million pound investment in new BA equipment. Previously fire fighters would wear their oxygen tanks and masks on an individual basis. Each oxygen tank contains compressed air and is charged with enough air to last for 33 minutes. The Station Commander in charge at a fire would have a stop watch and whiteboard. She would write the names of each fire fighter down and record manually the time a fire fighter went into a building. The maximum time a fire fighter can remain in a building fighting a fire is 33 minutes and corresponds to the amount of compressed air in an oxygen cylinder. After this time there is no air left in a fire fighter's tank; if the fire fighter remains any longer he or she can die. Mistakes in calculating entry and exit times have been one of the biggest causes of death amongst fire fighters. In serious incidents such as a warehouse or block of flats, twenty or thirty fire

fighters may be deployed at any one time. Accurately calculating compressed air levels and times can be problematic and challenging. The new BA system uses a telemetric device whereby everything is recorded on a large electronic board. The board calculates when a fire fighter enters a building and when she should leave. Just as importantly, and in contrast to the old system, the telemetric board calculates the work rate of fire fighters. If a fire fighter is climbing stairs or rescuing a casualty the telemetric system captures her air depletion rates. A fire fighter attempting a rescue will use much more air than her colleague who may be standing guard over entry to a building. This thesis documents the training undertaken by Red Watch on BATA. In particular, the thesis considers how Red Watch as a CoP shared and transferred tacit knowledge. It also explores barriers and enablers to transfer within Northern Fire.

Red Watch follow policies and procedures stipulated by Northern Fire on a broad range of fire fighting and search and rescue techniques. There has been a shift from a fairly rudimentary approach to fire fighting to a much more technical and scientifically based one. Many fire fighters interviewed during the conduct of this research described colloquially the essence of fire fighting as ‘putting cold o’er hot’. This is a reference to placing cold water on naked flames. However, many fire fighters also noted how different approaches were required for dealing with hazardous materials, factory and commercial premises and undertaking rescues from people trapped in vehicles. The National Operational Guidance (“NOG”) is an overarching framework of best practice for the UK Fire and Rescue Service. It promulgates best practice for operational policies, procedures and training for fire fighters. The NOG has no statutory or legal underpinning; rather it operates to promote best practice amongst front line fire fighters. The tragic loss of four fighters’ lives in attending a fire on 2 November 2007 in a vegetable processing warehouse in Atherstone-on-Stour is apposite. The facts surrounding the circumstances of the fire and the strategy adopted by Incident Commanders in tackling it have huge resonance amongst UK fire fighters. The fire resulted in the first criminal action for manslaughter by gross negligence against Incident Commanders who attended the incident. Ultimately both Incident Commanders were acquitted. Following detailed investigation into the causes of the fire a

number of failings became self-evident. There was a lack of consistency in applying BA procedures and sharing BA information as different BA teams went into the warehouse to tackle the blaze. A key learning point was for crews to adopt a standard methodology in terms of both BA practice and procedure. Here the NOG comes to the fore in standardising BA training and adopting uniform techniques at the point of entry to serious fires. The investigation also noted that the reduction in fire fighters' experience of serious fires heightens the importance of meaningful training to prevent loss of experiential knowledge. Further, very often there was wide discrepancies in how fire fighting policies and procedures were interpreted and applied. The use of the technique of gas cooling where water is sprayed on walls or doors to lower the temperature in buildings was noted to be problematic in application. This is discussed in more detail in the following empirical chapters. Greater clarity on when to use certain techniques and when to depart from them was an important factor for fire services to bear in mind.

5.6 Northern Fire: Management Structure

The upper echelon of management at Northern Fire comprises the Chief Fire Officer ("CFO"), Deputy Chief Fire Officer ("DCO") and Assistant Chief Fire Officer ("ACO"). This managerial triumvirate sets out policy, operational and strategic matters and the general direction of the service. It sits at the very apex of Northern Fire and takes all key operational decisions. Physically the offices for all three posts occupy the top floor of a grand Edwardian villa situated within Fire Service Headquarters.

The DCO, ACO and CFO are effectively a CoP operating at the epicenter of Northern Fire. They work closely together each day running the operational and managerial functions of the fire service. The DCO has a key operational role and ultimately will take key decisions on all policy matters that affect front line fire fighters. The new DCO assumed post on 1st January 2016 and replaced the outgoing DCO who elected to take early retirement. Prior to the new DCO's appointment, there was a handover period of three months during which the outgoing DCO was to transfer both tacit and explicit organisational knowledge on a broad range of operational and policy matters. Both the outgoing and incoming DCO were interviewed and observed during the three-month handover period.

5.7 Cistell and Mobile Data Terminals

Two key operational issues assumed priority during the handover period. The first related to the negotiation and execution of a multi-million pound procurement contract with a French incorporated company referred to as 'Cistell' (a pseudonym). Cistell was (and remains) contracted to install and provide a Mobile Data terminal ("MDT") in each and every fire engine used by Northern Fire. The MDT is analogous to a modern satellite navigation screen used in many motor vehicles. The screen's purpose and function is to provide a printed synopsis of the incident to the fire crew (e.g. a 'house fire'), provide detailed directions (e.g. quickest available route) and some historical or relevant information (e.g. chemicals stored at a school). The implementation of Cistell brings Northern Fire in line with other European fire services and similar software is used by other fire brigades in the United Kingdom.

The outgoing DCO took the decision to agree the contract with Cistell and roll out the new terminal technology to all fire stations in Northern Fire. The implementation has been problematic and poorly received by front line personnel. Fire fighters noted how the MDT was not fit for purpose, gave inaccurate directions and that the software underpinning the system often crashed during emergency call outs. The outgoing DCO ultimately took the decision to invest in the MDT and enter into the contract with Cistell. He had engaged in complex negotiations with key stakeholders in Cistell regarding the computer software used in the MDT and its functionality. Some of the problems with the installation of the new MDT were recorded in writing in key project milestones during the roll out period. Other more tacit and informal agreements were not recorded or written down; during the handover period it was agreed between the outgoing and incoming DCO that there would be a frank disclosure of all the issues regarding the MDT so that the new incoming DCO could resolve these.

5.8 Sale of Surplus Land and Buildings

The second key operational issue revolved around a decision taken by the outgoing DCO to sell the freehold of an unused fire station to a community interest group within Northern Fire's geographical area. The outgoing DCO commenced negotiations to sell the surplus fire station in 2007. The sale was very much driven

by an ideological commitment by the outgoing DCO to sell the station and 'put something back' into the local community. Many negotiations with politicians, stakeholders and community groups were conducted privately. A final sale value of £50,000 was placed on the station by the outgoing DCO. The intention was to agree the disposal before he retired. The sale price was lower than that could be expected on the open market. However, the outgoing DCO was of the view that as the fire station was to be used by charities and community groups there was merit in allowing the sale to proceed.

The incoming DCO adopted a diametrically opposed view to the sale of the surplus station; he felt it was undervalued and that legislation prohibited the sale in any event. The negotiations for Cistell and the sale of the fire station were documented both orally and in writing. The contractual position in relation to the new contract with Cistell was heavily documented. However, some key facets were agreed informally. The negotiations regarding the sale of the surplus fire station were predominantly negotiated tacitly by the outgoing DCO with little articulated in writing. A substantial element of the negotiations revolved around informal meetings and discussions with local Councilors and governmental stakeholder. Obtaining a political consensus to back the sale was something the outgoing DCO had invested a lot of time and energy since 2007.

5.9 Summary

This chapter has explored and discussed Northern Fire. It has set out the geographical area in which Northern Fire operates and its broad topography. The senior management structure has been discussed together with an exploration of some of the key managerial decisions taken both prior to and during the conduct of this research. The changing landscape of the fire service has been laid out. In particular, calls for reform of 'Green' and 'Grey' book terms and conditions of service and the challenges faced by fire services arising from a substantive reduction in the number of real fires attended. The Thomas Review (2016) discussed above has advocated substantive proposals to change how Fire and Rescue Services are both aligned and delivered. Proposals for utilising more retained fire fighters in lieu of 'whole time' fire fighters employed on a full time shift pattern basis have been discussed. The thesis now moves forward to

discuss and explore the empirical findings in relation to each of the primary research questions set out in the first chapter.

Chapter 6: Communities of Practice: Power, participation and trust

6.1 Introduction

This is the first of three empirical chapters which consider knowledge transfer within Northern Fire. This chapter explores the role played by CoP in transferring tacit and explicit knowledge and also their efficacy. The second empirical chapter examines how, and in what circumstances, knowledge is transferred at both an organisational and individual level. The final empirical chapter explores organisational memory and the circumstances in which organisations and individuals both retain and forget skills and knowledge.

This chapter addresses the first primary research question by examining how CoPs facilitate knowledge transfer and in what circumstances. This chapter seeks to make a theoretical contribution to current understanding of CoP on a number of fronts. As discussed in Chapter 2, a review of the extant management literature on CoP reveals a number of theoretical and empirical lacunae. There is a general paucity of empirical studies on how knowledge (both tacit and explicit) is transferred within (and through) CoP (Roberts, 2006; Contu, 2014). Similarly, the impact of power upon knowledge transfer within CoPs remains largely opaque and underexplored. This section arguably makes a unique contribution to understanding the 'how' and 'why' of knowledge transfer situated within (and through) CoPs in the UK Fire and Rescue Service.

From an epistemic perspective a number of anomalies and inconsistencies in existing CoP theory have become apparent. Adopting a Foucauldian notion of power / knowledge, the effect of power relations upon CoPs is arguably profound and rhizomatic. Interviews with fire fighters and senior management revealed that the deployment of power resources can have a malign effect which may impede and frustrate knowledge transfer within CoP. However, in some instances the deployment of managerial power was met with resistance from fire fighters; instead of constraining or impeding knowledge transfer, power became emancipatory and liberating. Participant observation revealed fire fighters within CoP at Northern Fire both simultaneously deployed power and also resisted it.

Often didactic rules or procedures were discarded, or management instruction ignored, for the benefit of the CoP and its members.

This thesis conceptualises fire fighters as thinking professionals. They exercised critical thinking and judgment and drew upon all forms of knowledge (both tacit and explicit) in performance of their duties. As thinking professionals on some occasions power relations were resisted. There was a desire to 'get the job done' in the safest and most effective manner and power could be usurped to achieve this. Alternatively, power relations were often accepted and whilst managerial instruction may have been critically challenged it was ultimately accepted and adhered to.

CoPs are often portrayed as benign, homogeneous structures that maintain equilibrium over time. However, participant observation revealed an inherent tension that arose between LPP as a means of ensuring continuity and stability within CoP and the displacement caused by newcomers becoming more established and replacing 'old timers' (Lave and Wenger, 1991). The empirical data obtained from the study of Northern Fire highlights a number of inconsistencies and anomalies in relation to our understanding of the CoP model. A freeze on recruitment, and the decision to postpone hiring new fire fighters until 2018, requires a careful re-examination of the notion of LPP. Data obtained from participant observations, focus groups and interviews challenge the normative position of the newcomer moving in a linear, centripetal manner from the periphery to core of the CoP. The lived experience of fire fighters within CoP illustrate that LPP can be messy, inchoate and problematic. The absence of probationary fire fighters joining CoP upon completion of their initial training militates against the epistemological bedrock of situated learning facilitated via LPP. From a theoretical standpoint, the notion of LPP is built upon the acquisition of work based skills and technical knowledge from an experienced 'old timer'. The reality at Northern Fire is the very antithesis of this; here the 'old timer' was learning new skills and firefighting techniques from the novice. With just one newly qualified probationer joining an established and busy fire station, rather than a linear centripetal progression from periphery to core the effect was radial. LPP was a two-way process. Exposure to the latest fire-fighting techniques and

praxis meant that experiential knowledge radiated out from newcomer to ‘old timer’ and reverted back through the entire CoP. This often acted as a cue that triggered fire fighters’ collective and individual memory and led to recall and articulation of tacit fire-fighting skills and knowledge.

As discussed in the literature review, the extant literature on how CoP deal with mistakes is sparse (Lave and Wenger, 1991; Roberts, 2006). The CoP model is often portrayed as a harmonious one where members share knowledge and where the activities and practice of the CoP are generally successful. However, organisations can (and do) make mistakes and those mistakes can often be of some magnitude. Here learning from failure and not repeating mistakes is more important than learning from success (Baumard and Starbuck, 2005). This chapter documents how the senior management team as a CoP dealt with mistakes and how they were hidden. It also lays out the use of power to preserve legacy, deflect criticism and ultimately responsibility.

This chapter is structured as follows. Firstly, utilising participant observation of Red Watch, there is a discussion of the routine workings of fire fighters within a CoP. The first section considers the ordinary daily working life of Red Watch and how they interacted as a CoP. There is also a depiction of how power was negotiated, its limits and boundaries and the tensions that arose from it. Secondly, the notion of LPP and how this impacted upon knowledge transfer is discussed and explored. Thirdly, there is an exploration of the exercise of power by senior management acting as a CoP. The interplay between power relations and mistakes are brought out. There is also a discussion of continuity and displacement theory within the senior management team and how this might influence knowledge transfer. This first empirical chapter then draws to a close with a summary and synthesis of the key findings and contributions made.

6.2 Ethnographic Observation – Vignettes from the Field

This section considers power relations amongst front line firefighters and how power was both negotiated and resisted at an everyday fire station. The following ethnographic account is a vignette from participant observation conducted over a period of four months. During this period Red Watch, a CoP of fire fighters based at Longworth Fire Station, were observed during their training and

preparation for formal BA training BA. Fire fighters must pass the BA assessment to be deemed competent and to 'ride the truck'; fire fighters who fail BA are excluded from front line fire-fighting duties and riding in fire engines. Hence it was paramount that all members of Red Watch passed their formal BA training.

The vignette documents how power was deployed and resisted within a CoP. It also seeks to capture the effect such deployment and resistance had upon knowledge and its transfer. Often resistance expressed itself by virtue of fire fighters choosing one form of knowledge over another. This section seeks to make a contribution by extending our understanding of power relations within CoP generally and more particularly in the UK Fire and Rescue Service.

6.3 First Vignette – Longworth Fire Station

Longworth Fire Station is a relatively new fire station and was constructed in 1956. The station is unprepossessing and non-descript with red paint flaking on the outside walls and door bells that do not work. In terms of size it is a medium sized station. Longworth is situated opposite a housing estate and nestled to the side of a large row of shops. The crew consists of 18 fire fighters comprising of 3 Watches made up of 6 fire fighters in each watch. Each watch is denoted a colour and the watch in this vignette is Red Watch.

Ian is the Station Manager who due to budgetary cuts also assumed responsibility for managing a neighbouring station. Ian was assisted by Ryan who had a peripatetic role filling in for Station Managers who were sick or on annual leave. Red Watch is the most experienced watch at Longworth; each fire fighter has over ten years' experience. Red watch comprises of Aaron, James, David, Nick, Brian and Louise. Louise is the only female fire fighter at Longworth and also the newest member of the CoP having transferred nine months ago. She is also the most experienced with 13 years' service at the London Fire Brigade.

6.4 Today's Training Session

Today's training session was to focus on door entry, a specific breathing apparatus technique. The training comprises part of the formal BA assessment in May. Door entry is a compulsory element of probationary fire fighters' training. It deals with a specific practice and procedure to check and assess the safety of

a building before entry. The explicit element of knowledge has a scientific basis; spraying a door with water before entry produces steam which is a reasonable indicator of temperature and location of fire. The tacit element of knowledge derives from experience of fighting real fires. Often fire fighters will look at a building, its location, where smoke is escaping from and the smoke's colour before deciding to enter without following the specific procedure. Ryan, the peripatetic Station Manager, is keen to follow the door entry procedure promulgated by Northern Fire. He is very aware that strictly following procedure is something fire fighters are judged on and need to satisfy to demonstrate competency.

Ryan: There's a specific way of entering a building, it's down in the operating procedures… they're assessed on it and it has to be right.

JB: You mean painting? Seeing if there is excess steam coming off?

Ryan: Yes, looking for signs and seeing if you need to vent the building…I'd rather they back off than jump right in.

Louise: I don't always check…because you can't and sometimes we would go in at LFB (London Fire Brigade).

The session would also cover search and rescue techniques. Two members of the Watch would enact a live training exercise. They would wear their breathing apparatus equipment and blindfolded try to make their way up the training tower to search for a missing person. A dummy weighing 8 stone is hidden in a locker on the third floor of the tower. Ryan explains why the dummy is hidden in a locker. Often children and the elderly hide in cupboards and under beds in a real house fire. I would follow the team with Ryan up the control tower and for the duration of the exercise.

6.5 The Exercise

Ryan sets the scene. In the control tower there is a person unknown left in the building. Louise and Dave are to undertake a search and rescue using correct BA technique and door entry control. Effectively what we have just covered in the previous training seminar but for real. A dummy will be the casualty and it is hidden somewhere in the control tower. Louise and Dave will wear full BA equipment; they will both be blindfolded. In a real incident vision in BA equipment is extremely limited. Fire fighters struggle to see through their visors and have dark, hot conditions to deal with in unfamiliar buildings. Communication is via hand signal and touch; there is no normal radio contact between Louise and Dave for this exercise as it has been switched off. Ryan notes that even though they have been up the control tower on many occasions this is different; they cannot see. They will need to work as a team to search and locate the control tower and bring the casualty to safety.

6.6 Starting Off

Ryan blindfolds both Louise and Dave by placing their thermal fire resistant balaclavas on backwards. Each member of the team needs to get all the BA equipment on quickly. Louise goes first, pulling on her protective suit, then her visor and breathing equipment. Progress is surprisingly fast and fluid; Dave checks all her equipment. Northern Fire introduced a ‘buddy check’ system in 2008. Each member of the watch has a buddy who will check their BA equipment before they go in. It is essential since, if the equipment does not function or the oxygen tank is not connected properly, then fire fighters can die. BA is the bedrock of individual safety. Louise lets off some air from her tank which whistles and puts her thumb up. Dave shouts ‘check’ and lifts his thumb up. The process is then repeated with Louise checking Dave. Louise can’t see anything and the process is executed by Louise patting down Dave’s fire tunic, working her hands over the connections in the oxygen tank and feeling his visor.

Both Louise and Dave are opposite the main door to the Control Tower. Louise starts the door entry procedure by feeling the door carefully but swiftly and trying to locate the handle. Ryan has already removed the handle and the only way to gain access is to insert your fingers into the aperture where the door handle was

and yank backwards. Deftly Louise gets to this point and signals ‘Backdraft’. Dave noted this and stands to Louise’s rear. Louise pulls the door open slightly to vent the building. She signals ‘hold’ and they wait. Just 40 seconds passed on my watch and then they both go in with Louise taking the lead. I follow them both into the Control Tower with Ryan walking to my side. The Control Tower is narrow and dark like the stairwell in a block of flats. Louise is carrying the fire hose with Dave behind her. She starts the ‘stamp and sweep’ exercise on each step. Progress is steady but slow as they make their way up the stairs. As they reach the first landing Louise encounters boxes, magazine and debris deliberately left there. Louise stamps and sweeps all the objects over the stairwell and pushes ahead.

6.7 Through the Stairwell

As Dave and Louise reach the top of the stairwell on the first floor they come across another door. This time Louise simply flings the door back and enters with Dave behind; the backdraft and venting procedure has been totally disregarded. Louise signals ‘check left’ and they split. Dave goes to the left and commences searching for the missing person. His progress is slow and he runs his gloved hands over furniture, beds and a sofa. All the items are left deliberately overturned and the room is in a mess. Louise is in the right of the building and I follow her as she makes her way across weaving from left to right. Nothing is there and Louise signals ‘Cross check’ with each person rechecking the areas the other has covered. I can see that they are tiring. They cannot see anything at all, the oxygen tanks and equipment are heavy and they are being assessed. Dave raises his thumb up to signal he has checked and there is nothing there. Louise and Dave make their way to the second floor just as before.

Louise is guiding the hose reel and unwinding it as she goes along. The reel, in Hansel and Gretel style, acts as a guide; it helps them locate their way out of the building and also put out the fire once it has been located. The doors swing back on the hose which is problematic as the pressure from the door resting on the hose can affect the strength of the water jet. This is a common problem for fire fighters; getting the hose stuck or losing vital pressure on the water jet and this

has claimed lives at Northern Fire. Ryan advocated following procedure and jamming the doors with wedges. This was disregarded.

Louise continues with the stamp and sweep technique and they make their way to the second floor of the Control Tower. Louise follows the correct door entry procedures this time and opens the door slightly to ensure a proper vent. Louise signals ‘Take right’ and this time Dave searches from the right and Louise from the left. I follow them into two narrow rooms that are full of old fireman’s equipment lockers. The lockers rattle and bang as Dave and Louise feel their way through each locker. Dave shouts ‘casualty found’ over his tannoy and Louise goes across to help. Dave starts to pull and heave at the dummy moving backwards with Louise leading the way. He then changes stance and heaves the dummy forwards. This is the pressure point of the exercise.

6.8 Casualty Found

Once the casualty has been found the focus is on getting the casualty to safety and out of the building as quickly as possible. Seconds and minutes count as a casualty in a real incident may be suffering from smoke inhalation or serious burns. Louise starts to speed up and in doing so hits the wall. Louise thinks the wall is actually the door and as she feels her way over the wall an old sign and painting came crashing down. Eventually she spots the actual door they came in by, but several minutes have been lost. They push on with Louise driving and guiding forward and Dave following dragging the dummy backwards.

The exit downstairs is swifter than the entry with Louise leading and maintaining control of the hose. As they make their way down to the second stairwell the hose is stuck. The hose has become jammed in the door and won’t move. Dave senses something is wrong and crashes into Louise by accident pushing her forward. Louise signals ‘Stop’ and Dave remains stationary whilst Louise tries to free the hose from the door. She simply cannot get the hose free and motions to Dave to move forward. They both make their way to the bottom of the stairs and out back into the engine room. Ryan follows and asks Aaron how much air they both have left in their tanks. Aaron confirms that Louise has 127 bars and Dave 136. Effectively both David and Louise had just 9 more minutes left before they would have had to leave the building and before another two fire fighters would have

been deployed to continue with the exercise. The formal debrief reveals the following exchange.

> Ryan: You didn't wedge the doors and you didn't follow the backdraft procedure.
>
> Louise: I couldn't as we wanted to get the casualty out.
>
> Dave: The door got stuck and I couldn't find my way out.
>
> Louise: You mean where did it all go wrong?
>
> Dave: Something like that.

("Real tension and annoyance on what looks like a successful exercise. Real panic over getting the hose reel stuck. Casualty found but the correct procedure has been breached") (Ethnographic field-notes, March 2016)

6.9 First Vignette: Analysis and Discussion

Participant observation of Red Watch during their BA training revealed how power relations permeated within (and through) CoP. Moreover, the deployment, negotiation and resistance of power impacted upon the CoP and how knowledge and skills were transferred within it. Rather than members always adhering to management instruction and didactic rules of procedure, these were sometimes ignored and disregarded.

Upon commencement of the training exercise it was made clear by Ryan that the correct door entry procedure must be adhered to. As a peripatetic manager, Ryan's performance is judged upon how well Red Watch perform at their formal BA assessment. If the crew are deemed not competent it has repercussions operationally and reputationally. Ryan would not have sufficient fire fighters to attend to emergency call outs and his ability as a manager and trainer would be called into question. Here power was deployed to ensure compliance and the CoP used a means of both reifying and ensuring managerial instruction.

At the start of the training exercise, Louise expressed discomfort with having to follow the door entry procedure didactically and conform with the operating procedure. There is an inherent tension between the realities of doing the job and meeting managerial expectations. The impact of the latter upon knowledge transfer was apparent. Ethnographic field-notes taken during participant observations of Red Watch noted how they were visibly annoyed and irritated by some managerial rules and procedures. This sometimes compromised the transfer and retention of information. Ryan was keen for the explicit knowledge enunciated in Northern Fire's entry procedures to be followed whereas Louise relied upon her own tacit experiential knowledge in assessing the situation and deciding whether to follow or disregard the procedure. Here power relations permeated the praxis of the CoP. There was a trade-off between following the door entry procedure at the start of the exercise but disregarding it later on.

From Ryan's perspective if everyone had followed the BA procedure sufficiently to pass the formal assessment then he would be viewed as a competent manager. From the fire fighters' perspectives there is a tension between complying with Ryan's instruction and their own experience of deviating from policy to get the job done. This was prevalent during all the participant observations of Red Watch leading up to their formal BA assessment on 24 May 2016. During a training session on 7 May 2016 Aaron assumed control of the BA telemetry board for the first time. As discussed in Chapter 5 the telemetry board is a large rectangular computerised board that calculates fire fighters' compressed air levels. It also calculates when fire fighters need to leave a building due to lack of air and their individual work rate. Aaron struggled with the computer software and communicating with the two fire fighters who had entered a simulated fire in a training building. Ethnographic field-notes noted how Aaron tried to override the software to correct his mistakes. However, this proved unsuccessful and Aaron simply abandoned using the telemetry board and calculated air levels using the old system.

Aaron explained during the debrief that his main concern was his colleagues' safety and getting a successful result. In this observation the exercise was entering a building from roof level and rescuing a casualty hidden on the first

floor. Power relations deployed by Ian, Red Watch's Station Manager, were resisted and the BA policy to use the new technology was departed from. Aaron's objective was to achieve the aim of the training exercise and he was willing to resist managerial instruction to do so. A common and recurring theme that arose from participant observation was the tension between formal rules and collective experiences. There was an acceptance by Ian of fire fighters doing enough to pass the formal BA assessment whilst also departing from rules or procedures to achieve a successful outcome.

Mastery of tasks and being viewed within the CoP as a proficient and able fire fighter was of paramount importance. So too was the role of checking and looking out for your partner. Louise carefully checked Dave's equipment, tunic and air before entering; she also held him back from rushing into the control tower. Power deployed to comply with procedure was accepted so far as it related to the safety of a member of the CoP or a swift rescue; power relations to simply implement managerial instruction were resisted by the CoP where it was felt these were unnecessary or restrictive. There was a tension between organisational knowledge in the form of policies and procedures promulgated by Northern Fire and the tacit knowledge possessed within the CoP. Rather than this being viewed as conflict arising between 'expert' and 'local' knowledge within an organisation, it was ultimately the CoP that made the final decision as to which was preferred. This was demonstrated by Louise who decided to forego wedging each door and following the venting procedure as she made her way from the second to the third floor.

Equally, the decision to abandon the hose reel and drag the casualty to safety was in itself an expression and articulation of power. It was also symbolic of the primacy of mastery over a task (successful rescue) and being judged by the CoP as a skilful practitioner. Participant observations of Red Watch during their BA training noted how being seen as competent and proficient as a fire fighter by other members of the CoP was hugely important. The members of Red Watch both individually and collectively noted how when they went into a burning building they were on their own and had to look out for each other. Being seen as competent, skilled and trustworthy by members of the CoP was more

important than managements' perspectives of them. Aaron and Louise noted how promotion was not important to them; what mattered was their relationship as a Watch. Disagreements with Station Managers such as Ian and Ryan were a common occurrence. Members of Red Watch would discuss their own experiences of dealing with house fires or rescues and be critical of how some training sessions were artificial and divorced from practical reality. Power relations to follow procedures were adhered to so as to pass the BA assessment. However, power was often resisted and contested once this had been achieved. Louise was the newest member of the CoP but also the most experienced; a failure to locate and rescue the dummy would have compromised her standing within Red Watch. Louise was a newcomer into the CoP but a newcomer with considerable experience. Failure during the training exercise would have been viewed by other members of the CoP as lack of competence. Louise was keen to be successful in locating the dummy and achieving a successful search and rescue. There was a nuanced deployment of power relations as between Ryan and the CoP. For Ryan the exercise was not successful as although the casualty has been found and rescued the correct procedure had not been followed. If this were the actual BA assessment, a training need on following procedure would have been recorded against Dave and Louise. In a Foucauldian sense this would amount to a capillary intervention; an expression of power at its terminal point. For Dave and Louise they would have passed the assessment but would have to undergo further training within the next twelve months on door entry technique.

Focus group interviews at all 12 stations noted the tension between passing formal assessments like BA and being deemed competent and the actual reality of the job.

An element of 'game playing' evolved whereby fire fighters would follow the rules strictly to pass core assessments. However, once assessments had been passed fire fighters would often be guided by the experiences of their own CoP. For some fire fighters having a training need registered against them was viewed as an occupational hazard, almost an irrelevance. Indeed, Aaron noted how some fire fighters perceived training needs as an expression of standing up to management. Fire fighters in Aaron's view knew best and for some colleagues a

training need represented this. For Dave and Louise power was exercised, deployed and acquiesced to in a complex wave of power relations. Here the mastery of skill and demonstration of competence took precedence. However, power deployed by Ian and Ryan was respected and very often adhered to. The issue was when to resist power (not wedging doors or using cooling techniques) and when to comply (buddy checks and cross checking to find a casualty).

This thesis theorises fire fighters as thinking professionals who exercised critical judgment and perspectives and did not follow instructions blindly. When power was deployed to comply with instruction this was often challenged, debated and discussed within CoPs. Where policies or procedures were discarded or only partially followed there was often good reason for this. Fire fighters acted as professionals who wanted to get the job done and achieve a successful outcome. Louise and Aaron were more concerned with locating the dummy and dragging it to safety then wedging doors or saving hose reel. The notion of acting professionally and challenging normative rules or procedures occurred during the entire period of participant observation which culminated in Red Watch's formal BA assessment on 24 May 2016.

6.10 Legitimate Peripheral Participation

This section moves forward to discuss LPP and its effect upon knowledge transfer. Lave and Wenger's (1991) account of situated learning is anchored epistemologically and practically with the notion of LPP. Here the novice learns from the skilful and experienced 'old timer' and moves in a centripetal manner from the periphery to the core of a CoP. This is done by a process of almost organisational and work based osmosis; observing, watching and learning from narrative and storytelling (Orr, 1996). As a result of this, as novices become more involved and gain experience they also acquire more power. The greater the level of LPP the more likely the newcomer, moving from periphery to core of the CoP, will be more powerful. Conversely, exclusion from LPP is disempowering with the novice remaining unable to progress further.

However, participant observation of fire fighters working at stations reveals a theoretical lacuna at the very heart of LPP. A freeze on the recruitment of new trainee fire fighters meant that entry by the novice into an existing CoP simply did

not occur into the vast majority of stations at Northern Fire. Of the 12 stations where focus groups were conducted only one station had a probationary fire fighter. The ability to transfer skills and knowledge by more senior and experienced fire fighters was therefore negated from the start. The 'old timers' in Northern Fire did not have a novice to hand down and convey experiential knowledge or skills. The very modality of LPP as a mechanism for situated learning was compromised. Whilst Lave and Wenger (1991) stress the importance of theorising LPP holistically and not in an atomistic way, both participation and peripherality were effectively abnegated.

The introduction of a probationer or newcomer also witnesses a shift in the equilibrium of power within the CoP. Rather than the 'old timer' having power, the newcomer also has power. The latest fire fighting techniques and skills straight from a thirteen week training course has its own purchase and currency. Newcomers are viewed as a valuable commodity, a chance to upskill, improve praxis and rejuvenate the CoP. This reverses stagnation and decay within CoP and the concomitant erosion of both tacit and explicit knowledge. LPP expressed itself as a two-way process.

Participant observation at Brinkworth fire station situated in a sleepy semi-rural area is apposite. Here all of the six front line firefighters were aged 55 or over. Brinkworth has not had a new recruit seconded at the station since 2009. The absence of a probationary fire fighter had a negative impact upon on the station.

> From the old time now it is something that has been missing for about seven years, we haven't recruited. So not having that on station 'cos you have a vested interest in bringing these guys up to standard in making sure that they know and they can benefit from your experience, now that doesn't happen on a whole time station so there's got to be a detriment to that.
>
> (Station Manager, Male, 27 years' experience)

The above fire fighter noted how his station had not had a new recruit in seven years. This resulted in a stagnation of the CoP and an inability to pass on skills

and knowledge to novices. Whole time stations are staffed solely by their own full time fire fighters and do not employ anyone on a part time basis. This exacerbated the stagnation of the CoP at Brinkworth. Fire fighters at Brinkworth recognised the utility and purchase of having a new recruit or probationer joining them. A novice entering the CoP resulted in the more experienced 'old timer' revisiting core skills such as erecting ladders, reeling out houses and effecting search and rescues. Probationers fresh from completing their compulsory training were able to impart the latest fire fighting techniques. This often acted as a cue and catalyst for deeply embedded tacit knowledge and enabled some recall and articulation of tacit skills (Nonaka and Takeuchi, 1991). Here the presence of a probationer was unifying for a Watch with fire fighters collaborating on shared tasks, encouraging 'old timers' to reflect on practice and learn new techniques from the probationer.

Central to the notion of LPP is the construction of meaning and identity by members of the CoP; via participation (sharing everday work praxis) and reification (giving form and substance to experience) (Wenger, 1998).

> I mean for me, for me personally, what's been good on this station is that when people have retired or left for whatever reason, we have always tried to recruit. So a few year ago had this…young blood came in and it were like, to do the basic core skills, come back, got an NVQ to do and get them through it. So for me personally to sit down with somebody and find out what they have been taught and what they don't know and then you can build.
>
> (Fire fighter, Male, 14 years' experience)

The above fire fighter noted how important it was to have new recruits. There was a process of the 'old timer' sharing knowledge with novices who in turn shared new fire fighting praxis and techniques. This created a virtuous circle of sharing knowledge, constructing meaning and identity and also a cue for the recall of deeply embedded tacit knowledge and skills.

Rather than LPP being centripetal and bilateral with the novice acquiring skills and knowledge from the 'old timer', the reality of LPP was very different. Interestingly, the 'old timer' acquired skills and knowledge from the novice in a unilateral and radial motion emanating from core to periphery and not vice-versa. In addition, established members of the CoP needed to reinterpret and represent their own knowledge in a way that was meaningful and useful to new recruits. Part of that process was identifying gaps in knowledge and also training needs.

> And then 'cos there's more people coming in, then for me It is knowledge, skill for me… it's like 'oh sh*t, I forgot about that.' So he's taught me something whilst I'm telling him something. Or we both don't' now, right let's get it up on there then [points to training yard]
>
> (Fire fighter, Male, 16 years' experience)

The above fire fighter noted how novices taught 'old timers' skills and fire fighting techniques that they had either forgotten or did not possess in the first instance. Here the model of LPP was radial and not centripetal; it was the 'old timer' learning from the novice as well as the novice learning from the 'old timer'. Moreover, the introduction of a probationer for a six month secondment into the CoP at Brinkworth had a profound effect upon it. Participant observation revealed that the novice acted as a cue or reminder that facilitated recall of deeply embedded tacit knowledge and skills (Nonaka and Takeuchi, 1991). During quiet periods and downtime more experienced fire fighters would recall house fires, search and rescue techniques and topography. This was imparted via narrative and aphorism to the probationer; however the very presence of the probationer acted as a catalyst that rejuvenated the CoP and aided articulation of experiential knowledge.

> When people complain about 'oh no a new recruit and that' I think it is brilliant. It is because ***it's making you***.
>
> (Fire fighter, Male, 12 years' experience, emphasis added)

The above fire fighter noted how some members of the CoP had reservations about new recruits. However, he felt that the introduction of a novice was positive and benefitted the CoP. From his perspective it 'made him' and resulted in him being challenged on his own core competencies and abilities whilst also having the opportunity to acquire new knowledge. LPP as a mechanism for sharing knowledge was not linear or centripetal, rather it was more of a radial process. 'Old timers' often learnt a great deal from novices. It also resulted in 'old timers' sharpening their core skills and extending courtesy to new members of the CoP.

> I better know that because I'm going to look a bit daft if he knows something and you do make more of an effort going out and drilling more and whatever else…it is like a breath of fresh air.
>
> (Fire fighter, Male, 16 years' experience)

The above fire fighter had some 16 years' experience. Yet the introduction of a novice resulted in him refreshing core skills to avoid appearing lacking in knowledge. Equally, the novice was extended courtesy and effort was expended on spending time with novices to assimilate them into the CoP. More time was spent on training together (drilling) and this facilitated the transfer of tacit knowledge and skills from novice to 'old timer' and vice versa.

6.11 Power Relations

This section moves forward to discuss how power was negotiated and deployed by the Senior Management team and its effect upon knowledge transfer. It also sets out how the Senior Management Team as a CoP dealt with mistakes and operational errors. This thesis uses a Foucauldian lens to understand power and departs from the notion of power being held 'over' one person or thing. Within this CoP, at the very apex of Northern Fire, a complex and nuanced deployment of power relations by individuals who themselves wielded significant power was readily apparent.

As discussed in the previous contextual chapter, the DCO, ACO and CFO operate at the very top of Northern Fire. They are responsible for the day-to-day running of the service and take all key commercial decisions. Two key operational

decisions are pertinent here. These were discussed in the previous contextual chapter but are worthy of a brief recap. The first decision related to the decision by the retiring DCO to sell surplus land and buildings to a community interest group. The sale was much criticised for undervaluing the land and ignoring the complex regulatory rules around land disposals. However, the sale had been negotiated over many years by the outgoing DCO and was perceived by him as part of his legacy. The second decision related to the retiring and outgoing DCO's investment in a multi-million pound contract with Cistell. The Cistell contract involved the installation of Mobile Data Terminals ("MDT"") in all fire engines. The MDT proved problematic and ineffective from the start. The purpose of the MDT was to give fire fighters accurate directions, information on buildings, chemicals and other technical information pertinent to fire-fighting. However, it did not work properly and provided inaccurate information. Fire fighters became frustrated and felt that they could not rely upon the new MDT system.

> But the system is so slow, when you go on the maps to find where the fire is and where the hydrants are, the MDT just crashes and you end up not using it, going back onto the radios. And like he says, the lads in the back are on their phones trying to find where we're going or on the A to Z.
>
> (Fire fighter, Male, 9 years' experience)

Here the above fire fighter noted how the new system often crashed in transit and was unreliable. Fire fighters in the back of the fire engine would consult their mobile telephones or maps to obtain locations or use their radios for help.

The effect of the deployment of power on knowledge transfer within the CoP was sometimes limited. In some circumstances power did not affect knowledge transfer; on other occasions it did. The explicit knowledge regarding the contractual negotiations with Cistell were relatively easily discernible by the incoming DCO. This flowed from negotiations being contractual with key milestones and problems with Cistell being noted by lawyers and set out in Northern Fire's project management systems.

> I think it manifests in project decisions and they are what they are and they're fine. They're reasonably well evidenced, but project management methodology doesn't tend to capture thoughts, feelings in anyway really. And I don't think it naturally flows out of [names outgoing DCO] to talk about that.
>
> (Incoming DCO, Male, 28 years' experience)

The incoming DCO noted how key project milestones were clear and easy to follow. The negotiations with Cistell were documented within the project management of the contract. This was largely explicit, codified knowledge. However, the tacit knowledge formulated from discussions and informal meetings between the outgoing DCO and Cistell were opaque. The outgoing DCO had had numerous meetings with key figures at Cistell to discuss how shortcomings in the MDT software could be improved or fixed. These meetings were informal and undocumented. Tacit consent to modifications to the main contract and relationships built up around shared understandings between the outgoing DCO and Cistell were neither shared or articulated within the CoP. Nor were they formally articulated or written down. The outgoing DCO saw the project as his; power was used as a mechanism not to divulge some of the important tacit and background knowledge regarding the contract.

> Some of it he doesn't want to let out. Some of it just isn't going to come out…you know the more tacit stuff, we're pretty much down the road at the moment, a well documented road, a legal road. So to some extent judgment is being removed.
>
> (Incoming DCO, Male, 28 years' experience)

The incoming DCO noted above how some of the tacit knowledge relating to the contract was just not going to be shared by the outgoing DCO. There was a reluctance by the outgoing DCO to share this; especially those parts he did not want to 'let out.' Adopting a Foucauldian notion of power relations, power was deployed by the outgoing DCO not to transfer his tacit knowledge regarding the

contract. There was an insistence by the outgoing DCO that the new MDT system would ultimately work.

> [Outgoing DCO's] line on it all the way through was we're gonna make it work, we're gonna make it work, it'll be good. After the bad January that we had, it's apparent to the whole organisation that this thing isn't working.
>
> (Incoming DCO, Male, 28 years' experience)

The outgoing DCO was not prepared to communicate any information relating to the failures or faults in the new Cistell system to front line fire fighters. Here power relations within the CoP influenced the transfer of explicit knowledge to fire fighters in a negative manner. The efficacy of the simple 'transmitter / receiver' method of knowledge transfer was abnegated by a conscious decision to withhold information regarding the new system by the outgoing DCO (Szunlanski, 1996). Notwithstanding the fact that everyone in Northern Fire knew the Cistell system was not working, the outgoing DCO took a conscious decision not to share any updates or briefing notes on the system. Fire fighters were left to simply muddle through.

> Um, [names outgoing DCO's] fairly closed, again, a continuum of both. Um, [names outgoing DCO's] line, there wasn't a line to the organisation because the only news that he could possibly give was bad news really, so he chose not to give it. Um, I got involved in a number of visits to stations where it was immediately apparent that they knew it wasn't working, we know it wasn't working.
>
> (Incoming DCO, Male, 28 years' experience)

The outgoing DCO was keen to preserve his legacy and deployed power in his capacity as DCO to withhold some of the tacit knowledge surrounding the negotiation and execution of the Cistell contract. This resulted in a complete lack of communication with front line fire fighters about the problems with Cistell and what was going to be done to ameliorate the situation. As the incoming DCO

noted above, because only bad news could be conveyed a decision was taken by the outgoing DCO to simply not communicate. Yet everyone in the senior management team as a CoP knew Cistell was not working; the incoming DCO knew this too from his station visits. Here the outgoing DCO used his power within the senior management team as a CoP to stop the transfer of explicit knowledge.

A conscious decision to withhold tacit understanding regarding the contract also acted as a barrier to transfer; the outgoing DCO deployed power to protect both his legacy and reputation within the service.

> It was just my methodology of achieving an outcome by being quite, Machiavellian in a way.
>
> (Outgoing DCO, Male, 29 years' experience)

Here the outgoing DCO noted how he had adopted a specific 'methodology' regarding the Cistell contract on what to discuss or divulge and what information to withhold. It was openly admitted by the outgoing DCO that he had been quite manipulative. It was of paramount importance to protect legacy and not be open to criticism for investing heavily in a new system that did not work and was not fit for purpose.

> Because I want to leave a legacy, a positive legacy. And I don't want certainly the last six or seven years of work to be changed without someone having good reason to change.
>
> (Outgoing DCO, Male, 29 years' experience)

The outgoing DCO was keen to preserve his legacy and avoid any criticism for having failed to negotiate and implement the Cistell contract successfully. This sentiment was echoed by the incoming DCO.

> It would be an absolute disaster in [outgoing DCO's] mind if we ended up

> litigating and buying a new system. It would be a massive failure. The whole symbolism of that.
>
> (Incoming DCO, Male, 28 years' experience)

The incoming DCO noted above how litigation over the Cistell contract would have been perceived as symbolic of failure by the outgoing DCO. Hence the decision to withhold certain elements of tacit knowledge and deploy power to block communications to front line staff regarding the MDT and its operational issues.

The negotiation of the Cistell contract involved a number of mistakes that were made by the outgoing DCO. These primarily related to deficiencies in the software when the MDT was installed on fire engines and the functionality of the actual system. However, these mistakes were in many ways swept under the carpet by the CoP as a whole. The incoming DCO knew the deficiencies in the MDT and these were apparent from his station visits. However, he took a conscious decision to let things run their course. The outgoing DCO was not willing to take any blame for poor initial negotiations with Cistell or faults that arose in the new MDT system. The outgoing DCO noted in interviews how historically investments in new technology frequently did not live up to expectations. There was an acknowledgement that when mistakes were made they were often repeated.

> But in other areas we are still evolving. I think one of the big areas is a lot of that experiential learning and why we did things in certain ways. One thing that I've seen is the circle going around a couple of times and thinking 'we are making the same mistake again.'
>
> (Outgoing DCO, Male, 29 years' experience)

The outgoing DCO noted above a circularity in poor decisions and how they were very often repeated in different guises. There had been an acceptance that Northern Fire's management decisions were 'evolving.' However, the outgoing DCO focused upon past successes and not failures. In the run up to his retirement and replacement, the outgoing DCO reflected upon his key managerial decisions.

> The very good and the very, very bad… It might be that more than half are actually more than adequate but the middle range you tend not to really remember and if there are more very bad than very good it almost slants your view on things doesn't it? When actually the majority were actually pretty good.
>
> (Outgoing DCO, Male, 29 years' experience)

The outgoing DCO noted above that 'very bad' decisions could slant perspective on 'good ones.' Rather than learning from mistakes, the above exchange noted the favouring of averages. If the majority of managerial decisions were reasonably good then this made up for any mistakes made. The importance of learning from past mistakes and trying not to repeat them was not seen as significant. Nor was this perceived as being important to the outgoing DCO; rather the focus was on having a good overall average of managerial decisions that were adequate.

The effect of power relations exercised between members of a CoP who themselves are influential and powerful occupying senior key positions is an interesting phenomena. To a certain extent the power exercised by the outgoing DCO had a minimal effect. The decision not to share tacit knowledge and explain and articulate some of the more nuanced contractual negotiations became less important. However, the sale of land and buildings at Howarth was resisted by the incoming DCO. Power was deployed by him to stop the sale.

> I cannot justify it, I cannot justify it to the public, I cannot justify it to the politicians. We have to do things in different and a very tangible sense of 'that was then, you know.' So I'm not overly concerned about the stuff that's in [outgoing DCO's] head, because it is getting irrelevant now.
>
> (Incoming DCO, Male, 28 years' experience)

The incoming DCO noted how he felt the sale could not be justified and that a different approach was required. Power deployed by the outgoing DCO was met

with resistance and the deployment of an equal power by the incoming DCO. External scrutiny by politicians and Local Councillors on how resources were being spent on the contract added an additional and more nuanced set of power relations. Whilst power is alluded to by Lave and Wenger (1991) its epistemic borders and the consequences of resistance and deployment are arguably nascent and underdeveloped. Power is often acquired in parallel with LPP as the novice acquires skills and knowledge and becomes accepted within the CoP. However, power relations in this CoP were conferred by virtue of rank and status with notions of legitimacy and peripherality becoming otiose and assuming far less importance.

6.12 Continuity and Displacement

The discussion now moves on to consider Lave and Wenger's theory of continuity and displacement within the Senior Management team acting as a CoP. The latter notes an inherent tension between LPP as a means of securing stability within CoP and the effects of displacement as old-timers are displaced by newcomers. Relationships both within (and through) CoP change just as power relationships change and develop over time (Lave and Wenger, 1991).

Data obtained from participant observations and focus group interviews challenges the normative and arguably prelapsarian organisational view of CoP being benign, stable and homogeneous. Rather than issues revolving around power and conflict being resolved amicably with common ground found, the incoming DCO in displacing the outgoing DCO had a profound impact upon the existing CoP. There was conflict and tension surrounding both the Cistell contract and disposal of land. The values of the 'old' CoP were very different to the values of the 'new' CoP. A struggle developed as the outgoing DCO tried to maintain the CoP as it was, preserve legacy and defend key decisions he had made. The incoming DCO in displacing the outgoing DCO was not concerned with preserving legacy or defending poor commercial decisions. Conflict arose from what was ostensibly polarity in terms of the direction of the 'new' CoP and making a break with the past.

> But the conflict which goes on in there is obviously, [names outgoing DCO] has worked his career and particularly the last few years to do certain things to what's in his head. And a lot of what he's trying to do now is to put them over the line beyond all doubt.
>
> (Incoming DCO, Male, 28 years' experience)

The incoming DCO noted above the conflict that arose from displacement within the CoP. The outgoing DCO wanted to get decisions 'over the line' before his replacement. During the hand-over period the structure and nature of the CoP at the apex of Northern Fire completely changed. The outgoing DCO was replaced by a new, younger incoming DCO introduced into the CoP during a three-month handover period. The existing CoP, rather than being homogenous and stable, entered a period of volatility and uncertainty. The incoming DCO had to quickly establish a rapport and understanding with the CFO who had worked with the outgoing DCO for many years. This resulted in a fundamental change to the CoP, its direction and undertaking. Part of that process was a simultaneous deconstruction and reconstruction of the very fabric of the CoP. The latter confutes the somewhat Elysian notion of acting out and resolving differences and coming to terms with each other posited by Lave and Wenger (1991).

Continuity and displacement were not worked out amicably. The incoming DCO would not agree to the sale of the surplus fire station and made that clear to the outgoing DCO. This created tension and discord. Whilst continuity and displacement within CoP are perhaps obviously affected by power relations the scope and parameters of such an effect are not explored further in most of the extant literature (Contu, 2014). Moreover, the effect of continuity and displacement upon LPP remains uncertain.

> Yeah. I wouldn't say it feels out of control, I just feel not as informed as I should be on some things as I step into the new role. Simon (acting CFO) and I have got to be like that (crosses one finger over the other) and inseparable. And [outgoing DCO] and Simon obviously are like that, but that's about to be busted apart, its putting it back together.

(Incoming DCO, Male, 28 years' experience)

The outgoing DCO noted above how he felt the changes to the CoP had become a little out of control. The existing relationship between the outgoing DCO and the CFO was a very close one. The incoming DCO in displacing the outgoing DCO needed to establish a close working relationship and trust with the CFO. The 'busting apart' that resulted from displacement and the 'putting it back together' that resulted from continuity within the 'new' CoP were problematic and messy. During the last month of the hand over period the incoming DCO assumed the symbolic position of Chair at Management Board meetings. These are attended by the CFO, DCO and ACO together with elected Councilors and Group Station Managers. At the inaugural meeting for the incoming DCO, the majority of questions on both Cistell and the sale of the surplus station were directed at the Outgoing DCO. There seemed to be a desire to maintain the status quo and ignore the fact that the constitution of the CoP had changed and the direction on key decisions had also changed. A desire to maintain equilibrium even when change was obvious and irreversible meant that continuity was clung on to.

> But [outgoing DCO] sat in with it as well. And I've not had anything to do with it but I've not sat in the Chair and it was really odd that so many people in the room spoke to [names outgoing DCO] and not to me as the Chair… But the dynamic in the room Monday afternoon was really, really odd. And a couple of people commented to me separately afterwards.
>
> (Incoming DCO, Male, 28 years' experience)

The incoming DCO noted the peculiarity at the Management Board meeting in not being recognised as its Chair and where the incumbent outgoing DCO was being addressed on key operational decisions. This is suggestive of a desire to maintain the status quo and ignore both the challenges and changes to the CoP that had arisen from continuity and displacement of its members.

6.13 Summary

This chapter has considered knowledge transfer within (and though) CoP in the UK Fire and Rescue Service. It has also considered how power relations effect knowledge transfer and the efficacy of LPP as a mechanism for transfer. The chapter seeks to make a contribution on a number of fronts. From an epistemic perspective what we know about power dynamics within CoP is limited; more particularly how power relations effect knowledge transfer within CoP is arguably opaque and warrants further investigation. Ontologically CoP as 'containers' of embedded knowledge and technical know-how at an individual and group level have utilised situated learning and the notion of LPP as a means of transfer.

Lave and Wenger's (1991) paradigmatical CoP model of which LPP is a central tenet is arguably a prelapsarian notion of work based and experiential learning. Here the CoP acts as both conduit and container of knowledge. The novice participates in often mundane tasks before being delegated with more complex ones as knowledge is obtained from an 'old timer' and meaning and shape are attributed to every day praxis. However, the reality in CoP at Northern Fire confutes this. A freeze on recruitment and budgetary constraints meant that only one fire station had a probationer. A central tenet of LPP, moving from periphery to core and gaining skills and knowledge from an 'old timer', was replaced with a more radial effect. Here the 'old timer' learnt from the newcomer and not always vice-versa. Learning was a two-way process. The presence of a probationer acted as a cue for the recall of tacit skills and experiential knowledge deeply embedded within the CoP. Power within the CoP was not conferred by a linear or centripetal process of LPP. Rather the probationer or newcomer paradoxically wielded more power than the 'old timer'; the latest fire training techniques and knowledge had purchase within the CoP and as such was viewed as a rare and valuable commodity.

This thesis has adopted a Foucauldian construct of power relations to theorise and explain the deployment of power, its impact on CoP and also knowledge transfer. Power is often theorised as 'power over' someone or a thing to be possessed and is often overlooked within the normative literature. Power relations within Northern Fire were complex, fluid and contested. The deployment

of power within the CoP at the very apex of Northern Fire illustrates how power deployed by senior figures was met with equal resistance. The effect of power upon knowledge transfer became negatory as tacit understandings by the outgoing DCO became irrelevant as the CoP was reformed and reconstituted.

The notion of continuity and displacement posited by Lave and Wenger is also questioned. Rather than the CoP being a benign and stable community it became vulnerable and unstable. LPP as a means of ensuring stability during a period of change assumed less importance as power relations within the CoP played out. The introduction of the new incoming DCO into the CoP was a messy, problematic and inchoate process. Lave and Wenger's idea of continuity-displacement ultimately resulting in a friendly resolution of differences and establishing of common ground was not made out.

Chapter 7: Explicit Knowledge Transfer: Facilitating Transfer and Exchange

7.1 Introduction

Chapter 6 considered the transfer of knowledge situated within (and through) CoPs. This chapter moves forward to discuss the practice based perspective view of knowledge and how explicit knowledge was transferred in Northern Fire. In doing so it seeks to address the second research question, namely what are the barriers and enablers to the transfer of explicit knowledge? Chapter 5 noted how Northern Fire relied upon the transmitter / receiver mechanism for transferring explicit knowledge. Here knowledge was transferred via email, EMOC's and formal operational procedures. Ontologically Northern Fire perceived explicit knowledge as an object that could be successfully transferred from management to operational fire fighters without diminution or dilution. Knowledge transfer was not perceived as an iterative or sequential process. Rather explicit knowledge was analogous to a football; the ball could be passed backwards and forwards instantaneously with the locus of control and transfer vesting in Northern Fire.

From an epistemic perspective, Northern Fire did not privilege one form of knowledge over another (e.g. tacit knowledge being superior to explicit) and nor did it view knowledge in binary terms (e.g. tacit and / or explicit). Knowledge transfer was theorised via a lens of risk and audit; knowledge transfer was used as a mechanism to prove policies and procedures had been dispatched and complied with.

A number of lacunae in the efficacy of the sender / receiver model are apparent from the data. A barrier to transfer of formal, didactic knowledge was the absence of a tacit component. Data from this study suggests that the transfer of explicit codified knowledge was dependent upon its tacit component. In circumstances where this was ignored or marginalised, explicit knowledge transfer was either inchoate or ineffective. The deployment of power by management was both an enabler and barrier to explicit knowledge transfer. In some circumstances power acted as an enabler with stations acquiescing to managerial instruction to observe and implement rules and procedures. Conversely, where power relations

were deployed they were sometimes resisted and contested. Discretion also had an impact upon knowledge transfer. In exercising discretion fire fighters acted as thinking professionals who selectively drew upon all forms of knowledge. What mattered was getting the job done successfully (extinguishing and preventing fire) and ensuring fire fighter and public safety (effective search and rescue). The successful transfer of explicit knowledge depended upon this and where it was absent transfer was less successful.

The absence or presence of trust as an enabler to transfer was an important factor. The data is suggestive of a dyadic nexus between power and trust in the transfer of explicit knowledge. Where power was deployed and trust levels were high, the transfer of explicit codified knowledge was largely successful; conversely where trust levels were low power was often resisted and formal mandates to apply or adhere to policies ignored. This chapter seeks to make a contribution to knowledge on a number of fronts. The sender / receiver model is often viewed as simplistic and unrepresentative of the complex, iterative and causally ambiguous nature of knowledge transfer. Yet within Northern Fire the presence of these factors were ignored. Knowledge transfer was viewed as an instantaneous process; the importance of transferring policy or procedure successfully was equally commensurate with demonstrating transfer had occurred to mitigate risk. The role of power as an enabler and barrier to knowledge transfer is not prevalent within the extant literature. A dyadic relationship emerges between trust and power as both an enabler and barrier to successful transfer.

This chapter is structured as follows. Firstly, the role of tacit knowledge is considered when transferring formal explicit knowledge in Northern Fire. Secondly, there is an exploration of the role of power as a facilitator of knowledge transfer. Thereafter the dyadic relationship between power and trust is enunciated. There is an examination of how the deployment of power, together with high levels of trust, helped facilitate successful explicit knowledge transfer.

7.2 Explicit Knowledge Transfer: The Importance of a Tacit Component

This section considers the transfer of explicit knowledge within Northern Fire. A large body of codified knowledge is contained within training manuals, policies

and formal operational guidelines. These are then ‘pushed down’ to front line fire fighters and Station Managers via the EMOC system. As discussed in Chapter 4, Northern Fire’s knowledge management literature and documents were reviewed as part of the research. This section considers how such policies and procedures were put into practice.

The successful transfer or dissemination of explicit knowledge was often dependent upon a tacit component. Rather than explicit knowledge being easily capable of transmission from sender to recipient, the transfer of explicit knowledge was parasitic and dependent upon a tacit counterpart. In circumstances where a wholly explicit knowledge was relied upon and the tacit element ignored, transmission of knowledge was either impaired or ineffective. Fire fighters used both tacit and explicit knowledge as thinking professionals. Again fire fighters sometimes exercised discretion in performing their duties and used all sources of knowledge to inform their actions and judgments. When a wholly explicit knowledge was relied upon to the exclusion of all else, mistakes were often made. Data obtained suggests that for the modality of the sender / receiver of knowledge transfer to work, the tacit component of knowing needed to be accounted for. The latter was prevalent throughout the entire organisation and manifested itself operationally at fire stations on ground level and also at Board level. It also manifested itself within key departments such as HR, Fire Protection and the Emergency Response team.

7.3 Hammond Mill

Hammond Mill was constructed in 1861 and comprised of a massive quadrant shaped structure with large towers at each end. The mill was home to a series of thriving textile companies until the early 1980’s when it fell into disuse and disrepair. On 28 January 2016 a fire started in the basement at the north of the mill structure. Fire crews were deployed and the general consensus was that the fire could be contained and put out; this proved erroneous and the entire structure burnt to the ground. In tackling the blaze the Senior ‘Gold’ Command Team stuck dogmatically to the text book approach to dealing with a huge blaze. Tacit skills and knowledge, including those of the fire fighters who attended at the scene, were ignored.

> And then I had two hours watching them fight the basement fire and everybody, myself, my Senior Command team that were there, we've talked long and hard about this. We expected that fire to go out. The conventional wisdom is that a fire in a basement with a stone floor on top of it, only one or two perceived ways of in and out of the building.
>
> (Incoming DCO, Male, 28 years' experience)

Here the incoming DCO preferred 'conventional wisdom' to experiential knowledge. Explicit knowledge on tackling basement fires is set out in policy manuals and procedures promulgated by both Northern Fire and National Operational Guidance ("NOG"). Training manuals stipulate that the means of dealing with basement fires is one of aggressive attack and containment; the idea is to stop the fire from spreading and use significant amounts of water to extinguish it. In dealing with the fire at Hammond Mill, a conscious decision was taken by the incoming DCO to follow the explicit knowledge on tackling basement fires. In doing so tacit knowledge from fire crews and Station Managers attending the scene was ignored. A wholly explicit knowledge and set of didactic rules was preferred. The tacit experience of other experienced fire fighters and Station Managers were ignored.

The incoming DCO took the view that the fire could be contained; the fire was almost identical to basement fires described and set out in the manuals of firemanship with one point of entry for the crew. Once the fire was under control, explicit knowledge and conventional wisdom held the fire would not spread any further. This was against the view expressed by fire fighters in attendance who recalled from experience that fires like Hammond Mill could spread rapidly and a different mode of attack was required.

The incoming DCO assumed 'Gold' command at 15.31 and took over from the Incident Commander at the mill.

> Um, that's the point I took over as Incident Commander, cos I'd been there as a senior advisor which is a role we have just to support the Incident

> Commander. Um, it wasn't a nice afternoon out, but you know…They were working at it, they were doing all the right things all conventional wisdom, this fire's gonna go out soon, it's gotta, got to. Benefit of hindsight, when we've been out to investigate what was in there, where the voids in the building were, the other ways to get there, get at it.
>
> (Incoming DCO, Male, 28 years' experience)

Upon assuming control of the incident, the incoming DCO followed strict and explicit policy guidelines within the NOG in dealing with basement fires. No discretion to deviate from policy guidelines was exercised. Tacit knowledge and previous experiences were wholly discounted. As the incident developed command and control management of the fire took hold with little or no dialogue with fire crews going into the basement. The incident was managed in accordance with the strict guidelines on mobilising and dealing with a major incident; tacit know-how of crews and individual fire fighters was ignored. An almost empirical assessment was made by the Incident Command team in dealing with the fire. Precise quantities of water required to extinguish the fire were calculated with strict time scales for the deployment of fire crews in and out of the basement.

> They'd calculated time based on the load fire that was in there of it burning, in the environment that it burnt which is basically a concrete box, it would have reached temperature x, it would have taken this much water to put it out. Um, it would have taken, I think they said a hundred and eleven main firefighting jets to put it out, which is a precise mathematical number, a hundred and eleven. I don't think there's been a job in history in the British Fire Service that they've used a hundred jets, say probably bar the Blitz.
>
> (Incoming DCO, Male, 28 years' experience)

The incoming DCO relied exclusively upon explicit knowledge in tackling the Hammond Mill blaze and adopted a scientific approach to containment. However, there was a large element of tacit knowledge to draw upon from fire crews, Station

Managers and individual fire fighters. The latter was ignored with the transfer of explicit, codified knowledge in the form of manuals and operating procedures being preferred.

Basement fires are not uncommon and very often tacit skills in diagnosing where the fire could spread to, alternative ways of getting fire fighters into the building and using alternative methods of containment. The Incident Command team had canvassed the views of experienced Area Station Commanders who had had direct experience of large basement fires or equivalent experience of fires in commercial premises. However, these views had been discounted. The lack of any willingness to depart from formal procedure and recognise and take cognisance of experienced crews' experiential knowledge was noted within Northern Fire in the aftermath of losing the mill.

> Someone phoned me up on that morning and said that you know, Hammonds Mill is on fire in [name of geographical area] and I were off duty, you know and thought you know it's a good day to have off innit?
> And they said… I said what's happening and they said you know, it's in the basement, you know, we're really struggling to get to it. And I said to them, there'd be two things that've happened there, you'll either put it out, you either get to it quickly and put it out or the next time you see that fire it will be through the roof.
> You won't see it and it'll spread all over and it'll come out through the roof and then you know, two or three hours later they thought they'd got it and then a couple more hours later you know, it appeared through the roof and then we burnt almost down a village didn't we, you know, on an enormous site.
>
> (Area Station Commander, Male, 32 years' experience)

The Area Station Commander quoted above is responsible for the busiest fire station in Northern Fire with substantial experience of dealing with large, complex incidents. His view was that the attack was too defensive and the fire needed to be fought at from above in the roof space of the first floor. Equally, it was felt that

other methods of containment were required; it was dangerous to rely upon the textbook guidance to keep deploying front line fire fighters just to the basement and ignore the rest of the mill complex.

> Lifts, lack of compartmentation, walls which can fail, cast iron beams and wooden floors, which will ignite so quickly cos of all the oil from the old machines and stuff. You know, we could tell you it all, and we could tell you the clock tower in the corner will be standing after the whole of the site has burnt down (laughter) and sure enough it was, you know. I mean that's old fashioned knowledge, it's old fashioned what we call practical firemanship you know, and we've moved away a bit from that, you know and that's where we need to get back to, innit?
>
> (Area Station Commander, Male, 32 years' experience)

The above exchange is suggestive of the fact that explicit knowledge was preferred to the detriment and exclusion of its tacit component. It also demonstrates an aversion to departing from strict policy guidelines and exploring other means of tackling the blaze. Tacit clues in the structure of the mill such as failing walls, wooden beams and the build-up of oils from old textile production over hundreds of years were ignored. The rejection of 'old fashioned' firemanship and knowledge rendered a purely explicit and codified approach to the incident ineffective. The transfer of knowledge onto the incident ground in the biggest single blaze dealt with by Northern Fire in its history saw an aversion to moving outside of formal policy and didactic rules. However, operational discretion borne out of experience and deriving from tacit knowing was ignored in tackling the blaze at Hammond Mill. This ultimately rendered the operation ineffective and resulted in the loss of the building. The incoming DCO accepted following formal debriefs that there had been too much reliance upon formal approaches to tackling large blazes. There had been too little focus on the tacit knowledge, skills and experiences of crews who had dealt with similar incidents. Had these been listened to Hammond Mill could have been saved.

7.4 Second Vignette: Longworth Fire Station: Breathing Apparatus Training Session

The importance of a tacit component to the successful transfer of explicit knowledge was not restricted to the upper echelons of management; rather this permeated the whole of Northern Fire. This second vignette documents Red Watch's formal classroom training in preparation for their BA assessment. Participant observation suggests that formal transfer of knowledge in training manuals and operational procedures relied upon a tacit element. Transfer that relied solely upon didactic classroom instruction was ineffective with only parts of the knowledge being transferred. Where the latter was supplemented by tacit experiential knowledge, transfer was effective and complete. Fire fighters acted as thinking professionals who challenged and critiqued the normative position in manuals, policies and guidelines. Explicit knowledge transfer was successful when fire fighters used all forms of knowledge to help contextualise, interpret and inform their judgments. Their focus was on getting the job done quickly and safely; all forms of knowledge helped achieve this.

7.5 Training Session

The training session is held in a large room above Longworth's main engine house with a large projector screen with two neat rows of seats behind it. Ian explains that the watch are tired as it is Friday evening and they have had a busy week. All of Red Watch are present and Ian is keen to get started. The session covers the key technical aspects of BA and door entry procedure. It occurred before the training exercise documented in the first vignette in Chapter 6. Ian is keen to make sure that the technical know-how contained within the core policies and procedures are understood and discussed by everyone. The session starts at 10.00 a.m. prompt with Red Watch sitting in one row at the front of the projector screen.

Ian: Right this evening, we're gonna have some practical input on door entry procedure and stairs procedure. Then we'll do a BA job, is that alright? And we're also going to explain to James what a backdraft is and how it occurs. So

we'll do that first, then will do door entry, then we'll go to top of stairs, demonstrate that and then we'll put it into practice, yeah. Right, we'll start with you.

Louise: Yes.

Ian: In your own words… In fact, we'll split you into pairs. In your own words, I want you to describe what a backdraft is. So you've got two minutes.

Red Watch splits off into pairs with Louise and Aaron working together and starting the discussion off. There is discussion and debate about the content of the policies and what it is actually like to go into a house fire and deal with what is in front of them. The policies are viewed with circumspection and in some instances suspicion. Being tested on a raft of policies is viewed as arbitrary and unfair. It is divorced from everyday praxis. The two minutes pass quickly with Louise and Aaron volunteering to explain what amounts to a backdraft to the rest of the watch.

Aaron: Do you want me to draw it as well when we're talking in front?

Louise: So you've got a compartment, a room. Say this is your door here, but it's shut that door, a window here is closed. So you've got a fire, it starts in corner of room there for instance.

Ian: Why is that door opening that way?

Louise: Dunno, doesn't matter does it?

Aaron: Don't confuse him.

Ian: Don't confuse me. That's floor. Right so, fire started in room here, like I say there's no ventilation, no windows open, no doors open. So fire's started and it's giving off fumes, hot gases crawling up looking for oxygen. And what's happening

is it's all heat, it's going into walls and ceilings and that's sucking it all… So it gets to a point where it starts pushing it back out, the heat back out. And what happens is, it pushes all these hot gases and smoke, pushes it right down.

Aaron: Fire's died down, there's no fire you can see owt. And soon as I'm opening this window by smashing it or opening door, you get an in rush of oxygen which like sparks an ignition and everything just gets consumed in a fire ball and shoot out through which ever's your ventilations are coming in through.

Ian: And then when it gets to middle, right in middle, perfect mix.

Louise: That's when you get that explosion.

Aaron: And that's called deflagration.

Ian: So we've got the fuel and we've got the heat, so we have this build up within the room. But what happens is, we no longer have the oxygen because it's a starved compartment ok. So when we open the door to gain entry, the one thing we have to be careful of is the in rush of oxygen. It then creates an ideal mixture for a chemical reaction, which is the explosion.

Aaron:That one me and him went in to... You don't often see them because if a fire is so intense in a room, usually the windows will fail because they can. A pane of glass can only take a temperature differential of seventy degrees. So if inside here's is seventy degrees warmer than it is out there then glass will fail. So once the room has been vented, which is in effect opening that door, a backdraft can't occur. So if you get to a house fire and flames are coming out of the windows, you won't have a backdraft.

Ian: You've got look at your own control. So like he'd say stand down, he looks at the building, don't you? You'll stand there and think right you'll look for colour of smoke, you'll look for all different facts will let you go into that building, or will

not let you go into that building, but then that's up to him. But then as a firefighter, you've gotta make your own decision, your dynamic risk assessment as well call it, whether to proceed forward into it or whether to fight it from…

The discussion moves on to the description of backdraft in the NOG and policy guidelines and whether the documents are helpful. Ian goes through Northern Fire's official PowerPoint presentation on backdraft, going backwards and forwards in-between slides. Louise who has transferred across from the London Fire Brigade is of the view that all fires are different. On some occasions there is no point in trying to assess the risk of backdraft and when in defensive mode the best way is often to get into the building first and depart from the policy.
The Watch discuss using the mnemonic 'WINDS" which is contained in Northern Fire's guidelines as the prescribed mechanism for dealing with backdraft. There is a general view that the mnemonic is not that helpful as some of the symptoms and signs of backdraft are not accurately described by it. The 'w' denotes the sound of whistling air, the 'n' a neutral plane, 'd' for dense smoke, 's' for signs of blistering or paint peeling and the final 's' signals smoke pulsing out of a building.

Ian: There's a mnemonic for backdraft but me personally, I don't like mnemonic because it just means people learn lists. Whereas if you get crews to explain it, because there's a difference in reading something and understanding something. So if they can describe it to you like they just have done, I know that they now understand what it is. There's signs and symptoms for a backdraft. So we'll start with him. It spells 'winds'. Is it two 'd's' or two 's's'?

Louise: So the whistling that he's just described there, you can very rarely hear it, because you've got the fire engine parked outside with its engine revving at full blast.

Aaron: Cos it's not really a (makes whistling noise) it's more of a…

Louise: You've got people shouting, they're all talking…

Ian: Fans may be on.

Louise: So the whistling is, there's a fire in this room, all the windows are closed, but the fire is searching for oxygen and it's trying to get outside. So it's searching for oxygen and it does make a slight whistling sound, so 'w' is the whistling that you're supposed to be able to hear, but practically you can't.

Ian: So the 'I' is the in rush of air is what we've described, when the air rushes.

Aaron: This is what you listen out for, when you actually have to put it into practice, it's actually really difficult to make sure you've got a check list …We'll sit down read, and go right, the signs and symptoms of backdraft are 'bla de bla de bla'. Put that into practical terms, you don't really know what you're doing, but you can read the list and you can be signed off as you know what the symptoms are practically, and putting that into practice is a different kettle of fish.

The discussion on backdraft draws to a close and the session moves on to discuss door entry technique and how best to enter a building on the assumption that there is no backdraft or the building is safe to enter. This is known as 'venting' and amounts to a controlled means of getting oxygen out of a building. Louise refers to the time tested mechanism of throwing a brick into a top window to let the air out. Ian reminds the watch about the requirement in the NOG to 'paint' the door to see if steam or other gases come off before entry. There is a discussion on the correct way to open a door and confusion over what the policy actually stipulates. Ian quotes the policy and explains that doors are to be pulled inwards, i.e. backwards and not flung open.

Louise: I transferred in from another brigade and I was given a re-training pack and I was sat at a computer and I had my big training pack and I had to answer all these questions. You sat me in front of a computer, to apply it practically, it's

completely different. But going out and doing it in real terms is a completely different story.

Aaron: Yeah and at night, are you really gonna see that water evaporate on that door. Bearing in mind you've got a facemask on, a BA facemask that's knackered. You've squirted water on that door, because it's under such high pressure, it all bounces back and wets you through anyway, so now you've got water dripping down your facemask. So all these techniques, they're all good in a perfect world aren't they, that's why you've got to use your experience as well as you' theory.

Ian: No and we don't just do this on an external door. Every door you come to in a building, this technique must be carried out. So before you walk through any door you've got to do this. I'll just simplify it again; cos I think this is a good way. People do get confused about the positioning regarding door entry and where they should be stood and where the BA partner should be stood. And you see them as they get mixed up. But they were both behind that door weren't they? And using that door as a shield. And that shield is to protect them from that chemical reaction and from that explosion, cos you're not gonna be stood in that. So another way to remember it is, imagine behind this door there's a big wall of water and if you're stood here, and you open that door like that, you're gonna get wet through aren't you?

Aaron: And it's such a simple action. Opening the door is such a simple action, when you put things in like there's a fire behind it and there's a load of smoke, people get confused don't they. But it's really simple, and you've got to keep things simple or else it all goes wrong…

7.6 Analysis & Discussion: Second Vignette

Formal training for the BA assessment relied heavily upon the transfer of explicit knowledge contained within both the NOG and policies and procedures promulgated by Northern Fire. The latter represents 'one side of knowledge' that is codified, didactic and set out in fire training manuals. The above vignette

suggests that for explicit knowledge to be transferred from sender to receiver successfully, the tacit element needs to be recognised. Ignoring the tacit component renders transfer inchoate (transfer has commenced but is not fully completed) or ineffective (transfer either fails entirely or knowledge is only partially transferred).

Ian's description of backdraft is almost textbook with an accurate description of the build-up of hot gases that compress and then ignite. However, Aaron in his testimony of backdraft and how fire shoots though appertures and gaps derives from experience. Moreover, Aaron's testimony is that backdraft is actually not that common in practice and certainly not as described in the textbooks. The modality of dealing with backdraft is also experiential and differs from the NOG. Once the temperature reaches a certain point windows break and hence ventilate the building and negating the need to follow the procedure. The latter is suggestive of the tacit element of knowing being integral to the transfer of explicit knowledge; a purely formal exchange is arguably rendered ineffective without accounting for the tacit elements of dealing with backdraft.

Aaron's comments noted how explicit knowledge on backdraft was one form of knowledge that was useful and informative. However, it did not represent the totality of all knowing. Fire fighters acted as thinking professionals who challenged text book accounts or procedures and supplemented these with their own experiences. They used professional judgment in performance of their duties.

Ian referred above to fire fighters making their own assessment of how best to proceed and fight fire and described this as a 'dynamic risk assessment.' Here Ian encouraged the Watch to exercise its own judgment in dealing with fires. The training session had been structured to facilitate discussion and debate. Both textbook and experiential knowledge could be drawn upon. Louise echoed this sentiment when she stated it was sometimes more sensible to depart from the formal backdraft procedure and enter the building first. Here all forms of knowledge (both tacit and explicit) were working together with fire fighters acting as thinking professionals in dealing with risk and situations in front of them.

Ian's comments regarding 'dynamic risk assessment' and ascertaining the colour of smoke and making a decision to enter a building are all examples of tacit knowledge supplementing an explicit component. The latter also arguably applies to the mnemonic 'WINDS' which Northern Fire uses in its NOG and policies to set out the conditions for backdraft. Louise, Aaron and Ian all articulated discomfort in pure reliance upon the mnemonic.

Louise noted that it is practically impossible to hear any whistling sound above the noise of fire engines, the public and a real fire. Codified knowledge in a 'closed environment' was very different to the realities faced by fire fighters on a daily basis. They did not restrict themselves to didactic manuals or procedures but consulted and drew upon their own tacit knowledge and experience. Similarly, Aaron was of the view that practically he had rarely witnessed backdraft first hand; once the temperature in a building reaches a certain point windows break, the building becomes ventilated and flames flow out from the windows. The exchanges above suggest that formal, codified knowledge contained within the mnemonic 'WINDS' was ineffective when transferred in isolation. For transfer from sender to receiver to be effective there needs to be some cognisance of the tacit component of knowing. Aaron and Louise noted the practical deficiencies in relying upon the conditions of backdraft without reference to their own lived experience of dealing with fires. The stipulation that doors need 'painting' before entry can occur represents the first 's' of the mnemonic and standard NOG procedure. The efficacy of this as a means of transfer without reference to any tacit component was questioned by Aaron. The reality of water at high pressure bouncing back and soaking the fire fighter who has limited vision in any event is brought into sharp relief.

Again, the need to refer back to prior experience and knowledge in interpreting and applying the mnemonic was articulated by Aaron. The same applied to confusion over how to open a door with Ian reminding Red Watch of the correct procedure in pulling the door backwards and using it as shield against possible explosion. Ian used the example of imagining the door as almost a shield against water and protecting the fire fighter. Aaron noted the need for simplicity and keeping things simple to avoid mistake and things going wrong. Arguably

following the mnemonic strictly and ignoring any tacit element gained from experience rendered transfer of explicit knowledge unsuccessful. A tacit element was required to render the transfer of explicit knowledge on door entry, backdraft and painting techniques effective. Without the latter transfer was often simply ineffective.

7.7 Fire Protection and Prevention

The successful transfer of explicit knowledge being parasitic or dependent upon a tacit co-efficient was also prevalent in other areas of the organisation. The latter was not limited to front line or operational fire fighters. Northern Fire appointed its first Director of HR in November 2015 having previously relied upon Station Managers and the DCO to implement and devise policy both strategically and operationally. Within the HR Department the transfer of explicit knowledge was relied upon to push out and disseminate policy documentation across Northern Fire. At an operational level, and also at fire stations, there was a reluctance to rely upon tacit judgment or skills in interpreting and applying HR policy.

> The difficulty I think that sometimes fire officers have is um, when it comes to exercising discretion, so lots of our HR policies are much more directive than I would normally expect them to be. You know, they do say if X happens then do Y.
> But because that isn't in place, I don't think that's any tacit HR knowledge necessarily gets shared across the organisation.
>
> (Newly appointed HR Director, 23 years' experience)

Here explicit knowledge in such forms as discipline and grievance procedures were strictly adhered to. Station Managers were keen to avoid using tacit knowledge and experience in applying and interpreting policy. Semi-structured interviews with the new HR Director revealed that often decisions taken on disciplinary matters were the wrong ones. Rather than relying upon precedent from previous incidents at stations, the rules were often applied rigidly and inflexibly leaving Northern Fire open to appeal and pressure from the main Trade Unions.

Similarly, within the Fire Protection department the sender / receiver model of explicit knowledge was relied upon to transfer policy information and procedure. Fire Inspector training was didactic with officers receiving guidance on inspecting premises and advising upon protection issues from a plethora of information.

> I mean what we do is, every inspector that we have has to go through a training programme, so they're gaining that knowledge through that training programme. But then we have policies and procedures, guidance notes, we produced public advice notes as well, that they can all refer to.
>
> (Fire Protection Manager, Male, 29 years' experience)

Data suggests the explicit knowledge promulgated in documentation was ineffective as a means of transfer without recourse to its tacit component.

> I think one of the hardest things is not about technically dealing with the fire safety problem because we've got that guidance there [points to training manual]. It's about the Department and how the Department runs and why we made decisions previously. So it goes to that knowledge in somebody's head really, you know.
>
> (Fire Protection Manager, Male, 29 years' experience)

Here the Fire Protection Manager articulated the gap between technical know-how on fire protection issues and the tacit experience built up as a Department and individually. This needed to be accounted for together with formal explicit knowledge transferred during actual inspector training. In the absence of the latter, the picture was incomplete and transfer ineffective.

> Now we've a different approach through knowledge from the Government, but it's knowing all of this and going to meetings where you talk to business people and you realise what a pain in the ar*e you can be. So all that impacts on you enforcing the regulation.

(Fire Protection Manager, Male, 29 years' experience)

Fire Protection Managers enforce fire protection rules and regulations enunciated by the Government. A large corpus of the role is enforcing fire regulations in commercial businesses; here Fire Protection Officers required a tacit awareness of when to forego enforcement and deviate from the rules. The use of discretion was encouraged by management. Again, Fire Protection Officers acted as thinking professionals in applying the rules and knowing when to depart from policy because that was the sensible thing to do. This relied upon a thorough appreciation and application of formal codified knowledge together with a tacit component. Fire Protection Officers drew upon all forms of knowledge in making decisions and this helped facilitate the transfer or explicit knowledge. The exchange above is suggestive of a wholly explicit knowledge transferred from sender (Government) to receiver (Fire Protection Officer) being ineffective without cognisance of its tacit component. Governmental policy needed to be applied but with an understanding of how this impacted personally on the individual; a nuanced application of formal rules and procedures was required.

Semi-structured interviews with the Emergency Response Team are also suggestive of the latter. The Emergency Response Team dealt with emergency calls from members of the public. They are the first point of contact and are responsible for mobilising fire engines across a large geographical area.

Response teams follow strict procedures when taking calls and follow a specific flow chart of how to deal with an emergency call and mobilise fire crews. There are a series of prompt questions that appear on computer screens and cards which are followed by members of the team.

> Right, well we handle all the 999 calls at [Northern Fire], dispatching the appliances, dealing with requests from the incident ground for contacting local authorities, that kind of thing.
>
> There's a lot of admin work as well behind that, paper work that we have to fill out, reports, that kind of thing.
>
> (Emergency Response Call Team Leader, Female, 30 years' experience)

However, the transfer of formal knowledge from training manuals and operational procedures was often rendered incomplete without reference to a tacit component.

> You can just think back to your training and if you've read up on it and you've thought about it enough few times it will eventually just sort of, it'll just flow. So things like, if you're asking somebody stuck in a house fire, the questions you need to ask and to ask them calmly and to also take in what they're saying back to you to be able to put it on the incident and as you say map it type of thing, you know.
> (Emergency Response Call Team Leader, Female, 30 years' experience)

The guidelines set out in policy documents and procedures are followed strictly but were supplemented by tacit knowledge derived from experience of previous calls and incidents. The Team Leader noted the nexus between taking the call as set out in the procedure and supplemental questions and cues that needed to be established to ascertain the correct (and complete) picture. These were not didactic rules or contained within any specific policy; rather they amounted to a tacit component that made the transfer of explicit knowledge effective and complete.

> Like I joined thirty years ago, so you know, you're taught at the beginning and then all those years' experience, you know you never forget how to do it and just I suppose you get better in a way because you can, you know, estimate what's gonna happen next, you know… You take so many fire calls it becomes like second nature, so you never forget you're initial training.
> (Emergency Response Call Team Leader, Female, 30 years' experience)

Here the Team Leader was able to anticipate what might happen next as an emergency call developed and the range of supplemental questions to pose to

elucidate additional, relevant information. Semi-structured interviews with the Emergency Response Team revealed that call handlers would often depart from the script set out on training cards and ask additional questions regarding the nature of the fire, presence of chemicals or children and the elderly. The experience of taking emergency calls over many years filled in the gaps found in the formal explicit knowledge enunciated in the training manuals. Without the latter the formal exchange of knowledge was often inflexible and ineffective.

7.8 Explicit Knowledge Transfer: Barriers to Transfer, Power and Trust

Having discussed the efficacy of the sender / receiver model as a mechanism for explicit knowledge transfer, this section moves on to consider the effect of power on the latter. The deployment of power within (and through) Northern Fire acted as both an enabler and barrier to the transfer of explicit knowledge. Power was used as a catalyst to facilitate and also secure the transfer of explicit knowledge within Northern Fire. Equally, power deployed by management was often resisted.

Power deployed by management in some circumstances resulted in fire fighters acquiescing with management instructions to follow, consult and utilise standard procedures. Here ultimately the transfer of explicit knowledge was successful with power acting as an enabler. Equally, power was often resisted with a willful refusal to follow didactic rules and procedures promulgated by Northern Fire. Explicit instructions to perform administrative functions or adhere to certain rules were ignored; power was counter deployed by Station Managers and fire fighters that rendered the transfer of explicit knowledge either incomplete or ineffective. Policies and standard operating procedures were either ignored or only partially followed.

Data obtained from focus group interviews at all 12 fire stations and participant observation suggests a strong nexus between power and trust. The data is suggestive of a dyadic relationship between power and trust; where both were present the sender / receiver model of knowledge transfer was successful. Fire fighters, station managers and support staff had to trust in management, the physical resources given (e.g. boots, helmets or hoses) and a belief that what they were being asked to do or concede was worthwhile.

Where trust was low the deployment of power was often ineffective or rendered the transfer of explicit knowledge inchoate. Station Managers sometimes acted in an almost Machiavellian fashion by resisting instruction and initiating a counter-deployment of power for their own ends. Conversely where trust was high, managerial edicts were obeyed and adhered to and facilitated the transfer of explicit knowledge.

7.9 Managerial Trust

A substantial element of trust was placed by senior management in operational staff and front line fire fighters to self-certify that they had read policy documentation and would comply with it. The sender / receiver mechanism was used exclusively for the transfer of explicit knowledge from management to operational level staff. The latter manifested itself in the EMOC system discussed in the previous contextual chapter and the use of email to transfer policy and procedures to stations. Trust in the honesty of the recipient in making the acknowledgment that they had read and would apply procedure was the bedrock of the EMOC and email systems.

> How do I know, sat here in my office behind my desk that that's the case? I'm heavily reliant on those people who work on fire districts, on watches and the individual themselves that they are being honest. Have they had the opportunity to demonstrate it, I can only rely on the fact that they have and it's been observed and it's been assessed competently by the right people, under the right circumstances or they've had a professional discussion and they've had a simulation to test that specific knowledge area and they've been able to demonstrate it in those circumstances.
>
> (Area District Commander, Male, 27 years' experience)

Here the Area District Commander recognised the trust being placed in front line staff to act with integrity and honesty. However, the paradigmatic model of the sender being vulnerable to the receiver when sharing knowledge was not always made out. Potential vulnerability of the sender (Northern Fire) upon the receiver (operational fire fighters) to share and disseminate knowledge was not always

vitiated by trust. The deployment of power relations meant that fire fighters and staff would comply; often compliance vested upon fear of disciplinary action or failing a formal assessment and having a training need on an individual's personnel records. Adopting a Foucauldian notion of power relations, here power was expressed at an end or terminal point.

> Like oh, feeling a bit bad about yourself. Instead of rectifying the problem there and then, you know you've made a mistake, we'll sort it out there on the day to rectify it, cos we've got all the facilities there to do it. It's just say right, is there a training need, go back, you're going there with your tail between your legs thinking oh, I've been cr*p there and it shouldn't be like that…
>
> (Fire fighter, male, 14 years' experience)

Here the fire fighter had made a mistake during formal BA training and as a result had a training need registered against his personnel records. He had failed to fully comply with the stipulation called 'painting' whereby entry points are cooled with water before fire fighters enter a building. He was given a further opportunity to resit his BA assessment which he ultimately passed. Power was used to ensure compliance and strict adherence to following operational guidelines and procedures. The transfer of formal explicit knowledge was facilitated via the deployment of power. Fire fighters at all 12 stations feared training needs being registered against them and power was often used successfully to engender compliance. They also felt that a training need was a badge of dishonour and a sleight upon professional competency. The fire fighter above described how he felt embarrassed and almost ashamed of having a training need registered against him. Power was used within Northern Fire to facilitate explicit knowledge transfer.

> That's where sometimes, with this job you get blinkered by, we've got to go by the rules and that's it we've gotta… They [management] don't really allow you to think outside the box.

(Fire fighter, male, 14 years' experience)

The above exchange related to stipulations in policy manuals in dealing with hazardous materials. Fire fighters were told not to depart from from these. The above exchange noted the narrowing down of discretion and the use of power to adhere to rules promulgated by Northern Fire. Power was deployed as a mechanism to ensure strict compliance with edicts by management and facilitated the transfer of explicit knowledge from sender to receiver. Fire fighters were aware that non-compliance could result in disciplinary action or sanction. Station managers would 'push down' policy documentation and procedures to front line staff and monitor compliance both operationally on the incident ground and also via classroom training.

> Everyone's got targets to hit, you know they've got targets to hit and they're cascading it down (name of individual) got targets, (name of individual) will then cascade it down to someone else, you've got targets to hit, you help me out with this, you help me out with that.
>
> (Station Manager, male, 14 years' experience)

Here targets were used by senior management to monitor and control stations and ensure that operational policy was being followed and EMOC's completed by individual fire fighters. Management deployed power relations to ensure compliance and maintain control.

> I think we could demonstrate very well that we have systems and methods in place that demonstrate we are being reasonable and practicable to ensure our staff are competent. It heavily relies on trust and people being aware of their responsibilities because the person who says somebody is competent and actually doesn't know they're the ones who deserve to be in a witness box, or indeed a dock later down the line, should anything happen.
>
> (Area District Commander, Male, 27 years' experience)

The systems and methods referred to above were EMOC and email. Power was deployed by Area District Commanders to ensure compliance and maintain levels of competence. The use of enquiries into fatalities or loss of life within Northern Fire were deeply embedded and had resonance amongst fire fighters. Power to comply with operating procedures was often acquiesced to by fire fighters for fear of being held to account at public or internal enquiries.

7.10 Resisting Power: Barriers to Transfer

Having discussed how power was deployed to enable transfer, this section moves forward to discuss how power relations could act as a barrier to explicit knowledge transfer. Whilst power could be used to monitor and control knowledge exchange, it was often resisted and challenged. Attitudes towards power were conflicted and contested by operational staff. Equally, management deployed power not just to ensure compliance with operational procedures but also to negate or curtail the transfer of knowledge that they deemed inappropriate or unsuitable.

At an operational level, fire fighters at stations would sometimes resist specific mandates or instructions set out in policies and operating manuals. A complete transfer of explicit knowledge was often compromised by fire fighters resisting original instruction. Often the latter would arise from a distrust in the integrity of particular items of kit or a policy or procedure that was viewed as unbeneficial to everyday fire fighters' praxis.

A common example from all 12 focus groups was the use of mobile telephones. As discussed in Chapter 5, fire fighters were specifically instructed to use the MDT system to locate buildings and get directions using the computer software. They were also forbidden from using search engines such as Google to get background or technical information; explicit knowledge in formal manuals and standard operating procedures was to be strictly adhered to without diminution.

Yet the reality of the situation at stations was that fire fighters would rely upon mobile telephones frequently to get directions or look up information on chemical spillages or hazardous materials. Fire fighters would ignore the didactic instructions on the MDT systems in favour of their mobile telephones. Managerial

edicts to rely upon and use the formal explicit knowledge contained on the MDT was ignored.

> Even though we're not allowed to carry our phones. We're not allowed to carry our phones. However, we'd be lost without them. We always use them; management say we can't.
>
> (Fire fighter, Male, 16 years' experience)

This exchange demonstrates the deployment of power by fire fighters against managerial instruction. The edict to use the formal MDT system was ignored with regular consultation via mobile telephones. The fire fighter above noted how he did use his mobile telephone even though this was not permitted. Power was resisted to get the job done safely as the MDT system was not reliable.

> We're not supposed to have us phones. No. That's the bottom line. We're not supposed to have us phones in pump on way to a job. But I've seen people, many people rely on em… People on the phone, you know I mean I'm sure public would just laugh, if they knew firefighters were putting in addresses, you know on phones.
>
> (Fire fighter, Male, 11 years' experience)

The fire fighter quoted above noted how the public would perhaps laugh at the idea of fire fighters using their own mobile telephones to obtain directions. However, the reality at an operational level was that all 12 stations regularly used their mobile telephones whilst riding fire engines and attending incidents. The formal and explicit instructions contained within the MDT were ignored. Here complete transfer of explicit knowledge contained within the formal computer based system was compromised. Power deployed by senior management not to use mobile telephones to get directions or technical information was resisted by a counter-deployment of power in ignoring managerial instruction in the first instance. The use of mobile telephones was not undertaken to usurp managerial instruction or be deliberately disobedient. Rather fire fighters resisted

management instructions in order to get to fires more quickly and get the job done. The effect of power on explicit knowledge transfer was readily apparent; formal knowledge on the MDT was not transferred successfully as much of it was ignored or supplemented from information obtained via mobile communications.

> They go for phone before they go for map. I didn't know the street 'cos it were [names geographical area] and it were a [names area] postcode. So coming out of station…I ain't even a fecking clue which way to turn. That's how bad it is. So then you have to get your phone out cos…
>
> (Fire fighter, Male, 14 years' experience)

Here the fire fighter interviewed was the main driver of the fire engine and readily admitted to using his mobile telephone to get directions instead of using the MDT system on the actual fire engine. There was an unequivocal admission that in circumstances where the area or postcode was unfamiliar, rather than looking at the map on the MDT he would consult his mobile telephone. The MDT contains other supplemental information regarding the size of premises, points of entry and details of occupation (e.g. domestic residence or houses with multiple occupants). The transfer of this formal explicit knowledge was hence rendered inchoate with other essential data not being transferred.

Yet the deployment of power and its impact upon the transfer of explicit knowledge was complex and sometimes conflicted. Management's own position here was that whilst the use of mobile telephones was forbidden, the operational reality meant that management new and in some instances condoned the latter. The managerial position was ambiguous. On one hand they knew mobile telephones were being used and were aware of the deficiencies in the MDT. On the other it would be unrealistic to sanction and check each individual fire fighter's mobile telephone. This resulted in a somewhat conflicted managerial position.

> Yeah and that's what we're gonna try to, you know, I think [names specific employee] is the one in my mind to try and see how it gets received. Accompany it with some pictures cos they've done a little PowerPoint for

> me. Share some of the photos they took during the day using the photos, ***cameras they haven't got*** and all that sort of stuff, some of the photos took ***with mobile phones***.
>
> (Incoming DCO, Male, 28 years' experience, emphasis added)

In December 2015 Northern Fire dealt with huge and unprecedented flooding within its geographical areas. Mobile telephones were used by fire fighters to obtain directions and also to take photographs of flood rescues. Both the latter amounted to disciplinary offences and were strictly prohibited. Yet the incoming DCO quoted above freely acknowledged the use of mobile telephones. Moreover, photographs of flood hit areas from fire fighters' mobile telephones were utilised by the incoming DCO for the purposes of an internal presentation on flood prevention. A tension between the deployment of power (to facilitate knowledge transfer in using the MDT) and power deployed by fire fighters in ignoring such instruction (the use of mobile telephones) was evident. A somewhat mercurial and quixotic relationship emerged between the deployment of power and its resistance; power could become a barrier to the transfer of explicit knowledge to follow procedures or policies as the latter were ignored or undermined.

> Because firefighters are order followers in theory. But actually when an organisation is a commanding control one the people for… Everybody lower down the chain is finding ways of not following the command (laughter) and I think that's… I mean we see quite a lot but I think again in a commanding control environment. The senior commanders don't want to believe that their staff are busily undermining commands that they don't like because they've been taught that that's what you do, you command.
>
> (Fire fighter, Male, 8 years' experience)

The above fire fighter noted weaknesses in the modality of the sender / receiver mechanism of knowledge transfer. As knowledge was passed down the hierarchial chain via command and control management techniques it became vitiated by power the other way. Fire fighters sought ways of undermining or not

following commands which rendered explicit knowledge transfer incomplete or ineffective.

The nexus between power and transfer demonstrated a latent complexity; managers believed orders were being followed and yet were simultaneously aware they were being disregarded. Of the 12 fire stations visited, a total of three were either adjacent or proximate to large swathes of open countryside and moorland. The NOG and operational procedures do not allow deployment of fire fighters onto moorland at night. This is because fire fighters can become lost or disorientated and it is easy to lose contact. The reality at all three stations was that fire fighters would go onto moorland at night. They would search for fire, contain fire and stop smoke spreading. They would also divide into teams so that one team would go onto the moor whilst the other would deal with a house fire. Again, power relations were resisted to get the job done effectively. Fire fighters at these three stations felt that exercising discretion in resisting managerial edicts not to venture onto open moorland was worthwhile. It was not necessarily done to usurp or frustrate managerial instructions. A pincer mechanism outside policy was used by all three stations to contain moor fires that fell outside of standard policy.

> It's a bit like you know, going on a moor at night, you are not allowed to go on a moor at night, they (management) say that. However, if it means… Some people say right, no don't go anywhere near it. However, if fifteen, twenty minutes worth of work going onto that moor with torches and all the rest of it is gonna be beneficial to the moorland and the firefighter standing in on the smoke and the house that's right next to it, you're gonna do it aren't you?
>
> (Fire fighter, Male, 14 years' experience)

The above exchange is suggestive of a counter deployment of power by fire fighters. Managerial instruction was ignored and thus rendered the transfer of explicit knowledge on dealing with moor fires ineffective. Power acted as a barrier to exchange with fire fighters taking a utilitarian approach to the benefits of

searching moors over formal instruction contained within policies and procedures.

The deployment of power and its concomitant effect as a barrier to explicit knowledge transfer was prevalent at the busiest station in Northern Fire. The Area Station Manager took a decision to note and record in writing a detailed summary of premises within the station's vicinity of dangerous and hazardous materials. Garages that kept chemicals, scrap yards and factories with hazardous materials were all noted down. The intention was to upload this explicit knowledge on the MDT for use and dissemination amongst fire crews and neighbouring stations. Thus if another crew in a different area was dispatched to an incident they would have readily available useful background and technical information of the premises. The uploading of the information on the MDT was not allowed by senior management.

> And for two and a half years we've been recording that information on a computer based system and we haven't been upgrading our fire engines with that information. So we could turn up at an incident, have information that we picked up a couple of weeks ago about something really serious. If summat really bad happens at a building and people get injured, what position would we be at where we've captured the information, but we haven't uploaded it onto the equipment on the fire engine?
>
> (Area Station Commander, Male, 32 years' experience)

Thus the deployment of power by senior management in barring the uploading of information onto the MDT system and sharing it negated transfer of explicit knowledge.

> Talk about a lack of sharing of information. So we've got the information, just not available to these on the fire ground.
>
> (Area Station Commander, Male, 32 years' experience)

Here power relations resulted in explicit knowledge regarding fire hazards and

dangerous substances contained at premises not being transferred. Power acted in a negative fashion and amounted to a complete barrier to explicit knowledge transfer.

> And now, the latest news is probably, cos we're in such a difficult position, it's a pretty precarious position innit, you go to an incident, we've got information on a risk, but we haven't got it available to us and something goes wrong, it looks like now we're gonna stop doing it. We're that worried about it, we're gonna stop gathering the information… So you turn up. The information was that there was some explosives or something like that say, it blows up, you know we all get hurt. What's gonna happen then when…? Did you have any information, yeah we did. Was it available for the fire crews? No, it wunt. Why not? Er…
>
> (Area Station Commander, Male, 32 years' experience)

Here the Area Station Commander articulated his frustration at the unwillingness of Senior Management to upload explicit knowledge gathered on serious fire hazards to the MDT. Power was deployed by management to abnegate any transfer as the new MDT system was deemed to be operationally sufficient and fit for purpose. Senior Management wanted all crews to use the information on hazardous materials contained within the MDT and not their own experience or evidence. Power acted as a barrier to explicit knowledge transfer flowing from the Area Station Commander to crews.

7.11 Power and Trust: Enabling Transfer

Having discussed how power relations can render transmission of explicit knowledge inchoate or ineffective, this section now moves on to consider the role of trust in facilitating transfer. Data obtained from focus group interviews at 12 stations and also participant observation is suggestive of a dyadic relationship between power and trust to facilitate the transfer of explicit knowledge.

As discussed above, power was often deployed to ensure compliance with fire-fighting principles enunciated in National Operational Guidance ("NOG"). High levels of trust helped facilitate explicit knowledge transfer in circumstances where

fire fighters trusted in both the policy itself and the credibility of the manager concerned. In circumstances where power was deployed to comply with policy, if trust levels were high this helped both facilitate and ameliorate transfer. Conversely, where levels of trust were low, often policies were not fully followed or instructions ignored. The latter acted as a barrier to transfer.

> And it just made people quite angry and you know when they are constantly getting stuff wrong and when it's us that's got the public, the public see us, if we are going to the wrong address or not enough appliances are turning up or there's too many you know like there's six pumps arrive at a bin fire it's us that are seen and it's us that almost feel embarrassed when something like that happens and I think that were reflected back to management a lot on station visits.
>
> (Station Manager, Female, 7 years' experience, Graduate)

Here the Station Manager articulated frustration with the new MDT system discussed in Chapter 5. Power deployed by management to use the system exclusively was resisted. There was no trust in the efficacy of the MDT and this resulted in arriving at an incorrect address or numerous fire engines being called out to a minor fire. All 12 stations reported the same issues and a lack of trust in the integrity of the MDT system. Data is suggestive of a nexus between power and trust; where power was deployed but trust was low explicit knowledge transfer was unsuccessful. The latter was not restricted to trust in specific items of operational kit but also trust in managers themselves.

> But there's a lot of managers out there that have been up at headquarters for six, seven, eight years not on a fire ground who are making decisions for us who are on the fire ground day in and day out and I don't know those days of almost doing your apprenticeship fireman, leading firefighter and so on station manager and upwards, there's a lot of jumps now almost and erm, or you're up at headquarters for six, seven years. I might be wrong but surely you must be out of the loop on what is fire ground is like.

(Fire fighter, Female, 7 years' experience)

Here decisions taken by management based at Northern Fire's Head Quarters were viewed with distrust in circumstances where managers had secured promotion with little practical fire-fighting experience. The above exchange noted trust in managers who had risen quickly through the ranks but had little front line operational experience was low. The fire fighter quoted above noted how recent practical experience on the fire ground had credibility. Trust was more likely to be given to Station Managers who were perceived as being experienced and efficient fire fighters.

All 12 station interviews revealed the latter and data is suggestive of a dyadic relationship between trust and power. Power deployed by managers to comply with managerial edicts or operational instruction was often resisted where trust levels were low. Trust very often depended upon the credibility of the manager concerned; where managers had significant fire-fighting experience trust levels were high and compliance with operation or policy mandates were complied with.

> There's a lot to be said and this is probably a big debate, not tonight probably, but the people getting promoted, the gaffers are getting promoted, how much experience have they got? Because if they haven't got any experience, you've no chance then have you? [Name] and he's an old boy, you'd listen to him cos he's been there, he's seen flat fires and he's you know…
>
> (Fire fighter, Male, 14 years' experience)

Here the paucity of front line fire-fighting experience was both noted and questioned. Focus group interviews at all 12 stations demonstrated that trust levels in managers who had secured 'fast track' promotion within Northern Fire were low due to a lack of perceived operational capability. Conversely where 'old timers' secured promotion and power was deployed by more experienced managers fire fighters would comply and adhere to instruction. The data is

suggestive of a dyadic relationship between power and trust in the transfer of explicit knowledge within Northern Fire.

All 12 stations confirmed that they followed BA policy and procedure completely and without deviation. Here high levels of trust in the use of BA equipment facilitated knowledge transfer when power was deployed by management to adhere to strict NOG BA guidelines. Fire fighters at all 12 stations trusted in management and believed that Northern Fire was acting in their best interests in stipulating strict compliance with following procedure. Data revealed that there was a high level of trust in management and that BA training was perceived as worthwhile, relevant to every day praxis and had the potential to save life.

The Atherstone-on-Stour tragedy has been discussed in the previous contextual chapter. One of the reasons for the deaths of four firefighters was using discretion in the interpretation of breathing apparatus policy and confusion and inconsistency in application of existing policies and procedures. Data obtained from semi-structured interviews and participant observation suggests that power was used by Northern Fire to ensure strict compliance with NOG in core areas such as breathing apparatus; divergence on the interpretation of core policies and procedures was reduced to a minimum. The latter was driven by management and cascaded down to operational staff.

> So we've all got together thinking for us it can't be right cos we all have five different versions how we interpret that guidance. So we're all getting together or have got together to say right this is how it should be, so we're all singing from the same hymn sheets, so to speak. We're all given the same information, everybody's… Any questions that are coming up are all relevant and basically the same. So as five districts again, we're all given out the same information on behalf of the organisation and not five different…
>
> (Area District Commander, Male, 24 years' experience)

Here power was deployed to ensure strict compliance with national guidelines on BA and to ensure that all stations and each geographical district in Northern Fire

followed identical procedures. Power to conform to managerial edicts on the use of BA was not resisted at stations as trust levels were high.

> Well it comes from the Atherstone-on-Stour where firefighters died in the warehouse… they realised every brigade had a different procedure so you could get two brigades working together who did it completely differently and we have got teams in together it just didn't work at all.
> So the resolution was to have a national policy that every brigade had to adhere to, that's naming teams, how many were in a team it was all nationalized so when you got two brigades working together there was never that issue again.
>
> (Station Manager, Female, 7 years' experience, Graduate)

Here trust in managerial edicts and competency was high across all 12 stations. This rendered the transfer of explicit knowledge contained within the NOG more effective. The deaths of four fighters by a lack of clarity in exercising discretion when interpreting BA policy and deploying breathing apparatus crews had huge resonance amongst all 12 stations. All fire fighters interviewed were aware of the circumstances of the Atherstone-on-Stour tragedy and it was often used as a case study for training purposes. Trust in senior management in limiting discretion in interpreting the NOG on breathing apparatus was high and managerial edicts advocating compliance were strictly adhered to.
A strong correlation between trust acting as an enabler to explicit knowledge transfer when power was deployed was not restricted to just operational fire officers. The latter was also relevant in other departments and divisions.

> So he [Department Head] has a meeting with his team every week. Then as managers, I have a meeting with the managers every other month, so each of the managers bring things that the team have raised to the managers' meeting. And then we have a senior fire protection meeting which is with the Chief and Assistant Chief, temporary at the moment. So we have got a flow of communication where things go both ways and we

> will, if we create policies and procedures we'll report them up to Chief and Assistant Chief to get their comments on and approval and then filter them the opposite way. So I think in terms of communication and if people have got concerns and how to raise them, we've got that process in place. The lines of communication are very clear and open.
>
> (Fire Protection Manager, Male, 29 years' experience)

The Fire Protection Manager above noted how relationship between managers and both the ACO and CFO was close. Specific policy documentation and decisions were vetted before dissemination throughout Northern Fire. Communication channels between senior management, the Fire Protection Department and front line staff were open with fire fighters being able to provide comments and feedback on operational policy. Focus group interviews at all 12 stations revealed high levels of trust in the Fire Protection Department and its ethos and values. As discussed in the previous contextual chapter, the role of fire protection within Northern Fire is one of the core duties of the service and the ethos of preventing fire in the first instance through education and training is deeply embedded. Accordingly, trust levels were arguably high and when power was deployed to comply with procedure and fire protection policies stations complied.

Just as with the NOG's (discussed above) the room for policy interpretation was kept to a minimum. Power was used by senior management and the Fire Protection Department to minimise operational interpretation of policies so that application was uniform throughout all stations.

> It's like the old thing in the First World War, send reinforcements we're going to advance, turns into send, three and four pence, we're going to a dance. I'm making that comparison because sometimes what he [Department Head] says comes out totally differently by the time he's got somewhere. And the problem with email is sometimes it's open to interpretation and the interpretation sometimes can be quite damaging.
>
> (Fire Protection Officer, Male, 6 years' experience)

There was a cognisance amongst fire protection staff to ensure that room for interpreting policies incorrectly was minimised or eliminated. Power was deployed to ensure compliance; arguably the efficacy of explicit knowledge transfer was augmented by high levels of trust at both station level and operationally. All 12 stations were willing to strictly adhere to fire safety policy without deviation.

A review of EMOC records at Northern Fire arguably corroborates evidence of a dyadic relationship between trust and power in the transfer of explicit knowledge. The EMOC system was discussed in the previous contextual chapter. Essentially it comprises of policies and procedures being sent to individual fire fighters and station managers via email. The latter in turn self-certify that they have read the policy and are asked a series of questions on the subject matter using the EMOC software. The questions are relatively straightforward with ‘yes’ or ‘no’ responses that confirm basic understanding of core fire-fighting principles.

The EMOC records for Red Watch at Longworth fire station were reviewed as part of participant observation. Those for White Watch, Northern Fire’s busiest station, were also reviewed together with the EMOC records for Blue Watch Northern Fire’s least busy station. Access to EMOC records was restricted to the core areas of BA training, casualty care and dealing with road traffic collisions. The latter are viewed as essential fire fighting skills. They comprise the substantive element of basic fire fighting training and also as part of continuing professional development. Red, Blue and White Watches were chosen in conjunction with senior management as being representative of all fire stations in terms of gender, experience and exposure to the challenges of inner city and rural fire fighting.

Longworth fire station was the subject of participant observation over a period of four months for the period February 2016 to May 2016. The station was suggested by senior management as being representative of an ‘ordinary’ station; it was neither excessively busy nor quiet. Northern Fire’s own recorded figures note that for the period 01/04/2015 to 31/03/2016 it dealt with 352 fires. Participant observation during Red Watch’s formal BA assessment noted

reasonably strong bonds of trust in their Station Manager and their ACO and DCO. Whilst the watch did not agree with every policy change or initiative, the broad consensus was that the trajectory of decision making that affected their lives was fair.

A review of EMOC records for Red Watch for the period 01 January to 31 March 2016 and 01 April to 30 June 2016 revealed that all EMOC's had been completed by the Watch in full for BA training and road traffic collisions. The number of EMOC's to be completed by fire fighters varies; approximately there are between 5 and 10 to complete each month. Some EMOC's such as those concerning changes to BA techniques could be lengthy, onerous and time consuming. Others would be simple technical updates that fire fighters simply acknowledged electronically confirming that they had been read and understood. Only Aaron had not completed his EMOC's for this period in respect of casualty care and this was subsequently completed. Further, no training needs were recorded against any individual. All members of Red Watch were deemed competent in their BA assessment on 24 May 2016.

This is to be contrasted with Blue Watch at Northern Fire's least busy station. Northern Fire's own recorded figures note that for the period 01/04/2015 to 31/03/2016 it dealt with 9 fires. Blue Watch were interviewed on three separate occasions. On the first occasion the interview was cut short due to Blue Watch being called out to a fire which subsequently proved to be a false alarm. On the second occasion the interview was curtailed due to a real fire and reconvened for a final third time. Blue Watch comprised of six male fire fighters with an average age of fifty-two. Relations with their Station Manager the DCO and ACO were fractured and febrile. Fire fighters noted resentment to changes to their pension rights and terms and conditions of employment. They also voiced apathy towards management and a lack of any desire to assist management in wider training initiatives.

> The knowledge, when people retire, the knowledge goes with them and people can't wait to get out of this job. No one wants to stop back an extra two years and pass that knowledge down…

(Fire fighter, Male, 25 years' experience)

A review of EMOC records for Blue Watch for the period 01 January to 31 March 2016 and 01 April to 30 June 2016 revealed all members of the watch had not completed either road traffic collision or casualty care EMOC's and two fire fighters' EMOC's for BA training were only partially complete. In addition, two members of the watch had training needs on their personnel records; one related to competence in dealing with hazardous chemicals and materials whilst the other related to competency in line rescue techniques.

White Watch's records were exemplary and the station was held out as being the best within Northern Fire. It was cited as an example by both HR and senior management as a paradigm of best practice. White Watch were chosen to be the first station to move across to the new telemetric BA system discussed in Chapter 5. The station had a graduate female manager with the average age of fire fighters being under 35. Trust in the station manager was high; key operational decisions were discussed with fire fighters and fully explained.

> And like especially with the new BA I worked on the project so I could tell my shift doing the exercise why they have gone down this route, but everybody else there is nobody to give them that answer and I think sometimes it just needs that bit of a feedback loop and it spreads like wild fire when somebody knows it, everybody gets to know but it just needs to have that transparency both ways of why we do things not just for the sake of it.
>
> (Station Manager, Female, 7 years' experience, Graduate)

Northern Fire's own recorded figures note that for the period 01/04/2015 to 31/03/2016 it dealt with 1067 fires. A review of EMOC records for White Watch for the period 01 January to 31 March 2016 and 01 April to 30 June 2016 revealed that all EMOC's for BA, casualty care and road traffic collisions were fully updated. No training needs were recorded against any individual member of the watch and nor was any fire fighter subject to any disciplinary procedure (actual

or pending). EMOC records for all three watches are suggestive of a dyadic relationship between power and trust in enabling the transfer of explicit knowledge.

7.12 Summary

This chapter has considered the transfer of explicit knowledge within Northern Fire. In doing so the second research question has been explored, namely what are the barriers and enablers to explicit knowledge transfer? From an epistemic perspective, Northern Fire did not privilege one form of knowledge over the other; tacit knowledge was not preferred over explicit knowledge. Rather explicit knowledge was perceived in terms of modality of transfer and mitigation of risk. Northern Fire relied upon the sender / receiver method of transfer to push out policy documentation and operational procedures. The latter facilitated an evidential chain that could be relied upon to prove operational policies had been communicated to fire fighters and operational staff.

The EMOC system was used to transfer explicit knowledge and monitor understanding of core policies and also ensure compliance. Northern Fire viewed explicit knowledge transfer as instantaneous and did not perceive exchange as being a sequential or heuristic process. Within its hierarchical structure, Northern Fire was able to use and deploy power to ensure compliance with didactic instruction and operational policy. However, data reveals a complex and conflicted relationship between power and explicit knowledge transfer. In some instances power was successful in ensuring explicit knowledge transfer, yet in other instances instructions were either disobeyed or only partially adhered to. Discretion was sometimes of significance with fire fighters selectively choosing the best form of knowledge in their operational duties.

The data is suggestive of a dyadic nexus between power and trust. Where power was deployed often fire fighters would accept such deployment and follow instruction or policy where levels of trust were high. Trust manifested itself in the credibility of managers, specific departments or the utility of items of kit. Conversely where trust levels were low, often fire fighters would disobey instruction or not follow operational policies or procedures. The latter rendered transfer incomplete or ineffective

Chapter 8: Organisational Memory: Unlearning and Learning to Forget

8.1 Introduction

Chapter seven considered the transfer of explicit codified knowledge within (and through) Northern Fire and the barriers and enablers to successful transfer. This final empirical chapter moves forward to explore unlearning and the challenges faced in both learning new work routines and practices whilst unlearning others. This chapter also considers organisational memory loss and the circumstances in which everyday routines and praxis can become forgotten or lost. In doing so this final empirical chapter seeks to address the third primary research question, namely how does organisational memory and unlearning effect knowledge transfer? As explored within the literature review, unlearning has arguably been a Cinderella of the knowledge management literature. Learning and the acquisition of new organisational knowledge have taken centre stage whilst unlearning has occupied a more peripheral space.

This final empirical chapter seeks to make a contribution to knowledge on a number of fronts. As a general observation, how we theorise unlearning is arguably underrepresented in the extant knowledge management literature. From an epistemic perspective how we define unlearning and its relationship with acquiring new knowledge could be further clarified. Fire fighters often acted as thinking professionals and made informed choices when discarding ‘old’ knowledge and also when acquiring ‘new’ knowledge. Rather than slavishly or didactically following new policies or procedures fire fighters used their own collective and individual professional discretion towards unlearning.

As discussed in Chapter 5, this research witnessed the introduction of a new system of BA equipment in Northern Fire. The new BA system involved the replacement of a manual mechanism for monitoring the air supply levels of fire fighters with an electronic one. Accordingly, this thesis offers an insight into our empirical understanding of unlearning and its correlation with the acquisition of ‘new’ knowledge and the discarding of ‘old’ knowledge.

Data obtained from semi-structured interviews, focus groups and participant observation suggests that unlearning was not epistemologically an antecedent or precondition to new learning. Nor did the process of unlearning necessarily result

in the deliberate discarding or erasure of existing stocks of knowledge or work based praxis. Often unlearning was a dialectical and iterative process that moved between the acquisition of new knowledge and skills whilst retaining old ones. Fire fighters did not unlearn 'old' BA techniques and discard them in favour of 'new' ones; rather unlearning involved the retention of some existing knowledge together with the acquisition of new knowledge and skills. Moreover, unlearning did not manifest itself as a binary choice between discarding 'old' knowledge to facilitate the adoption of 'new' knowledge; rather the process of unlearning included the retention of some old practices which helped embed and augment adopting new ones. Further, unlearning manifested itself as potentially being categorised as both 'soft' and 'hard.' Soft unlearning occurred within a 'new for old' exchange framework; new work based knowledge was acquired simultaneously with the replacement or abandonment of old knowledge. In practice soft unlearning occurred when either an obsolete work based practice was forgotten entirely or when new knowledge easily replaced old knowledge. Here the process of unlearning is denoted as being 'soft' because giving up existing practices or routines was relatively easy. Here new knowledge was perceived as being more efficient and useful to fire fighters' working lives.

Hard unlearning manifested itself where old knowledge was difficult to replace due to deeply embedded work based praxis or where it was essential to retain it in order to make sense of new technology or ensure fire fighter safety. Here the process of forgetting was 'hard' as organisational memories were sometimes difficult to dislodge. Hard unlearning was not linear or sequential but rather a dialectical and iterative process as between new and old knowledge. Ontologically it did not necessarily result in discarding or eliminating existing stocks of knowledge; unlearning included the retention of some elements of existing knowledge whilst acquiring new knowledge.

With regards to involuntary knowledge loss, organisational memory was often retained via narrative and storytelling. Adopting a CoP based perspective, fire fighters kept organisational memory alive in their own watches via narrative. Knowledge was capable of being passed on through storytelling and shared amongst watches within Northern Fire. This helped in some instances to bridge

the gap between losing knowledge forever and maintaining it. As discussed in the previous contextual chapter, the UK Fire and Rescue Service has witnessed a substantial reduction in the number of actual fires in England and Wales. Very often organisational memory was augmented via learning vicariously through the lived experience of others. Fire fighters within their watches passed on organisational memories to other watches who had no direct experience of situations such as warehouse fires or major flood rescues. 'Forgetting' was often prevented via storytelling situated within CoP. Narrative replaced and became a substitute for direct experiences of serious fires or major incidents. Borrowing from Kuhn, the latter amounts to a paradigm shift of approaches to fire fighting both at Northern Fire and on a national level. A reduction in real fires resulted in relying upon a CoP approach to both knowledge sharing and the retention of organisational memory.

This chapter is structured as follows. Firstly, there is a discussion of unintentional or involuntary forgetting. The factors that cause organisational memory loss are explored together with those that help ameliorate or prevent such loss. Secondly, intentional or deliberate memory loss is enunciated. There is an examination of how Northern Fire sought to discard certain work procedures or routines and replace these with new ones. This final empirical chapter then draws to a close with some observations on how the data suggests a dialectical relationship between unlearning and learning situated within (and through) CoP.

8.2 Unintentional Forgetting

This first section considers the accidental or unintentional loss of knowledge within Northern Fire. Here knowledge was not lost or discarded purposefully or erased from organisational memory as an antecedent to new learning or the acquisition of new knowledge. Rather knowledge was lost inadvertently and unintentionally. Unintentional forgetting within Northern Fire needs to be contextualised via reference to a reduction in the number of fires attended. This reflects a national trend with an onus on preventing fire rather than fighting it. The latter has resulted in a substantive reduction of experiential knowledge due to the paucity of exposure to real fires. Adopting the bathtub metaphor, valuable stocks of organisational knowledge are analogous to water levels in a bathtub. Data

indicates that fire fighters lost knowledge accidentally by a lack of regular exposure to certain elements of their everyday fire-fighting praxis; water levels in the bathtub were unintentionally reduced. In addition, other elements of everyday fire fighters' activities had also been curtailed.

Often some work based procedures and routines were in danger of being forgotten. However, it was through narrative and storytelling within individual watches that organisational memory was kept alive and maintained. This also facilitated the transfer of knowledge between watches and within Northern Fire as a whole. One common example of possible organisational memory loss from all 12 stations interviewed related to tackling chimney fires.

> Looking up chimneys, we don't have them now, chimney fires. [names geographical area], they've got no chimney fires, you know.
>
> (Fire fighter, Male, 7 years' experience)

Here the fire fighter reflected upon the fact that he did not have any direct experience of chimney fires and nor did the fire station adjoining his. Many modern houses do not have chimneys. However, within Northern Fire's broad geographical area some houses and industrial buildings had chimneys that were still in use. The ability to extinguish a chimney fire was in danger of being forgotten due to a lack of regular exposure to them. Of the 12 stations interviewed, only three had exposure to chimney fires and these were a fairly rare occurrence each year. Yet fire fighters collectively in their watches recognised the importance of attempting to capture work based routines that were in jeopardy of being forgotten. Moreover, knowledge and experience of dealing with chimney fires was perceived as being representative of a true, authentic fire fighter; stories were told by Station Managers of how they dealt with these fires early on in their careers.

> One of the things I write for a chimney fire is take your boots off when you go in the house. You know if you've got a crew full of newly qualified firefighters and a crew manager who've never been to one before. A

> chimney fire and they all go in with their boots on and get carpet all muddy and stuff like that. Cos a load of soot comes down and it's just little things like that that we don't get taught. But you know, my first chimney fire, I went into a house and gaffer said take your boots off.
>
> (Station Manager, Male, 15 years' experience)

Here the Station Manager referred to writing down an approach to dealing with chimney fires. The Station Manager wanted to capture the approach to a chimney fire and how best to deal with it. He recalled how many newly qualified fire fighters and crew managers had no experience of dealing with a chimney fire. An ostensibly basic action of removing boots before entering a property was viewed by the Station Manager as important. It helped stop his watch of fire fighters from forgetting about chimney fires and was a means of passing on what he had remembered from his initial training. The Station Manager noted that some elements of organisational memory in danger of being forgotten could be captured and recorded in writing.

> My first post was at a fire station within a mining community, so I did attend a lot of chimney fires. So I was always taught there's a certain pump you use, it's called a stirrup pump which you put in a metal bucket, that's what you use to extinguish a chimney fire. You can use that and you can use the hose that's on the fire engine as well to extinguish the chimney fire. However, I learnt that because steam is water as well, just in a different form, if you put the water on the coals, the steam goes up the chimney, it can find the hot spots and put the fire out.
>
> (Station Manager, Male, 17 years' experience)

The above exchange noted how organisational memory could be maintained and passed on via narrative. The Station Manager detailed how to use a stirrup pump instead of the hose on the back of a fire engine to extinguish a chimney fire. However, the most effective mechanism was to place a small amount of water on the hot coals so that steam would act as the extinguisher. The latter was capable

of being forgotten and erased from Northern Fire's collective memory and organisational stock of knowledge. Fire fighters did not come across chimney fires regularly and in some cases not at all. Yet the practical knowledge in dealing with chimney fires, irrespective of frequency and actual exposure to them, was maintained within the watch and shared amongst fire fighters. This kept organisational memory alive within individual fire fighters' memory. By virtue of being capable of being written down and passed on to other fire stations, the collective memory of Northern Fire in dealing with chimney fires was also maintained.

> I was that person, I've been that person who's operated, who's held a wing mirror, a broken wing mirror from a car underneath the actual fire to look up at the chimney. I've been the person on a fire station to make sure there's no washing up liquid in a washing up liquid bottle. So I can fill it up with water, put it on the fire engine for chimney fires because you use far less water but it's just as effective as getting the hose from the fire engine to put the fire out sometimes. Cos you put the water on the coals, the steam then extinguishes the fire.
>
> (Fire fighter, Male, 21 years' experience)

Here the fire fighter recalled using a car wing mirror to hold up under a chimney to obtain a reflective image of the fire. He noted how he ensured a washing up bottle was empty to that it could be filed up with water to extinguish a chimney fire rather than utilising the fire engine hose. Again, through narrative and storytelling the modality of dealing with chimney fires was transferred amongst fire fighters and watches.

> There isn't on chimney fires. The only thing I've ever read was a little bit I think it was Manuals of Firemanship, that's the title of the book, so that's all they are, the firemanship. And it talks about three ways to tackle it from above, from below and the intermediate level. But it's all, that's as much and it was about me finding that information out myself. And then going to

> them (points to crew) and the experience they have, right, have a look at it, this is a wing mirror off a car cos we found bits of equipment that we, you know use and, just sort of showing me.
>
> (Fire fighter, Male, 13 years' experience)

The above exchange referred to there being only a minor reference to chimney fires in the Manuals of Firemanship. The latter is a core text book still used in fire fighter training that dates back to 1890. It was the collective experience of the crew that explained using a wing mirror to look up a chimney to locate the source of fire. Northern Fire's organisational memory of chimney fires was maintained and kept alive through storytelling; fire fighters with no direct experience of a chimney via could learn vicariously through others' experience. The maintenance of organisational memory was often achieved by sharing experiences.

> And that's when experience comes in because all these lads have got more time in than me, so when we get to a job like that, that's quite out of the ordinary for most people, there's a good chance that, you know I wouldn't have seen something like that, but these lads might have. So you know, I'm gonna sort of look to them for what do you want me to do, what's the plan, have you seen something like this before and how do I go about it because like I say it's not just me but, you know I've only been at this station for twelve months and my station before that we never really got any motorway jobs, so I haven't really seen that many.
>
> (Fire fighter, Male, 7 years' experience)

The above exchange noted how unusual or infrequent fire-fighting experiences that could easily be forgotten were captured via storytelling and passed on. Here the fire fighter referred to dealing with a motorway fatality and rescue for the first time. Rather than this experience being forgotten, it was shared with other fire fighters within their watches. Data from all 12 focus group interviews is suggestive of the CoP based approach to sharing knowledge and maintaining organisational memory collectively.

> From personal experience going to incidents, you know flat fires and things like that and then there's things like these guys know about different jobs that they've been to, oh hang on it doesn't quite work like that we need to do this this and this. So then I know, so they pass it on to me through their experiences, that experience they've probably had it passed down to them and then they pass it on to different people and then we work with different stations in station training, which is a really good thing and then you can pass that knowledge across.
>
> (Fire fighter, Male, 12 years' experience)

The fire fighter above was able to share his experience of dealing with a flat fire with other members of his watch. Fire fighting techniques and different approaches to dealing with serious incidents were discussed and analysed. This process helped keep organisational memory alive and adopting a CoP perspective this knowledge was capable of being passed on to other watches within Northern Fire.

8.2 Recalling the Floods

As discussed in the previous contextual chapter, the western area of Northern Fire was subject to unprecedented local flooding on Boxing Day 2015. Whilst flood rescue techniques are part of fire fighters' compulsory training, dealing with a complex, large scale flood operation was a rare operational occurrence. Northern Fire had inadvertently 'forgotten' how to respond to severe flooding. Organisational memory of dealing with flooding had faded; this was largely attributable to a lack of regular exposure to floods. On the day of the floods three core operational fire stations were given responsibility for undertaking search and rescue. Only one station had specialist training in dealing with floods whilst the other two had undertaken flood search and rescues some 11 years previously in 2005. Organisational memory in all three watches had faded somewhat. There was a depletion in recall of the application of standard operating procedures and cognisance of some of the indicators of the effects of flooding. Here three fire

fighters were tipped out of their rescue boat because of sudden changes in water levels.

> Um, the water that had come out of the river that was now the canal and the river was hitting the lock gate unbeknown to them because the lock gates were like that. It was diverting this through somebody's garden into the road which was also flooded. So all of a sudden the road which where they'd put the boats in was quite calm, they then hit currents, fierce currents in the road that washed them down the road. The motor on the boat wouldn't keep up with it, they got washed up against the give way sign, at about just short of the triangle height and the boat hit it in such a place that the current was pushing them onto the sign and the water starts to build underneath the boat and starts to flip the boat over.
>
> (Incoming DCO, Male, 28 years' experience)

Collective memory of watches had forgotten how to deal with practical issues like securing the lock gates or noting changes to the velocity of the river's current. Preparation for sudden changes in current or surges in water are part of fire fighters' core training. Yet due to a lack of regular exposure to floods the collective organisational memory of fire crews had become diminished. As noted above, this resulted in the loss of control of the rescue boat which ultimately capsized together with the fire fighters in it. Organisational memory of how to tackle fierce currents and maintain stability in the water had faded. A de-brief after the floods in January 2016 revealed errors in applying Northern Fire's flood rescue policy.

> Um, the instructor said what you should have done is this, this and this and you should have got out of it. They didn't know it, they ended up tipped into the water um, I need to get that experience out to everybody else and I picked that up and stuff like that but it's… We've had a lot of experiential learning in the last three months that we need to share as widely as we can.
>
> (Incoming DCO, Male, 28 years' experience)

The above exchange noted the importance of sharing the experience of flooding amongst other watches and how storytelling helped ameliorate organisational memory loss. First hand testamentary experience of dealing with large scale flooding was used as a mechanism for transferring the lived experience of those fire fighters who attended the floods and keeping alive organisational memory.

> He's [names employee] pretty rough and ready, he's articulate in a pretty rough and ready way, but his presentation of this story is overpowering about what he did from the moment they turned at eleven o'clock in the morning to the moment where they got tipped out of the boat at seven o'clock at night and they worked continually in between. He's just a… He's a gruff Yorkshireman, he tells the story so powerfully that we have to capture him telling that story and find a way to share it with other people. The only way would be to video him and send it round and let people listen to it.
>
> (Incoming DCO, Male, 28 years' experience)

The incoming DCO noted how narrative could be used as a mechanism for capturing the experience of dealing with floods. The fire fighter referred to above gave a series of talks at fire stations with little or no experience of flooding. Best practice on search and rescue techniques was shared together with tips and pointers on dealing with rising tides. Narrative was used as a means of keeping organisational memory alive and preventing its loss. The fire fighter quoted above explained what it was like to capsize and the fear and panic arising from the surging and rising tide. This was shared amongst other watches within Northern Fire. Tips and pointers on how to practically deal with a large-scale flood scenario were also shared amongst watches many of whom had no recent or direct experience of flooding. Once again through narrative and storytelling organisational memory was capable of being passed on and also maintained.

> Cos like now you can be sat having a cup of tea and you can just start

> talking and it might be months ago and you say, oh you remember that yeah, yeah, yeah and you might go, would you do anything different? Oh well you could've tried that couldn't you or you could've tried that. And I personally find that, just not formal de-brief or anything like that, just talking about it. And then when we obviously go outside, you think oh I might just try that and see what happens, see if it would've made a difference, it might not have made a difference, but that for me is the best way.
>
> (Fire fighter, Male, 9 years' experience)

The fire fighter above noted how through talking with other watch members at the fire station organisational memories were kept alive. Organisational memory also facilitated fire fighters questioning standard fire fighting techniques and practices and modifying them. Incidents that were attended several months or even years ago were capable of being recalled, retained and passed on. Often recollection occurred whilst sitting around a table or having tea.

> One thing in the fire service that we excel in is that I know I've learnt as we alluded to earlier that through others experience and them sort of showing me when I was a younger firefighter, the benefit of their experience and then through the old cup of tea, round the table and listening to the stories of the guys twenty years ago when I was joining and you know running into fires twenty years ago and just things that we pick up. Yeah, I think we do that really well don't we?
>
> (Fire fighter, Male, 17 years' experience)

The above exchange noted the CoP based approach to organisational memory; experiences were shared amongst fire fighters via narrative and passed on. Organisational memory was capable of being retained even when there had been a considerable effluxion of time from past events. Equally the notion of fire fighters acting as thinking professionals within CoP helped facilitate organisational memory. Fire fighters reflected upon their own practice and skills and shared those that they felt might fade or disappear.

8.3 Topography

Data obtained from all 12 stations referred to topography as something that derived from organisational memory and was capable of being passed on. Fire fighters recalled how they would walk around their geographical area and inspect water hydrants. As a CoP watches constructed a mental map of the location of hydrants and their functionality.

> We used to have the time to go and we'd walk and drive round and test all the hydrants ourselves, er it meant that we knew where they all were, we knew which ones were working and which ones weren't.
>
> (Fire fighter, Female, 9 years' experience)

Organisational memory of the location of fire hydrants was capable of being retained and fire fighters would share this within their watches. Adopting a CoP based perspective of knowledge, this information was passed on to other watches in different geographical locations within Northern Fire. Topographical organisational memory was also capable of being captured in writing and recorded on hydrant cards. Eight out of 12 stations maintained hydrant cards with details of which hydrants worked best and their location.

> Once a year cos you used to get hydrant cards. I used to pick two or three hydrant cards on an afternoon and I used to go out and I used to walk the routes, each one, lifting the lids, turning them up, digging them out, putting the lid back down, kept a bit of a white sheet, so you knew what was what… and any defective ones.
>
> (Station Manager, Male, 18 years' experience).

The above exchange noted how the Station Manager would consult the hydrant cards and then check whether they were in working order. This information was then recorded and shared amongst watches. Here organisational memory was both maintained but also capable of being recorded in writing and passed on often within (and through) CoP.

> It's called topography, we call it topography, local knowledge. So you go to a job and it might be a massive mill fire and you're thinking oh God where's all water, you might find two or three hydrants that are cr*p. But (name) who's been there before'll know there's a hydrant.
>
> (Fire fighter, Male, 9 years' experience)

The fire fighter above noted that knowledge of working hydrants was maintained within CoP and loss of organisational memory was prevented by sharing it amongst watch members. Fire fighters at all 12 stations made reference to the 'bible.' This was a document compiled by Station Managers containing useful information on a broad range of fire-fighting techniques that might be forgotten. The 'bible' was a means of noting down useful tips and procedures that could be passed on. All 12 stations noted and recorded elements of fire fighting practice that were unusual and capable of being lost from organisational memory.

> We call it the bible and mine got handed down from the guy who was retired and it were basically just a folder and they gave you addresses, left off so and so, right off so and so, second left and it used to tell you where hydrant was as well. But before we had the technology that would have been like the gospel. So that would have been treasured and passed on.
>
> (Station Manager, Male, 18 years' experience)

All 12 stations made reference to the fact that the 'bible' was a useful means of maintaining organisational memory. It could be referred to as a point of reference in difficult or unfamiliar situations. Fire fighters would often update and circulate information from the bible to fire fighters in different watches or geographical areas in Northern Fire. The Station Manager quoted above noted how he would consult the bible for directions or the location of fire hydrants. The bible was an effective way of preserving organisational memories and preventing organisational memory loss. It also demonstrated how in some instances

knowledge that was in jeopardy of being forgotten or that might fade over time was capable of being recorded and written down.

8.4 Intentional Forgetting and Unlearning

Having discussed organisational memory and how this could be maintained within CoP, this section moves forward to discuss intentional forgetting. As discussed in the literature review, ontologically unlearning is often theorised as the deliberate and permanent erasure of existing knowledge. The latter is often viewed in the extant literature as a linear and sequential process; unlearning is often perceived as precedent to learning. However, unlearning did not necessarily manifest itself as the deliberate discarding of existing work based knowledge which was then replaced with new knowledge. Rather unlearning was often a dialectical and iterative process; fire fighters situated within CoP made sense of new knowledge and the transition between forgetting old techniques and adopting new ones. Accordingly, new knowledge was acquired and absorbed in conjunction with existing stocks of knowledge that in time were either fully or partially forgotten. In some circumstances unlearning preceded learning, but this was not always the case.

The notion of unlearning operated within a continuum and could be categorised as ‘soft’ or ‘hard’ unlearning. ‘Soft’ unlearning within Northern Fire occurred when existing work based practices, routines or knowledge were replaced entirely with new knowledge. Unlearning was categorised as ‘soft’ because the discarding or erasure of knowledge was a relatively easy and straightforward process; practically new knowledge easily replaced existing stocks of knowledge. ‘Soft’ unlearning could be placed at one end of a continuum as representing knowledge that was easy to discard or erase from organisational memory. ‘Hard’ unlearning was more problematic and manifested itself when old routines or knowledge proved difficult to discard. Often technological failures meant that unlearning was frustrated; fire fighters retained elements of ‘old’ knowledge during the process of unlearning. In some circumstances the retention of ‘old’ knowledge helped facilitate the acquisition or application of new knowledge. Often fire fighters would make a value judgment call as to the efficacy or utility of new knowledge. Again this judgment was made by fire fighters within their CoP and could delay the

process of unlearning by manifesting itself in a reluctance to give up existing work based practice. This evidenced the notion of fire fighters as thinking professionals who would not necessarily accept normative rules or procedures without reflecting upon and in some instances challenging them.

8.5 'Soft' Unlearning and Deliberate Forgetting

During the conduct of this research Northern Fire undertook a substantive review of all its operational fire fighting policy documentation. The purpose of the review was to streamline policy documents to make them more manageable and to ensure that they reflected best practice to ensure fire fighter safety. The review was undertaken by the ACO, DCO, and CFO and then communicated to all stations.

> To review the whole suite of national operational guidance, erm a very sequential process, project managed by the London Fire Brigade, to look at the extended guidance that's out there and for instance I believe the numbers that are often quoted there are 8,000 documents, publications, pieces of law that are appertained by the Fire and Rescue Service some of which are hopelessly out of date.
>
> (Incoming DCO, Male, 28 years' experience)

Practices or procedures that were outdated, rarely consulted or used were examples of 'soft' unlearning. They were easy to remove from organisational memory and in some instances were replaced with new knowledge whilst on other occasions simply discarded.

> Is it current? Does it reflect best practice? No - basically re-write the whole lot so that is quite a linear process that is ongoing at the moment, for example there is a piece of guidance about hazardous materials which shows the best way to deal with metal on fire is to shovel on powdered asbestos.
>
> (Incoming DCO, Male, 28 years' experience)

The incoming DCO noted how using powdered asbestos was clearly no longer good practice. Interviews revealed that fire fighters were aware of this reference in the hazardous material policies and manuals and viewed it with amusement. It was easy to forget or discard elements of practice that were clearly anachronistic or dangerous.

> Well book eleven in particular, so like I've done my FE (firemanship) exams. So they refer to book eleven, they keep referring back to this book eleven, you've got to read this. And in book eleven they talk about percolating hose. Now percolating hoses haven't been in this brigade in forty years, probably since when your Dad [points to colleague] first started. You know and it's gone, it's obsolete.
>
> (Fire fighter, Male, 7 years' experience)

The fire fighter above noted how the Manuals of Firemanship referred to using percolating hoses which have a distinct nossle and water distribution mechanism. However, percolating hoses have not been used by Northern Fire since the mid-seventies. Data indicates that this type of unlearning was easy to achieve. Even though fire fighters were referred to the use of certain equipment or fire-fighting techniques during training, this type of knowledge was easy to discard and forget as it was clearly antiquated and of no practical use. CoP facilitated the unlearning process as often when fire fighters returned from training or assessments they would share new knowledge within the CoP. Antiquated, obsolete or dangerous elements of fire-fighting practice were discussed within CoP and a consensus reached to discard existing knowledge and learn to forget it. This was often an iterative and dialectical process.

A further example of 'soft' unlearning related to the Cleveland Load. The Cleveland Load is a technique originating from America where fire fighters coil and recoil hose reel into a tightly packed structure. This can then be picked up by fire fighters and taken to the top of high-rise buildings or apartment blocks. The Cleveland Load replaces the old technique of laying out fire hose at the entry point of a building and adding further extensions until the top of a building is

reached. This is often dangerous with the hose getting stuck or objects pressing upon the hose that cause significant drops in water pressure. Louise's challenges with losing the hose reel and forgetting to wedge doors to stop the hose kinking were set out in Chapter Six. Data obtained from all 12 stations revealed that unlearning the old hose reel technique and learning the new one was a straightforward process. This was an example of 'soft' unlearning where old knowledge was easily discarded in its entirety for the acquisition of new knowledge.

> Yeah it works. It's kind of more difficult in as much you have to roll the hose in a certain way, you have to change it in a certain way. There's new things to learn, but everyone's forgotten the old ways, just like that because the old way was a pain in the ar*e to be fair. So if yeah, so if… It is easy to move on, even though for the last twenty year's people having been rolling hoes out like this, they'll pick up something new straight away cos it's great.
>
> (Fire fighter, Male, 14 years' experience)

The fire fighter above noted how old and deeply embedded work practice could be discarded quickly and replaced with new knowledge. The process of unlearning was easier because the new technique of rolling a hose was much more efficient than the previous one. Data obtained from all 12 stations demonstrates that 'soft' unlearning was often successful when new knowledge was easy to assimilate and was viewed as being beneficial to every day fire fighters' practice.

> When we're fighting high-rise fires we use the Cleveland Load. It's like you carry it up on your shoulder and put it down so it keeps its shape and then you can walk down with it. So that's been really well received because…it works (laughter).
>
> (Station Manager, Male, 18 years' experience)

The Station Manager above noted the utility of the new hose rolling technique and how because it worked well in practice the assimilation of new knowledge was easier. Unlearning was facilitated by new knowledge having an almost immediate practical benefit. This helped the process of forgetting the old ways of rolling hose and adopting the new one. Again this process occurred within fire fighters' CoP as old knowledge was replaced with new.

8.6 'Hard' Unlearning and Learning To Forget

This section now moves forward to discuss 'hard' unlearning where the abandonment or discarding of old knowledge manifested itself as more problematic. Here unlearning was not a linear or straightforward process; unlearning was not precedent to the acquisition of new knowledge and it could occur in isolation. Fire fighters within their CoP often gave up existing practices because they were deemed ineffective or obsolete due to technological advances. Further, unlearning as a process did not necessarily mean that all existing knowledge had to be replaced with new knowledge. Often unlearning was facilitated by retaining some elements of old knowledge alongside elements of new knowledge. Indeed this was often necessary to ensure fire fighter safety with 'old' knowledge acting as a fall back should technology or systems fail. Very often unlearning was often subject to value judgments being made by fire fighters as to the benefit or utility of new technology or alterations to core policies or procedures.

On some occasions conflict could arise within CoP where the acquisition of new knowledge meant discarding old knowledge which some members of the CoP did not wish to relinquish. Where fire fighters felt there was little benefit in acquiring new knowledge the process of unlearning was made more difficult. Here unlearning took much longer and changing work practices and dislodging organisational memory was far harder.

> We had two retirees recently, one of them, who only retired last week. He was a very good firefighter and he's dragged me round quite a few fires and through different scenarios and he was very old school. And whenever new stuff came out he'd be, oh bloody hell why have we got this, it's stupid

> [mock voice]. Well when I joined we didn't have to do this, you can't put a fire out with a computer [mock voice]. And you think well, [says name] it were thirty three years ago. He was a classic example, he learnt something, was very, very good at it, wouldn't let go of it.
>
> (Station Manager, Male, 18 years' experience)

The Station Manager above noted how two retiring fire fighters were reluctant to adopt new work practices on the basis that they questioned their usefulness or value. Discarding 'old' knowledge in favour of 'new' knowledge was made more difficult by value judgments being placed on the utility of new procedures. This was exacerbated by the fact that both fire fighters were exceptionally competent and experienced members of their CoP. Data from all 12 stations revealed that it was not just older fire fighters who were reluctant to let go of existing knowledge but younger ones too.

> Yeah. Nine times out of ten the old way wouldn't be the wrong way.
>
> (Fire fighter, Male, 9 years' experience)

The fire fighter above referred to the fact that previous knowledge or practice was often viewed as being sufficient or adequate. There was a general sense that fire fighting was a practical occupation and technical innovations or improvements were not necessarily that beneficial. A common obstacle to discarding existing knowledge derived from a mistrust in new technology. Fire fighters were concerned that forgetting old practices and procedures in favour of new technology might compromise their or the public's safety. Running parallel to this was that fire fighters within their CoP took great pride in their job and viewed it as a skill or craft. Data from all 12 stations revealed that some fire fighters felt new technological advances were at odds with the basic craft of fire fighting. This made unlearning much harder to achieve. The retention of some 'old' knowledge often helped facilitate acquisition of 'new' knowledge.

> If you know the old way and the new way's not working, you can always adapt it. You know, with a lot of things we adapt in this job, sometimes, you know you've got to do sometimes. Whereas if you know two ways, then you can maybe merge the two together and get a solution.
>
> (Fire fighter, Male, 14 years' experience)

The fire fighter above noted how new working practices sometimes did not work and the process of unlearning included adaptation of existing practices. Here unlearning was not always a case of discarding old knowledge and replacing it with new knowledge. Rather the process of unlearning included retaining some elements of existing knowledge or adapting existing work practices to incorporate new knowledge. Unlearning did not necessarily manifest itself as a binary choice between 'old and new' knowledge. During the conduct of the research Northern Fire adopted a new electronic rota system for all fire stations. Previously Station Managers had maintained a white board or book in each station and would note which crew members were on duty, their shift patterns and holiday periods. This manual system dated back to the early 1970's. One of its key components was making sure that there were always enough fire fighters on duty to fight fires and that their contact details in case of emergency were accurate and up to date. During the roll out of the new system there were a number of technical glitches and errors.

> Before we used to have book in the front office, we used to write on your availability for the week in pen, in this book and it was done and this electronic version came on. And it seemed like a nightmare didn't it, all of us we were like scratching our heads and I don't know whether it's cos with our job, a lot of the time, it's rolled out, stuff's rolled out that hasn't been fully tested, or isn't the full package and there's always teething problems in it. And that's why, I think a lot of the time we're reluctant to forget what we've been taught before.
>
> (Station Manager, Male, 18 years' experience)

Data from all 12 stations revealed that ‘hard’ unlearning did not result in completely discarding or erasing all knowledge of the ‘old’ system. Rather this process took several months and here unlearning did not result in deliberate erasure of all knowledge of the previous system. A total of nine stations confirmed that they still relied upon writing down rotas and shift patterns in conjunction with new system. The Station Manager above referred to technical problems with the new system that frustrated the process of unlearning. Here unlearning did not manifest itself as a linear or sequential process and nor did it involve the complete discarding of old knowledge or practice. Rather unlearning involved retaining elements of existing knowledge alongside the acquisition of new knowledge. Practically this was often borne out of necessity due to new systems or computer software not working properly and fire fighters being unable to rely upon them. Unlearning took longer and became more problematic whilst technical issues were being worked out. Once the new electronic rota system was working fire fighters began to unlearn and discard the old system and adopt the new one.

8.7 Breathing Apparatus Training

This section now moves forward to discuss the introduction of new BA equipment in Northern Fire. As discussed in the previous contextual chapter, the new BA system replaced the old one by measuring fire fighters’ air and work rate levels. A telemetry board would monitor how much compressed air was being used and calculate exactly when a fire fighter should leave a burning building. The ‘old’ BA system was manual and relied upon a Station Manager or experienced fire fighter calculating air levels and when fire fighters should leave. This information was recorded on a chalk board and a whistle used to warn fire fighters that air levels were running low. The old BA system was deemed unsafe and inefficient; it was unclear how much air was being used at any given time and often fire fighters could not hear the warning whistle. Fire fighters had used the old BA system for decades and had to ‘unlearn’ their former working practice and ‘learn’ the new one.

> I’m sure it will be better, I’m sure it will be better. But it’s that going from one to the other isn’t it when you’ve had it for twenty odd years writing it

> all down. All of a sudden you're going from that to some machine that's now telling you how…. what a wearer's using and is it right, you know?
>
> (Station Manager, Male 19 years' experience)

Often with 'hard' unlearning there was not necessarily a correlation between the difficulty in giving up knowledge and the length of time knowledge was used. The longer knowledge was used or relied upon did not always result in it being harder to relinquish or forget. The Station Manager above noted that the difficulty in unlearning the old BA procedure was not the fact that he had used this for over twenty years, but rather because he was suspicious of the new technology and its efficacy. Fire fighters who wore BA sets voiced concern over their own safety if the technology were to fail.

> It's gone from belt and braces writing it down and working it out yourself, to relying on computer.
>
> (Fire fighter, Male, nine years' experience)

The fire fighter above had used the 'old' BA system for just over nine years. Unlearning and acquiring knowledge of the new BA system was compromised because there was a concern it might not work. During the conduct of the research Northern Fire was rolling out the new BA system to its stations. Of all 12 stations only the busiest station had already adopted the new BA system and unlearnt the old one. Participant observation at stations revealed that operating two conflicting operating systems made the process of unlearning much harder and problematic. Fire fighters at those stations that were in the process of adopting the new BA system noted how the lack of a clear break and demarcation from old knowledge to new knowledge made unlearning more difficult.

> We're running with one, but we've got another one sort of running in the background and then come January, we're gonna have to go forget everything we've learnt about the old one and go with the new one.
>
> (Fire fighter, Male, 14 years' experience)

The above fire fighter noted the practical difficulty in utilising two different BA systems during the roll out period. This made unlearning more difficult.

> We're supposed to go live with these telemetry sets tomorrow, but they haven't got any sets to give us because they're defective, so it's gonna be later on in the week.
>
> (Station Manager, Male, fourteen years' experience)

The above Station Manager noted how a lack of physical kit meant that his crew could not use the new BA system. Unlearning was compromised and knowledge of the old BA system was retained until new telemetry boards were obtained. Unlearning did not manifest itself as linear or sequential; it was an iterative process. Further, unlearning was not perceived in binary terms with 'old' knowledge being viewed as 'good' or 'bad.' Fire fighters at all 12 stations saw the benefits of the new BA system in terms of fire fighter safety but also acknowledged the utility of the existing system.

Data from all stations noted how the old BA system was eventually unlearnt but that unlearning did not manifest itself in the complete discarding of prior knowledge. Some prior knowledge was retained and this actually assisted the process of unlearning.

> And things can get forgotten, oh I forgot about that and then that… but you always remember how… What your training was.
>
> (Fire fighter, Female, 7 years' experience)

Unlearning was often an iterative process that took time. When fire fighters forgot new knowledge or operating procedures they would often revert back to knowledge acquired during their initial training. Unlearning involved an oscillation back and forth between old and new knowledge until new knowledge became embedded. The above fire fighter noted how he forgot elements of the new BA system and in particular how to operate the new oxygen calculation systems on

the telemetry board. However, he had not forgotten oxygen calculations in his initial training.

Participant observation of Red Watch revealed how unlearning occurred within CoP. Fire fighters would physically take apart and reassemble the new BA telemetry board and get to grips with it as part of the unlearning process. Once they were confident that the system could be relied upon it was easier to let go of previous knowledge.

> But we haven't got the information to say 'yeah it could be the wiring and that's why it's not charging' or what cos they never told us. We found the orange colour, it were the old wiring had been rigged up wrong, but we didn't know, why would we know cos it's brand new. So then there's all different colours flashing at different times, we haven't got a clue…
>
> (Fire fighter, Female, 7 years' experience)

Data from all 12 stations revealed problems with an orange light flashing on the telemetry board. This did not interfere with the software and hence was largely ignored by fire fighters. Participant observation at Red Watch witnessed fire fighters as a CoP taking the board apart to work out the reason for the flashing light. The fire fighter above managed to establish that the orange light was flashing due to incorrect wiring within the telemetry board itself. Unlearning within the CoP was improved as confidence in the new system increased. This helped the process of unlearning and forgetting the old BA procedures.

Data obtained from all 12 stations noted that the simplicity of the old BA system was attractive to fire fighters. It also symobolised traditional fire fighting techniques and fire fighters within their CoP took pride in the assumption of responsibility for monitoring oxygen levels for their colleagues.

> In the past everyone was the same. So everyone put a set on and the old style, you used to look at the average person consuming air. So 300 bar, it gave you 20 minutes. So if you went in at three o'clock, you'd be coming out by twenty past.

(Station Manager, Male, 18 years' experience)

The new BA system required an understanding of the computer software contained within the new telemetry board. In addition, the switching on and off of face masks and oxygen tasks involved new procedures that replaced the previous ones. The Station Manager above noted how oxygen consumption was calculated as an average and how all fire fighters used the same system. Participant observation revealed that the new telemetry boards often suffered from technical faults and fire fighters frequently went back and used the 'old' BA system.

> Well problem with BA now is, if you have a board failure, you need to revert back to the old system. So you need that knowledge of both systems for it to work successfully, cos all it takes is, if you've forgot the old stuff and your board faults then you need to revert back to it.
>
> (Fire fighter, Male, nine years' experience)

Again unlearning here was not a linear or sequential process; fire fighters used both systems simultaneously whilst technical issues were being resolved. Further, unlearning did not manifest itself as discarding 'old' BA knowledge and replacing it with knowledge of the 'new' BA system. Prior knowledge was important in understanding the new system and helped contextualise the assimilation of the new technology. Assimilation and understanding of the new software and BA technology occurred and was situated within CoP.

> We're going over… We're changing that procedure, so that one has been re-vamped and now we're trying to get our heads around the new procedures, which seem to be taking a lot of our time.
>
> (Fire fighter, Male, 14 years' experience)

The fire fighter above noted how he, together with other members of his CoP, worked through the process of unlearning together. This was a time consuming process and one in which unlearning manifested itself as a dialectical and

iterative process. There was a sense of unease at all 12 stations that the traditional methods of fire fighting were being eroded. Often the new BA system was viewed as being unreliable and hence unlearning the old system became more problematic.

> Well it depends what it is really to be honest. BA is kind of almost there as a backup, you don't want to forget that…
> The only problem will come probably in when they start recruiting again, they starting learn all this electronic, press a button, the computer will say yes or no.
> And if it's not been taught that you'd have to physically calculate if something goes wrong with that.
>
> (Station Manager, Male, 18 years' experience)

The Station Manager quoted above noted that it was possible in the future to have a generation of new fire fighters who had never calculated oxygen levels manually and who were completely reliant on the new computer system. This sentiment was acknowledged at all of the other sixteen fire stations where traditional means of fire fighting were perceived as being eroded. There was a reluctance to give up and unlearn old knowledge of the BA system on this basis. Fire fighters were encouraged to 'learn to forget' by Station Managers and Senior Management and let go of previous operational or technical practice. Data suggests that this was often a dialectical process that occurred within CoP over time. Fire fighters would make sense of the new system and adapt; unlearning was often a process of evolution and not revolution.

> But they will come up with new fandangled ideas and it's kind of going to be more effective long term for the future than the current system. I am sorry but I think the sign of the times are that people feel obliged to change, but the new BA procedures I think the old ones were effective and efficient and now the new system, ok we are adapting…
>
> (Station Manager, Male, fourteen years' experience)

The Station Manager above noted how the new BA system would prove beneficial in the long term. However, there was a sense that the old system was still a good one. Fire fighters within CoP unlearnt over time with a steady and processural move towards the new system whilst forgetting and unlearning parts of the old system. As unlearning occurred with CoP, there were differences and distinctions in how the process manifested itself. Frequently unlearning involved different interpretations and applications of the new BA system. These were not uniform and some stations unlearnt far more quickly than others.

> But then again you see, that happens all the time, but then two different shifts will use it in two different ways... They'll find something with it, they'll start using it one way and then we'll start using it another way.
>
> (Station Manager, Male, 18 years' experience)

The Station Manager above noted how different watches of fire fighters utilised the new BA system differently during the roll out period of the new BA system. Ultimately there evolved a uniform application of the new system that all watches adhered to. The process of unlearning within CoP involved sharing knowledge and understanding of the new system amongst each other and across stations within Northern Fire's geographical location. Unlearning the old system and learning the new one and embedding it was not an instantaneous or linear process. Often fire fighters had to be encouraged to discard organisational memory and 'learn to forget.' This was facilitated by Station Managers who encouraged watches to exclusively use the new BA technology and dispense with the old BA operating techniques.

8.8 Summary

This final empirical chapter has considered organisational memory and the circumstances in which knowledge may be forgotten either deliberately or accidentally. In doing so this chapter has addressed the third research question, namely how does organisational memory loss and unlearning effect knowledge transfer? This final empirical chapter seeks to make a contribution to our existing

understanding of voluntary and involuntary organisational memory loss on a number of fronts. At a macro level there is a paucity of empirical studies on organisational memory loss. The dominant focus within the extant knowledge management literature has been on new learning and the acquisition of new knowledge. There do not appear to be any empirical studies of unlearning situated within the UK Fire and Rescue Service. During the conduct of this research Northern Fire experienced flooding on an almost biblical scale. In addition, it introduced new BA techniques that replaced old BA apparatus and training that dated back to the mid-seventies. Running parallel to this there was a substantive reduction in the number of fires being attended by watches within Northern Fire. House fires that were once an every-day experience became less common and prevalent; fire fighters had to learn vicariously through others experience. Organisational memory loss could be prevented by narrative and storytelling situated within CoP. Skills and practices such as dealing with chimney fires or topography were capable of being recorded in writing and passed on. Ontologically organisational memories could be captured, noted down and passed on to future generations of fire fighters.

In some circumstances skills and practices that were used infrequently were capable of being forgotten. During the conduct of the research Northern Fire responded to dangerous and unprecedented flooding on Boxing Day 2015. Some fire fighters had ‘forgotten’ how to deal with floods and many had no prior experience of flooding. The experience of flooding was captured via narrative and storytelling. Organisational memory was preserved and passed on to other fire fighters within Northern Fire; fire fighters with no experience of flooding learnt through the cumulative experiences of others. This represented a huge shift in practice within Northern Fire and was also representative of national trends within the UK Fire and Rescue Service.

Often deliberate or voluntary memory loss was not a linear or sequential process. Rather unlearning was an iterative process that involved giving up some but not necessarily all existing stocks of knowledge. Ontologically unlearning did not necessarily manifest itself as discarding or abandoning existing knowledge. Nomenclature within the normative knowledge management literature suggests

unlearning is ‘deliberate’ and uses adjectives such as ‘discarding,’ ‘deleting’ or ‘abandoning’ to describe the process. Data suggests that in some instances ‘old’ knowledge was completely discarded in favour of new knowledge. However, this was not always the case and some elements of old knowledge helped with the acquisition of new knowledge.

Data suggests that unlearning may be categorised as either ‘soft’ or ‘hard.’ ‘Soft unlearning occurred when old knowledge was relatively easy to remove and was instantaneous. Often this occurred within the framework of a straight swap between old and new knowledge or working practices. However, ‘soft’ unlearning did not always involve acquiring new knowledge; often it manifested itself with the discarding of existing knowledge that was never replaced. ‘Hard’ unlearning was more problematic and occurred when existing knowledge was hard to dislodge or discard. In some circumstances value judgments were placed on the efficacy of technological advances or changes to procedures. This did not thwart or stop unlearning but rather meant that unlearning took longer to achieve. Unlearning occurred within CoP and it was through this medium that fire fighters made sense of new knowledge and began the process of forgetting. In some circumstances fire fighters needed to be encouraged to ‘learn to forget.’ They needed to be reminded and encouraged to commence the process of letting go of old stocks of knowledge and fully adopt and instigate new technology or operational procedures. This manifested itself as a dialectical process that often took time. On some occasions unlearning meant the total elimination of old knowledge whilst in others it manifested itself in retaining some old knowledge alongside new knowledge. This thesis now moves forward to set out and explore the discussions and conclusions arising from the research.

9. Discussion and Conclusions

9.1 Introduction

This final chapter moves forward to explore and discuss the data presented in the three previous empirical chapters. It investigates the findings and how they align or depart from the extant knowledge management literature. What we know about the UK Fire and Rescue Service is limited as only a few studies have been conducted. An overarching empirical contribution is made by extending, deepening and augmenting our understanding of how fire fighters share knowledge. A core tenet of the thesis is conceptualising fire fighters as thinking professionals. As such, they utilised all forms of knowledge in performance of their duties. Discretion was selectively exercised in choosing which type of knowledge to draw upon in certain situations whilst in others it was not. This could impact upon knowledge transfer both positively and negatively.

The research has borrowed from Orr (1996) in using ethnography to observe how knowledge was transferred within CoPs. A number of discrete epistemic contributions are made in relation to power, CoPs and organisational memory. These are more fully discussed below. The research is not limited to just its empirical and theoretical contributions; it has considerable impact and the potential to save lives. By virtue of sharing valuable experiential knowledge and retaining organisational memory the safety of both the public and fire fighters are improved. A number of recommendations for sharing tacit knowledge were adopted by Northern Fire as part of an overall review of its strategic command and leadership process. The impact of the research and adoption of some of the findings are set out below.

This final chapter is structured as follows. Firstly, the empirical and theoretical contributions are laid out. Secondly, possible avenues for future research are explored. Thirdly, the limitations and impact of the research are discussed. This chapter then draws to a close with a discussion on generalizability of the findings and some final conclusions.

9.2 Communities of Practice: Power, Participation and Trust

This section discusses and explores the findings around the first primary research question namely how communities of CoP facilitate knowledge transfer and in what circumstances. This is addressed by two discrete theoretical contributions and one empirical one. As discussed in Chapter 2, what we know about knowledge transfer in the UK Fire and Rescue Service is very limited. An overarching empirical contribution is made by this study in understanding how fire fighters within CoP share knowledge. Existing studies have not considered the role of CoPs in knowledge transfer. The main focus has revolved around the role of critical decision making tools by Incident Commanders in simulated fire environments. Hatton-Cohen and Honey's (2015) detailed empirical analysis of decisions taken by Incident Commanders during 'live' and simulated fires does not address the role of CoP in knowledge transfer. Similarly, Okoli et al.'s (2014; 2016) empirical analysis of Nigerian and UK fire fighters looked at how critical decision making tools were used as a mechanism for understanding why decisions were taken on the fire ground. It referenced the importance of tacit knowledge for fire fighters but went no further. This study has specifically considered the role of CoPs in the transfer of tacit knowledge. Chapter 6 noted how it was through narrative and storytelling that fire fighters transferred knowledge both tacit and explicit. This aligns with the normative position in the literature where narrative is often a successful means of transferring knowledge and sharing expertise (Lave and Wenger, 1991; Orr, 1996; Eraut, 2000).

Two specific theoretical contributions are made in relation to the existing CoP literature. The first relates to LPP which is the bedrock of situated learning. Here the novice acquires skills and knowledge from an experienced 'old timer'. Lave and Wenger (1991) posit that skills are acquired situationally and where the novice moves in a centripetal manner from periphery to core. As discussed in Chapter 3, LPP has been subject to much criticism (Fuller and Unwin, 2004; Fuller, 2007; Grugulis and Stoyanova, 2011). A key epistemic contribution is made by extending our understanding of LPP and how it impacts upon knowledge transfer. Interestingly LPP was not centripetal but rather radial; knowledge flowed back and forth from novice to 'old timer'. Here both the 'old timer' and novice

learnt from each other; this was a two-way bilateral process. Chapter 6 noted how the introduction of a probationary fire fighter on secondment was beneficial to the CoP. LPP was a two-way process with more established fire fighters learning from novices. This departs from Lave and Wenger's (1991) notion of LPP as being centripetal only. The freeze on fire fighter recruitment and the absence of probationary fire fighters at Northern Fire meant that a vital link to LPP was missing. LPP is predicated upon having a novice present in the first instance. However, often there were no novices to pass skills and knowledge on to which resulted in a stagnation within CoPs. Practically this meant that LPP sometimes acted as a barrier to knowledge transfer and not an enabler. The findings extend the notion of the 'missing middle' to include a 'missing beginning' (Grugulis and Stoyanova, 2011). At Northern Fire the absence of probationary fire fighters meant that often 'old timers' had no one to pass their skills on to. Grugulis and Stoyanova (2011) noted how an incomplete group (novices and experts but no journeymen) impacted upon LPP. Similarly, this study noted how an incomplete group (experts but no novice) also impacted upon LPP and the way CoPs functioned.

This also impacted upon the presupposition that expert knowledge is always possessed by 'old timers' (Lave and Wenger, 1991; Fuller and Unwin, 2004). The findings depart from and challenge this perspective. Often novices displayed the very latest fire fighting skills and knowledge that more experienced fire fighters had either forgotten or were not exposed to during their training. From an epistemic standpoint, the research extends Fuller and Unwin's (2004) notion of challenging the validity of the novice / expert dichotomy. Fire fighters who were experienced and established members of CoPs often acquired new technical knowledge from newcomers; they were not necessarily omniscient experts.

The second theoretical contribution is a rebuttal of the idea that continuity and displacement within CoPs is ultimately a harmonious process. Whilst Lave and Wenger (1991) note the disruption caused by the introduction and replacement of new members of a CoP, this is portrayed in a benign way. Ultimately new members will replace 'old timers' and establish themselves within a reconstituted and stable CoP. Chapter 6 noted changes to the senior management CoP where

the outgoing DCO was replaced by the new incoming DCO. The process was messy and difficult with the existing members resisting change and seeking to maintain the status quo. Lave and Wenger's (1991) notion of a smooth and harmonious transition whilst the constitution of a CoP changes was not borne out. The reality at Northern Fire was the antithesis of this. It took some time for differences of opinion to be worked out and in some instances this acted as a barrier to knowledge transfer.

9.3 Explicit Knowledge Transfer: Facilitating Transfer and Exchange

This section moves forward to explore the findings around the second primary research question, namely what are the barriers and enablers to the transfer of explicit knowledge? As discussed in Chapter 7, Northern Fire relied heavily upon the sender / receiver model of transfer (Szulanski, 1996; Collins, 2010). The data aligns with the normative ontological position that Northern Fire dealt with explicit knowledge as an object that could be passed back and forth instantaneously without much dilution (Szulanski, 1996; Cook and Brown, 1999; Hislop, 2010). Northern Fire's approach to explicit knowledge was analogous to a football that could be passed between stations and fire fighters with the locus of control always vesting in it. However, the data departs from the dominant epistemic views expressed in the knowledge management literature. Explicit knowledge was not preferred or privileged over its tacit component (Cook and Brown, 1999; Eraut, 2000; Schultze and Stabell, 2004). Nor was knowledge viewed in binary terms or viewed as a means of conferring competitive advantage (Grant, 1996; Spender, 1996). Rather, explicit knowledge was theorised through a lens of mitigating litigation risks, audit and ensuring compliance. Policies were 'pushed' down the hierarchical chain to Station Managers, fire fighters and support staff to demonstrate that changes to procedure or legislation had been communicated and then complied with. This aligns more with Power's (1999) notion of an 'audit society' where power is often expressed via a process of audit and verification. Knowledge was not conceptualised as fitting neatly into either an epistemology of possession or practice (Cook and Brown,1999; Schultze and Stabbell, 2004; Strati, 2007; Nicolini, 2011). Rather the sender / receiver model was used to prove policies had been sent out and that fire fighters had received them.

Establishing an evidential chain that could be relied upon was of paramount importance to Northern Fire.

The transfer of explicit codified knowledge was successful in circumstances whereby all forms of knowing were accounted for and recognised. The data does not support the view that explicit knowledge transfer can always be instantaneous and passed from sender to receiver without diminution or dilution (Szulanski, 1996; Cook and Brown; 1999; Collins, 2010). Where the tacit element of knowing was ignored or marginalised the transfer of explicit codified knowledge was less successful. This aligns with Polanyi's (1958) exposition of personal knowing where individuals draw upon all forms of knowledge and where a wholly explicit knowledge is unthinkable.

A leitmotif of this thesis is the idea of fire fighters acting as thinking professionals who utilised all forms of knowledge in their everyday praxis. Acting as a thinking professional often involved exercising discretion; variations around the use of discretion could impact upon knowledge transfer. Fire fighters focused upon getting the job done successfully and in achieving a positive outcome. This could result in departing from standard policies and procedures. Chapter 7 noted how in some circumstances discretion was actively encouraged whilst in others it was not. The second vignette described how the Station Manager structured training seminars to facilitate critical discussion. Fire fighters were encouraged to use their own judgment in interpreting operational policy. However, senior managers in tackling the blaze at Hammond Mill did not exercise any discretion and nor were they encouraged to. They strictly adhered to formal operational policy and guidelines and elected not to draw upon the experiential knowledge of senior colleagues. Ultimately this decision had a negative impact on knowledge transfer and led to the destruction of the mill.

Chapter 2 noted how there are relatively few empirical studies on power. Moreover, few studies consider the relationship between power and knowledge transfer or adopt a Foucauldian lens to help understand power and its impact upon knowledge transfer (Foucault, 1977; Liao, 2008; Heizmann, 2011). Similarly, the existing empirical studies on the UK Fire and Rescue Service do not consider power or its effect upon knowledge transfer (Okoli et al. 2014;

Cohen-Hatton and Honey, 2015; Cohen-Hatton et al. 2015). This thesis makes a unique contribution to knowledge by extending our understanding of how power relations affect knowledge transfer in the UK Fire and Rescue Service. More particularly, an epistemic contribution is made by theorising the relationship between power and trust as a dyadic one. The data supports the assertion that when trust levels were high the transfer of explicit knowledge was more effective. Conversely, where trust levels were low the transfer of explicit knowledge was less effective.

9.4 Organisational Memory: Unlearning and Learning to Forget

The third primary research question asked how organisational memory and unlearning effect knowledge transfer? This section moves forward to explore the findings regarding unlearning and its relationship with knowledge transfer. Chapter 3 noted that there are relatively few empirical studies of unlearning (Becker, 2010; De Holan and Phillips, 2011). What we know about unlearning from an ontological and epistemic perspective is limited (Tsang and Zahra, 2008; Becker, 2010; Hislop et al. 2014). More specifically none of the existing empirical studies on the UK Fire and Rescue Service consider organisational memory loss (Okoli et al. 2014; Cohen-Hatton and Honey, 2015; Cohen-Hatton et al. 2015) Both Okoli et al. (2014) and Cohen-Hatton and Honey's (2015) empirical studies note the huge reduction in UK fires but neither study considers organisational memory loss or how to prevent it. A unique empirical contribution to knowledge is made by considering how fire fighters unlearn work based practices and techniques whilst also acquiring new ones. This research has explored unlearning from the vantage point of individuals acting collectively within (and through) CoP. It has also explored how, and in what circumstances, fire fighters can mitigate involuntary memory loss and its nexus with knowledge transfer. As outlined in Chapter 5, Northern Fire has seen a significant reduction in exposure to real fires; fire fighters have had to learn vicariously through the experience of others. A significant practical contribution arises from the findings. By understanding how fire fighters share, retain and pass on experiential knowledge the safety of fire fighters and the public is enhanced and improved.

The literature on the nexus between tacit knowledge and organisational memory is underdeveloped and often referred to only tangentially or briefly (Tsang and Sara, 2008; Hislop, 2010; Easterby-Smith and Lyles, 2011). There has been a focus on the conversion of tacit knowledge into an explicit form or its capture or codification (Nonaka, 1994; Nonaka and Von Krogh, 2009). However, the relationship between tacit knowledge and organisational memory remains largely underdeveloped (Casey and Olivera, 2010). A key contribution of this thesis is the finding that via narrative and storytelling fire fighters were able to ameliorate knowledge loss and decay. This often manifested itself in transferring tacit skills and knowledge within CoP; some of this was written down and passed on whilst some was shared orally. Accordingly, sharing tacit skills, know-how and best practice helped fire fighters reduce organisational memory loss. This aligns with Orr's (1996) ethnography of photocopier repair personnel who would swap 'war' stories on faulty machines and discuss the diagnosis of possible faults with each other.

Three specific theoretical contributions are made to the existing literature and epistemic understanding of organisational memory loss. Firstly, the dominant position in relation to voluntary organisational memory loss is that unlearning amounts to an intentional act where knowledge is discarded. Ontologically adjectives such as 'discard,' 'eliminate' or 'abandon' are often used to describe the process of unlearning (Hedberg, 1981; Nystrom and Starbuck, 1984; Tsang and Zara, 2008; Hislop, 2010). However, unlearning within Northern Fire did not necessarily result in the deliberate abandonment of 'old' knowledge in favour of 'new' knowledge. Unlearning manifested itself a dialectical and iterative process where old and new knowledge were used alongside each other.

Secondly, from an epistemic perspective how we theorise deliberate unlearning could be better clarified (Hedberg, 1981; Nystrom and Starbuck, 1984). Often unlearning has been theorised as occurring as precedent to the acquisition of new knowledge. Unlearning is often perceived as linear or sequential with unlearning occurring before acquiring new knowledge or skills (Hedberg, 1981; Klein, 1989). The data from this study does not support this premise. Unlearning did not have to precede the acquisition of new knowledge; rather unlearning

manifested itself as an iterative and dialectical process. Unlearning could occur in isolation and without acquiring any new knowledge; equally unlearning did not need to occur before the acquisition of new skills. As discussed in Chapter 8, fire fighters in Red Watch did not unlearn the 'old' BA techniques which were then neatly and sequentially replaced with 'new' ones. Rather unlearning was often messy, heuristic and involved a process of critical reflection as fire fighters compared and contrasted the old way of doing things with the new.

Thirdly, a key theoretical contribution is made by adding two new typologies of organisational forgetting. As discussed Chapter 3, De Holan and Phillips (2004) place organisational forgetting into four taxonomies. Involuntary or accidental memory loss is attributed to either memory decay or a failure to capture knowledge. Voluntary or deliberate unlearning is attributed to either the purposeful and deliberate removal of knowledge or removing knowledge to avoid bad habits in organisations.

This research adds two new typologies in how we might theorise organisational forgetting. The first relates to involuntary memory loss and the second to voluntary memory loss. With regards to involuntary memory loss, De Holan and Phillip's (2004) typology may be extended to include 'lost opportunity.' Organisational memory of dealing with fires in Northern Fire eroded due to a loss of opportunity. Fire fighters could not retain some fire fighting skills and knowledge as the opportunity to exercise and retain those core skills was greatly diminished. Chapter 8 noted how this mainly applied to serious fires but also with regards to dealing with floods and chimney fires. Vital skills were sometimes lost due to a lack of opportunity to practice or use them in the first instance. Here organisational memory was accidentally lost due to a lack of opportunity to engage in certain elements of everyday fire fighters' praxis.

With regards to deliberate or voluntary memory loss, De Holan and Phillip's (2004) typology may be extended to include 'readjustive unlearning.' Here unlearning manifests itself as a process of readjustment. This was achieved not by the deliberate erosion or discarding of all existing 'old' knowledge. Rather some elements of 'old' knowledge were retained alongside the acquisition of 'new' knowledge. This helped to contextualise and assimilate new knowledge and

give it meaning. Readjustive unlearning may be theorised as an iterative and dialectical process. It may also be theorised as either ‘hard’ or ‘soft.’ Unlearning may be ‘soft’ where ‘old’ knowledge and practices are easy to dislodge and remove. ‘Hard’ unlearning occurred where giving up old knowledge was more problematic as everyday activities were deeply embedded and difficult to give up. Chapter 8 noted how fire fighters could forget old knowledge more easily where new knowledge made their working lives easier, safer or more efficient. The notion of unlearning as a process of readjustment extends and further develops Klein’s (1989) idea of parenthesis where old working practices were placed to one side whilst new ones were acquired.

9.5 Limitations and Generalisation

As discussed in Chapter 4, this research has used a single longitudinal case study to explore knowledge transfer within Northern Fire. It offers an in depth account of fire fighters’ lived experiences and has adopted Stake’s (2005) notion of using case study research to generate small analytical generalisations but not statistical ones (Eisenhardt, 1989; Yin, 1989; Stake, 2005).

A corollary of a single case study approach is that there may difficulties in generalising some of the findings. It is acknowledged that the findings are in many ways unique to Northern Fire particularly and more generally to the UK Fire and Rescue Service. Accordingly, they may not be readily transposable to other industry sectors or organisations. That said adopting Stake’s (1995) notion of small analytic generalisations, some of the findings may well be applicable to the entire UK Fire and Rescue Service and also the wider UK emergency services. The findings regarding the barriers and enablers to explicit knowledge transfer may well be applicable to other UK Fire and Rescue Services. They may well have experienced some of the challenges and difficulties faced by Northern Fire. Equally, as all UK fire fighters operate in a Watch, the findings regarding knowledge transfer within (and through) CoPs may also be capable of analytic generalisation.

The findings regarding the deployment, resistance and acquiescence to power within CoPs of fire fighters may be capable of application in other UK Fire and Rescue Services. This is because they all operate within the National Operating

Guidelines discussed in Chapter 5 as well as their own standard operational policy documents. Accordingly, how power was resisted and deployed to comply with these regulations may well have applicability to other UK Fire and Rescue Services. The findings make a broad contribution to the CoP literature and expands upon what we already know about CoP. In particular, how CoP transfer knowledge, create meaning and deal with issues such as conflict and power (Lave and Wenger, 1991; Roberts, 2006; Fuller, 2007; Heizmann). The findings around these areas may well be capable of generalisation and be applicable to other CoPs in a wide variety of contextual and industry settings.

As discussed in Chapter 3, what we know regarding unlearning, whether voluntarily or involuntarily, is limited. There is a dearth of empirical studies on unlearning generally. From an epistemic perspective there is considerable scope for a more precise theoretical understanding and definition of how unlearning manifests itself. The two new suggested typologies of unlearning as 'lost opportunity' and 'readjustive unlearning' may be applied analytically to help explore unlearning in other organisations. Many organisations face significant challenges with retaining essential elements of organisational memory whilst also attempting to remove knowledge that is no longer useful or which impedes organisational performance. Equally, many companies and professions encounter situations where organisational memory is lost due to lost opportunity. Surgeons who rarely perform certain surgical procedures and emergency service responses to acts of terrorism are examples of where organisational memory may be lost due to loss of opportunity to engage in a certain praxis or activity. The findings on organisational memory loss from this thesis may well have analytic generalisation in such circumstances.

9.6 Areas for Future Research

The findings explored and enunciated in this research open up some fruitful avenues for possible future research into knowledge transfer and CoP. These relate to the CoP literature generally and also the extant literature on knowledge transfer in the UK Fire and Rescue Service. As a general observation, what we know regarding knowledge transfer in the UK Fire and Rescue Service is limited and arguably an under researched area. Chapter 2 noted how the scope of

existing empirical studies is quite narrow. There is a tendency to focus upon goal-orientated training and its effect on the decision making processes for Incident Commanders (Okoli et al. 2014; Hatton-Cohen and Honey; 2015; Hatton-Cohen et al. 2015). The role of tacit knowledge and skills on Incident Commanders' decision making processes could be further explored as this is not currently dealt with. In particular, whether and to what extent tacit skills and knowledge impacted or effected Incident Commanders' decision making when dealing with fires or rescues could be further explored. Equally, as fire fighters operate within CoPs it seems incongruous that extant literature on the UK Fire and Rescue Service does not consider the role of CoPs at all. Further research into how fire fighters and also senior management operate within CoP and how knowledge is both transferred and created would be beneficial. Turning to the CoP literature more generally there is still a paucity of studies which consider power or its effect on knowledge transfer; further research in this sphere would augment existing studies and understanding (Roberts, 2006; Heizmann, 2011). This thesis has challenged the normative position regarding LPP as a mechanism for knowledge transfer. In doing so it has critiqued the novice / expert dichotomy as being misleading; often novices entering CoP have additional or different skills and knowledge to the expert (Fuller and Unwin, 2004). Similarly, LPP and the CoP model is predicated on having an expert to consult with and learn from (Lave and Wenger, 1991; Grugulis and Stoyanova, 2011). Further empirical research into how knowledge transfer is effected by the novice / expert dichotomy and the absence of an experienced ‘‘old timer’’ to consult with is a fecund and interesting area for future research.

9.7 Research Impact

This research has had impact upon how Northern Fire deals with tacit knowledge and skills amongst front line fire fighters. It also arguably has much wider societal impact by virtue of being able to potentially save lives. Sharing tacit knowledge and skills on key areas of praxis like BA or search and rescue techniques can have profound and far reaching consequences. It could result in rescuing casualties more quickly and limiting exposure to danger for front line fire fighters. As discussed in Chapter 5, a quid pro quo for being granted access was the

drafting of a Management Report setting out the key research findings. The Management Report was presented to the Management Board of Northern Fire on 4 April 2017. It recommended a number of improvements to current knowledge management within Northern Fire. The key recommendations in relation to tacit knowledge were as follows:

- A central online repository for fire fighters to post summaries and descriptions of tacit skills and knowledge from both serious and mundane incidents.
- The Incident Sheet filled out after every attendance by fire fighter crews to include a blank text box entitled 'Experiential Learning.' Here fire fighters could share and articulate experiential knowledge of fires and rescues.
- The use of video recordings to make short videos of staff retelling their experiences attending serious and unpredictable incidents such as flooding, terrorism or major fires. These would be disseminated via the intranet to stations to pass on tacit knowledge and skills. It would also be shared with other fire brigades.

The Management Board of Northern Fire elected to instigate the findings as part of its overall command and leadership management review. This thesis arguably has significant impact as the research findings have potential to result in improving the sharing and dissemination of knowledge (both tacit and explicit) in the fourth largest UK Fire and Rescue Service.

9.8 Conclusion

This research has considered knowledge transfer and the barriers to such transfer situated within (and through) CoP. It has offered an arguably unique and unprecedented account of how fire fighters in the fourth largest UK Fire and Rescue Service share and construct knowledge in their everyday lives. Extant studies on the UK Fire and Rescue Service are scant; what we know about how knowledge is transferred is limited and opaque. This thesis has shed light on the working lives and practices of front line fire fighters, senior management and support staff. A longitudinal ethnographic study has been utilised to understand the 'how' and 'why' of knowledge transfer to produce a rich and vivid account of life at Northern Fire.

It is argued that Polanyi's (1958) account of personal knowing has been misconstrued and misappropriated in the knowledge management literature. There has been a focus on the conversion of tacit knowledge into its explicit counterpart often to gain competitive advantage. This focus is both myopic and misconstrued. Polanyi's detailed exposition of personal knowing was not anchored by notions of conversion or the superiority of one form of knowledge over another. Rather, for Polanyi knowledge is anchored epistemologically via the connection between tacit and explicit knowledge. This manifests itself as deeply embedded in human activity and via a commitment to personal knowing. A key axiom of this thesis is to argue that to understand tacit knowledge a more careful and faithful appraisal of Polanyi is required. Rather than fixating upon placing knowledge in rigid taxonomies, or attempting to convert tacit knowledge into a more explicit form, we should concentrate upon personal knowing. Some knowledge is not capable of articulation or dissemination; to borrow from Polanyi humans no much more than they can tell. By focusing on skilful performance of human activities situated within CoP, there is arguably a more fecund and useful approach to understanding knowledge and its transfer.

The findings have contributed to a much deeper and nuanced theoretical understanding of CoPs. They have set out in some detail how CoP share and construct knowledge and the barriers to transfer. The research has also explored and expanded our understanding of LPP. The normative position of the novice moving from periphery to core of a CoP has been challenged. Equally, the novice / expert dichotomy has been questioned as often probationary fire fighters rejuvenated CoP, acted as catalysts for the recall of tacit knowledge and imparted knowledge to ‘‘old timer's.' The thesis has also expanded upon our empirical understanding of power and conflict within CoP. This has arguably been underrepresented in the extant literature. Moreover, using a Foucauldian (1977) lens to theorise power and understand both its deployment and resistance is a perspective not previously adopted when studying the Fire and Rescue Service. The thesis has augmented and added to a fairly barren field regarding organisational memory loss. It offers a unique empirical account of how organisational memory was lost or depleted on both a voluntary and involuntary

basis and what could be done to ameliorate this. As discussed above, the research has extended existing typologies of organisational memory loss to include lost opportunity and readjustive unlearning.

Helping fire fighters share valuable experiential knowledge and prevent organisational memory loss matters profoundly. The findings presented here are of great importance. They have the potential to keep fire fighters and the public safe and prevent unnecessary loss of life.

References

Akgun, A.E., Byrne, J.C., Lynn, G.S. and Keskin, H. (2007). Organisational Unlearning as Changes in Beliefs and Routines in Organisations. *Journal of Organisational Change Management*. **20(6)**, pp.974-812.

Alvesson, M. (2003). Beyond Neo-Positivists, Romantics and Localists: A Reflexive Approach to Interviews in Organizational Research. Academy of Management Review. **28(1)**, pp. 13-33.

Alvesson, M. and Skoldberg, K. (2009). Reflexive Methodology: New Vistas for Qualitative Research (2nd ed.). Sage Publications Limited.

Archer, M. (2003). Structure, Agency and the Internal Conversation. Cambridge: Cambridge University Press.

Bain, G. (2002). The Future of the Fire Service: Reducing Risk, Saving Lives. [Online]. [Accessed on 8 August 2017]. Available from:webarchive.nationalarchives.gov.uk/+/http:/www.communities.gov.uk/fire/../future.

Bakhtin, M.M. (1986). Speech Genres and Other Late Essays. Austin: University of Texas Press.

Baumard, P. and Starbuck, W.H. (2005). Learning from Failures: Why it May Not Happen. *Long Range Planning*. **38**, pp.281-298.

Becker, K. (2010). Facilitating Unlearning During Implementation of New Technology. *Journal of Organizational Change Management*. **23(3)**, pp.251-268.

Berger, P. and Luckmann, T. (1966). The Social Construction of Reality: A Treatise in the Sociology of Knowledge. Penguin Books.

Bernard, H.R. and Ryan, G. W. (2010). Analysing Qualitative Data: Systematic Approaches. Thousand Oaks, CA: Sage.

Bettiol, M. and Sedita, S.R. (2011). The Role of Community of Practice in Developing Creative Industry Projects. *International Journal of Project Management*. **29**, pp.468 – 479.

Bhardwaj, M. and Monin, J. (2006). Tacit to Explicit: An Interplay Shaping Organization Knowledge. *Journal of Knowledge Management*. **10(3)**, pp.72-85.

Bhaskar, R. (1975). A Realist Theory of Science, London: Verso.

Boddy, C. (2005). A Rose by Any Other Name May Smell as Sweet But “Group Discussion” Is Not Another Name For “Focus Group” Nor Should It Be. *Qualitative Market Research*. **8(3)**, pp.248-255.

Brannan, M.J. and Oultram, T. (2012). Participant Observation. In: Symon, G. and Castell, C., *Qualitative Organizational Research Core Methods and Current Challenges*. Sage Publications Limited.

Brinkmann, S. and Kvale, S. (2005). Confronting The Ethics of Qualitative Research. *Journal of Constructivist Psychology*. **18**, pp. 157-181.

Brown, J.S. and Duguid, P. (1991) Organizational Learning and Communities of Practice: Toward a Unified View of Working, Learning and Innovation. *Organization Science*. **2**, pp.40-57.

Brown, J.S. and Duguid, P. (1998), Organizing Knowledge. *Californian Management Review*. **40(3)**, pp. 90-111.

Brown, J.S. and Duguid, P. (2001). Knowledge and Organization: A Social-Practice Perspective. *Organization Science*. **12(2)**, pp. 198-213.

Brown, P. and Hesketh, A. (2004). The Mismanagement of Talent: Employability and Jobs in the Knowledge Economy. Oxford: Oxford University Press.

Garfinkel, H. (1967). Studies in Ethnomethodology. Englewood Cliffs, NJ: Prentice-Hall.

Golden-Biddle, K. and Locke, K. (1993). Appealing Work: An Investigation of How Ethnographic Texts Convince. *Organization Science*. **4(4)**, pp. 595-616.

Blackler, F. (1995). Knowledge, Knowledge Work and Organizations: An Overview and Interpretation. *Organization Studies*. **16(6)**, pp. 1021-1046.

Burr, V. (2003). Social Constructionism (2nd Ed). London: Routledge.

Carley, K. (1992). Organizational Learning and Personnel Turnover. *Organization Science*. **3(1)**, pp. 20-46.

Casey, A.J. and Olivera, F. (2010). Reflections On Organizational Memory and Forgetting. *Journal of Management Inquiry*. **20(3)**, pp.301-310.

Cegarra-Navarro, J.G. and Moya, B.R. (2005). Business Performance Management and Unlearning Process. *Knowledge and Process Management*. **12(3)**, pp.161-70.

Chiravuri, A., Nazareth, D. and Ramamurthy, K. (2011). Cognitive Conflict and Consensus Generation in Virtual Teams during Knowledge Capture: Comparative Effectiveness of Techniques. *Journal of Management Information Systems*. **28(1)**, pp.311-350.

Clegg, S.R. (1989). Frameworks of Power. London: Sage Publications Limited.

Clegg, S.R. and Hardy, C. (1996). Representations. In: Clegg, S.R., Hardy, C. and Nord, F. (eds). *Handbook of Organization Studies*. London: Sage Publications Limited, pp.676-708.

Clifford, J. (1986). Introduction: Partial Truths. In: J. Clifford and G. Marcus. (eds). *Writing Culture: The Poetics and Politics of Ethnography*. Berkeley: University of California Press, pp.1-26.

Cohen-Hatton, S.R. and Honey, R.C. (2015). Goal-Orientated Training Affects Decision-Making Processes in Virtual and Simulated Fire and Rescue Environments. *Journal of Experimental Psychology*. **21(4)**, pp.395-406.

Cohen-Hatton, S.R., Butler, P.C. and Honey, R.C. (2015). An Investigation of Operational Decision Making In Situ: Incident Command In The UK Fire and Rescue Service. *Human Factors*. **57**, pp.793-804.

Contu, A. and Willmott, H. (2003). Re-Embedding Situatedness: the Importance of Power Relations in Learning Theory. *Organization Science*. **14(3)**, pp.283-296.

Contu, A. (2014). On Boundaries and Difference: Communities of Practice and Power Relations in Creative Work. *Management Learning*. **45(3)**, pp. 289-316.

Cook, S.D.N. and Brown, J.S. (1999). Bridging Epistemologies: The Generative Dance Between Organizational Knowledge and Organizational Knowing. *Organization Science*. **10(4)**, pp.381-400.

Collins, H. (2010). Tacit and Explicit Knowledge. The University of Chicago Press.

Collins, H. (2007). Bicycling on the Moon: Collective Tacit Knowledge and Somatic-Limit Tacit Knowledge. *Organization Studies*. **28(2)**, pp.257-262.

Corradi, G., Gherardi, S. and Verzelloni, L. (2010). Through the Practice Lens: Where Is the Bandwagon of Practice Based Studies Heading? *Management Learning*. **41(3)**, pp. 265-283.

Court, D. and Abbas, R. (2013). Whose Interviews Is It, Anyway? Methodological Challenges of Insider-Outsider Research, Multiple Languages, And Dual-Researcher Cooperation. *Qualitative Inquiry*. **19(6)**, pp.480-488.

Covaleski, M.A., Dirsmith, M.W., Heian, J.B. and Samuel, S. (1998). The Calculated and the Avowed: Techniques of Discipline and Struggles Over Identity in Big Six Public Accounting Firms. *Administrative Science Quarterly*. **43(2)**, pp.293-327.

Creswell, J.W. (2013). Qualitative Inquiry and Research Design: Choosing Among Five Approaches (3rd ed). Los Angeles: Sage.

Cunliffe, A.L. (2002). Social Poetics as Management Inquiry a Dialogical Approach. *Journal of Management Inquiry*. **11(2)**, pp. 128-146.

Cunliffe, A.L. (2008). Orientations to Social Constructionism and its Implications for Knowledge and Learning. *Management Learning*. **39(2)**, pp.123-139.

Cunliffe, A.L. (2010) Retelling Tales off The Field: In Search of Organisational Ethnography 20 Years On. *Organizational Research Methods*. **13(2)**, pp.224-39.

Davenport, T. H and Prusak, L. (1998). Working Knowledge: How Organizations Manage What They Know. Harvard Business School Press, Boston, MA.

Danermark, B., Ekstrom, M., Jakobsen, L. and Karlsson, J.C. (2002). Explaining Society: Critical Realism In The Social Sciences. Routledge, London and New York.

Denzin, N.K. (2001). The Reflexive Interview and A Performative Social Science. *Qualitative Research*. **1(1)**, pp.23-46.

Derrida, J. (1976). Of Grammatology. Baltimore, MD: Johns Hopkins University Press.

Descartes, R. (2008). Meditations on First Philosophy with Selections from the Objections and Replies. Oxford World Classics.

Descola, P. (1996). The Spears of Twilight: Life And Death In the Amazon Jungle. London: Harper Collins.

Dierksmeier, C. (2013). Kant on Virtue. *Journal of Business Ethics*. **113(4)**, pp.597-609.

Durkheim, E. (1952). Suicide: A Study in Sociology. Routledge, London and New York.

Easterby-Smith, M., Antonacopoulou, E., Simm, D. and Lyles, M. (2004). Constructing Contributions to Organizational Learning: Argyris and the Next Generation. *Management Learning*. **35(4)**, pp.371-380.

Edwards, P.K. and Collinson, M. (2002). Empowerment and Managerial Labor Strategies. *Work and Occupations*. **29(3)**, pp.271-90.

Edwards, P.K. (2006). Power and Ideology in the Workplace: Beyond Even the Second Version of the Three-Dimensional View. *Work, Employment and Society*. **20(3)**, pp.571-581.

Eraut, M., Alderton, J., Cole, G. and Senker, P. (1998). Learning from Other People at Work. In: Coffield, F. (ed.). *Learning at Work*. Bristol, The Policy Press, pp.231-262.

Eraut, M. (2000). Non-formal Learning and Tacit Knowledge in Professional Work. *British Journal of Educational Psychology*. **70(1)**, pp 113-136.

Eraut, M. (2007). Learning from Other People in the Workplace. *Oxford Review of Education*. **3(4)**, pp.403-422.

Fairhurst, G.T. and Grant, D. (2010). The Social Construction of Leadership: A Sailing Guide. *Management Communication Quarterly*. **24(2)**, pp.171-210.

Felstead, A., Fuller, A., Jewson, N. and Unwin, L. (2009). Improving Working as Learning. Routledge: Taylor & Francis Group London and New York.

Fernandez, V. and A. Sune. (2009). Organisational Forgetting and Its Causes: An Empirical Research. *Journal of Organisational Change*. **22(6)**, pp.620-634.

Fincham, R. (2012). Expert Labour as a Differentiated Category: Power, Knowledge and Organisation. *New Technology Work and Employment*. **27(3)**, pp.208-223.

Fiol, C., O'Connor, M., Edward, J. and Aguinis, H. (2001). All For One And One For All? The Development and Transfer of Power Across Organizational Levels. *Academy of Management Review*. **26(2)**, pp.224-242.

Fleetwood, S. (2001). Causal Laws, Functional Relations and Tendencies. *Review of Political Economy*. **13(2)**, pp.201-20.

Fleming, P., Harley, B. and Sewell, G. (2004). A Little Knowledge is a Dangerous Thing: Getting Below the Surface of the Growth in "Knowledge Work" in Australia. *Work, Employment and Society*. **18(4)**, pp.725-747.

Foucault, M. (1977). Power / Knowledge: Selected Interviews & Other Writings 1972 – 1977. Pantheon Books, New York.

Foucault, M. (1979). Discipline and Punish: The Birth of the Prison, Alan Sheridan (trans). New York: Vintage.

Foucault, M. (1990). The History of Sexuality, Volume 1: An Introduction, R. Hurley (trans). New York: Vintage.

French, J.R.P. and Raven, B.H. (1958). Group Support, Legitimate Power and Social Influence. *Journal of Personality*. **26(3)**, pp.400-409.

Frenkel, S., Korczynski, M., Shire, K. and Tam, M. (1998). Beyond Bureaucracy? Work Organisation in Call Centres. *The International Journal of Human Resource Management*. **9(6)**, pp.957-79.

Frost, D. (2007). Frost / Nixon: Behind The Scenes of The Nixon Interviews. Harper Perennial.

Fuller, A. and Unwin, L. (2004). Young People as Teachers and Learners in the Workplace: Challenging the Novice-Expert Dichotomy. *International Journal of Training and Development*. **8(1)**, pp.31-41.

Fuller, A. (2007). Critiquing Theories of Learning and Communities of Practice. In: Hughes, J., Jewson, N. and Unwin, L. (eds). *Communities of Practice, Critical Perspectives*. Routledge.

Geertz, C. (1973). Thick Description: Toward an Interpretative Theory of Culture. *Culture: Critical Concepts in Sociology*. **36(6)**, pp. 1465-1514.

Gergen, K.J. (2015). An Invitation to Social Construction (2nd ed.). SAGE Publications Limited.

Gettier, E. (1963). Is Justified True Belief Knowledge? *Analysis*. **23(6)**, pp.121-23.

Gherardi, S., Nicolini, D. and Odella, F. (1998). Toward a Social Understanding of How People Learn in Organizations: The Notion of Situated Curriculum. *Management Learning*. **29(3)**, pp.273-98.

Gherardi, S. (2009). The Critical Power of the "Practice Lens." *Management Learning*. **40(2)**, pp.115-28.

Gherardi, S. (2000). Practice Based Theorizing On Learning and Knowing In Organizations: An Introduction. *Organization*. **7(2)**, pp.211-23.

Gilmore, S. and Kenny, K. (2015). Work-Worlds Colliding: Self-Reflexivity, Power and Emotion In Organizational Ethnography. *Human Relations*. **6(1)**, pp.55-78.

Gobo, G. (2011). Glocalizing Methodology? The Encounter Between Local Methodologies. *International Journal of Social Research Methodology*. **14(6)**, pp.417-37.

Gory, G.A. (2008). Sharing Knowledge in the Public Sector: Two Case Studies. *Knowledge Management Research and Practice*. **6(2)**, pp. 105-11.

Gourlay, S.N. (2006). Towards Conceptual Clarity for 'Tacit Knowledge': A Review of Empirical Studies. *Knowledge Management Research & Practice*. **4(1)**, pp. 6-69.

Gourlay, S.N. (2004). Knowing as Semiosis: Steps Towards a Reconceptualization of 'Tacit Knowledge.' In: Tsoukas, H. and Mylonopoulos, N. (eds). *Organizations as Knowledge Systems*. Palgrave Macmillan, London, pp.86-105.

Grbich, C. (2013). Qualitative Data Analysis: An Introduction, (2nd ed.). London: Sage.

Grant, R. (1996). Towards a Knowledge Based Theory of the Firm. *Strategic Management Journal*. **17**, pp.109-122.

Grugulis, I. and Stoyanova, D. (2011). The Missing Middle: Communities of Practice in a Freelance Labour Market. *Work Employment and Society*. **25(2)**, pp. 342-351.

Grugulis, I. and Knights, D. (2001). Glossary. *International Journal of Management and Organizations*. **30(4)**, pp.12-24.

Gubrium, J.F. and Holstein, J.A. (2012). Narrative Practice and The Transformation of Interview Subjectivity. In: J.F. Gubrium, J.A. Holstein, A.B.

Marvasti and K.D. McKinney (eds.). *The Sage Handbook of Interview Research. The Complexity of the Craft* (2nd ed). Thousand Oaks, CA: Sage, pp.27-43.

Hacking, I. (1999). The Social Construction of What? Cambridge, MA: Harvard University Press.

Hales, C. (2000). Management and Empowerment Programmes. *Work, Employment and Society*. **14(3)**, pp.501-20.

Haldin-Herrgard, T. (2000). Difficulties in Diffusion of Tacit Knowledge in Organizations. *Journal of Intellectual Capital*. **1(4)**, pp.357-65.

Handley, K., Sturdy, A., Fincham, R. and Clark, T. (2006). Within and Beyond Communities of Practice: Making Sense of Learning Through Participation, Identity and Practice. *Journal of Management Studies*. **43(3)**, pp.641-53.

Hannerz, U. (2003). Being There…And There…And There…! Reflections On Multi-Site Ethnography. *Ethnography*. **4(2)**, pp.201-216.

Hammersley, M. (2007). The Issue of Quality in Qualitative Research. *International Journal of Research & Method in Education*. **30(3)**, p.287.

Hayes, N. and Walsham, G. (2000). Safe Enclaves, Political Enclaves and Knowledge Working. In: Prichard, C., Hull, R., Chumer, M. and Willmott, H. (eds). *Managing Knowledge: Critical Investigations of Work and Learning*. London: Macmillan.

Hedberg, B. (1981). How Organizations Learn and Unlearn. In: Nystrom, P. and Starbuck W. (eds.). *Handbook of Organizational Design*. Oxford, Oxford University Press, pp. 3-27.

Heizmann, H. (2011). Knowledge Sharing in a Dispersed Network of HR Practice: Zooming in on Power / Knowledge Struggles. *Management Learning*. **42(4)**, pp.379-393.

Hesketh, A. and Fleetwood, S. (2006). Beyond Measuring the Human Resources Management-Organizational Performance Link: Applying Critical Realist Meta-Theory. *Organization*. **13(5)**, pp.677-699.

Heyl, B.S. (2005). Ethnographic Interviewing. In: Atkinson, P., Coffey, A., Delamont, S. and Lofland, L. (eds). *Handbook of Ethnography*. Thousand Oaks, CA: Sage, pp.369-383.

Hislop, D. (2013). Third Edition. Knowledge Management in Organizations: A Critical Introduction. Oxford University Press.

Hislop, D., Bosley, S., Coombs, C.R. and Holland, J. (2014). The Process of Individual Unlearning: A Neglected Topic in an Under-Researched Field. *Management Learning*. **45(5)**, pp.540-560.

Ho, S.C., Ting, P.H., Bau, D.Y. and Wei, C.C. (2011). Knowledge Sharing Intention in a Virtual Community: A Study of Participants in the Chinese Wikipedia. *CyberPsychology, Behaviour and Social Networking*. **14(9)**, pp.541-545.

De Holan, P. M. and Phillips, N. (2004). Organizational Forgetting as Strategy. *Strategic Organization*. **2(4)**, pp. 423-433.

De Holan, P.M. and Phillips, N. (2011). Organizational Forgetting. In: Easterby-Smith, M. and Lyles, M.A. (eds). *Handbook of Organizational Learning & Knowledge Management*. (Second Edition). Wiley and Sons Limited, pp.433-451.

Home Office (2016). Fire Statistics Monitor: April 2015 to March 2016. [Online]. [Accessed on 8 August 2017]. Available from: https://www.gov.uk/.../statistics/fire-statistics-monitor-april-2015-to-march-2016

Howells, J. and Scholderer, J. (2016). Forget Unlearning? How An Empirically Unwarranted Concept From Psychology Was Imported To Flourish In Management And Organisation Studies. *Management Learning*. **47(4***)*, pp.443-463.

Huber, G.P. (1991). Organizational Learning: The Contributing Processes and the Literature. *Organization Science*. **2(1)**, pp.88-115.

Hume, D. (2011). The Essential Philosophical Works. Wordsworth Editions Limited.

Irvine, A., Drew, P. and Sainsbury, R. (2013). 'Am I not Answering Your Questions Properly?' Clarification, Adequacy and Responsiveness in Semi-Structured Telephone And Face-To-Face Interviews. *Qualitative Research*. **13(1)**, pp. 87-106.

Jarzabkowski, P., Bednarek, R. and Spee, P. (2015). Making A Market for Acts Of God: The Practice of Risk Trading In the Global Reinsurance Industry. Oxford University Press.

Jarzabkowski, P., Bednarek, R. and Cabantous, L. (2014). Conducting Global Team-Based Ethnography: Methodological Challenges and Practical Methods. *Human Relations*. **66(91)**, pp.3-33.

Jewson, N. (2007). Cultivating Network Analysis: Rethinking the Concept of 'Community' within 'Communities of Practice.' In: Hughes, J., Jewson, N. and Unwin, L. (eds). *Communities of Practice, Critical Perspectives*. Routledge.

Joia, L.A. and Lemos, B. (2010). Relevant Factors for Tacit Knowledge Transfer in Organizations. *Journal of Knowledge Management*. **14(3)**, pp.410-427.

Kant, I. (2007). Critique of Pure Reason, Penguin Classics.

Karreman, D. (2010). The Power of Knowledge: Learning from "Learning by Knowledge-Intensive Firm." *Journal of Management Studies*. **47(7)**, pp.1405-1416.

Kelly, C. (2006). Managing the Relationship Between Knowledge and Power in Organisations. *Aslib Proceedings: New Information Perspectives*. **59(2)**, pp.125-138.

Klein, J. (1989). Parenthetic Learning in Organizations: Towards The Unlearning of The Unlearning Model. *Journal of Management Studies*. **26(3)**, pp.291-308.

Knights, D. (1997). Organization Theory in the Age of Deconstruction: Dualism, Gender and Postmodernism Revisited. *Organization Studies*. **18(1)**, pp.1-19.

Kondo, D. (1990). Crafting Selves: Power, Gender, and Discourses of Identity in a Japanese Workplace. Chicago, IL: University of Chicago Press.

Von Krogh, G. (2011). Knowledge Sharing in Organizations: The Role of Communities of Practice. In: Easterby-Smith, M. and Lyles, M.A. (eds). *Handbook of Organizational Learning & Knowledge Management*. (Second Edition). Wiley and Sons Limited, pp.403-432.

Krueger, R.A. and Casey, M.A. (2009). Focus Groups: A Practical Guide for Applied Research (Fourth Edition). Thousand Oaks, CA: Sage.

Kuhn, T.S. (2012). The Structure of Scientific Revolutions. The University of Chicago Press, Chicago and London.

Kvale, S. (1996). Interviews: An Introduction to Qualitative Research Interviewing. Thousand Oaks, CA: Sage.

Lave, J. and Wenger, E.C. (1991). Situated Learning, Legitimate Peripheral Participation. Cambridge University Press, Cambridge.

Lawrence, T.B., Mauws, M.K., Dyck, B. and Kleysen, R.F. (2005). The Politics of Organizational Learning: Integrating Power onto the 4I Framework. *Academy of Management Review*. **30(1)**, pp. 180-191.

Lawson, C. and Lorenzi, E. (1999). Collective Learning, Tacit Knowledge and Regional Innovative Capacity. *Regional Studies*. **33(4)**, pp. 305-3 17.

Leggett, W. (2017). Politics and Social Theory: The Inescapably Social, the Irreducibly Political. Palgrave Macmillan.

Leidner, R. (1993). Fast Food, Fast Talk: Service Work and the Routinization of Everyday Life. University of California Press.

Leonard, D. and Sensiper, S. (1998). The Role of Tacit Knowledge in Group Innovation. *California Management Review*. **40(3)**, pp.112-32.

Liao, L.F. (2008). Knowledge Sharing in R & D Departments: A Social Power Exchange Theory Perspective. *International Journal of Human Resource Management*. **19(10)**, pp.1881-1895.

Locke, J. (2014). An Essay Concerning Human Understanding. Wordsworth Editions Limited.

Louden, R.B. (1986). Kant's Virtue Ethics. *Philosophy*. **61(238)**, pp.473-489.

Luke, S. (2005). Power A Radical View, Second Edition. Palgrave Macmillan.

Van Maanen, J. (1988). Tales of The Field: On Writing Ethnography. Chicago: University of Chicago Press.

Van Maanen, J. (2011). Ethnography at Work: Some Rules of Engagement. *Journal of Management Studies*. **48(1)**, pp. 218-234.

Marshall, N. and Rollinson, J. (2004). Maybe Bacon Had a Point. The Politics of Interpretation in Collective Sense Making. *British Journal of Management*. **15**, pp. 71-86.

Massingham, P. (2008). Measuring the Impact of Knowledge Loss: More than Ripples on the Pond. *Management Learning*. **39(5)**, pp.541-560.

May, T. (2016). Home Secretary Speech on Fire Reform. [Online]. [Accessed on 8 August 2017]. Available from:

https://www.gov.uk/government/speeches/home-secretary-speech-on-fire-reform.

McAdam, R. and Reid, R. (2000). A Comparison of Public and Private Sector Perception and Use of Knowledge Management. *Journal of European Industrial Training*. **24(6)**, pp.317-29.

McAdam, R., Mason, B. and McCrory, J. (2007). Exploring the Dichotomies Within the Tacit Knowledge Literature: Towards a Process of Tacit Knowing in Organizations. *Journal of Knowledge Management*. **11(2)**, pp. 43-59.

McKinlay, A. and Starkey, K. (1998). Foucault, Management and Organization Theory. London: Sage Publications Limited.

McKinlay, A., Carter, C., Pezet, E. and Clegg, S. (2010). Using Foucault to Make Strategy. *Accounting, Auditing and Accountability Journal*. **23(8)**, pp. 1012-1031.

Mead, G.H. (1934). Mind, Self and Society. Chicago, IL: University of Chicago Press.

Merleau-Ponty, M. (2014). Phenomenology of Perception. Routledge.

Monahan, T. and Fisher, J.A. (2010) Benefits of "Observer Effects": Lessons from the Field. *Qualitative Research*. **10(3)**, pp.357-76.

Mork, B.E., Hoholm, T., Ellingsen, G., Edwin, B. and Aanestad, M. (2010). Challenging Expertise: On Power Relations Within Communities of Practice in Medical Innovation. *Management Learning*. **41(5)**, p.575-592.

Muzio, D. and Kirkpatrick, I. (2011). Introduction: Professions and Organisations: A Conceptual Framework. *Current Sociology*. **59**, pp.389-405.

Muzio, D., Hodgson, D., Faulconbridge, J., Beaverstock, J. and Hall, S. (2011). Towards Corporate Professionalism: The Case of Project Management, Management Consultancy and Executive Search. *Current Sociology*. **59(4)**, pp.443-464.

Newell, S., Scarborough, H., Swan, J. and Hislop, D. (2000). Intranets and Knowledge Management: De-centred Technologies and the Limits of Technological Discourse. In: Pritchard, C., Hull, R., Chumer, M. and Wilmott, H. (eds). *Managing Knowledge: Critical Investigations of Work and Learning*. London: Macmillan, pp.88-106.

Nicolini, D. (2007). Stretching Out and Expanding Medical Practices: The Case of Telemedicine. Human Relations. 60(6), pp.889-920.

Nonaka, I. (1991). The Knowledge Creating Company. *Harvard Business Review*. **69**, pp.96-104.

Nonaka, I. (1994). A Dynamic Theory of Organizational Knowledge Creation. *Organization Science*. **5 (1)**, pp. 14-37.

Nonaka, I. and Takeuchi, H. (1995). The Knowledge Creating Company: How Japanese Companies Create The Dynamics Of Innovation. Oxford University Press.

Nonaka, I. and Von Krogh, G. (2009). Tacit Knowledge and Knowledge Conversion: Controversy and Advancement in Organizational Knowledge Creation Theory. *Organization Science*. **20(3)**, pp.635-652.

Nystrom, P.C. and Starbuck, W.H. (1984). To Avoid Organizational Crisis, Unlearn. *Organizational Dynamics*. **12(4)**, pp.53-65.

Okoli, J.O., Weller, G. and Watt, J. (2014). Eliciting Experts' Knowledge in Emergency Response Organizations. *International Journal of Emergency Services*. **3(2)**, pp.118-130.

Okoli, J.O., Weller, G. and Watt, J. (2016). Dynamic Risk Assessment: The Role of Experience in Fireground Decision Making. *Journal of Risk Management.* **18(1)**, pp.4-25.

Orlikowski, W. (2002). Knowing in Practice: Enacting a Collective Capability in Distributed Organizing. *Organization Science*. **13(3)**, pp.249-73.

Orr, J.E. (1996). Talking About Machines: An Ethnography of A Modern Job. Cornell University Press.

Pfeffer, J. (1992). Understanding Power in Organizations. *California Management Review*. **34(2)**, pp.29-50.

Polanyi, M. (1958). Personal Knowledge: Knowing and Being: Towards a Post-Critical Philosophy. Routledge and Kegan Paul, London.

Polanyi, M. (1966). The Tacit Dimension. Routledge and Kegan Paul, London.

Polsby, N.W. (1963). Community: The Study of Community Power and Political Theory, Second Edition, 1980. New Haven, CT: Yale University Press.

Power, M. (1997). The Audit Society Rituals of Verification. Oxford University Press.

Prahalad, C.K. and Bettis, R.A. (1986). The Dominant Logic: A New Linkage Between Diversity and Performance. *Strategic Management Journal*. **7(6)**, pp.485-501.

Boblin, S.L., Ireland, S., Kirkpatrick, H. and Robertson, K. (2013). Using Stake's Qualitative Case Study Approach to Explore Implementation of Evidence-Based Practice. *Qualitative Health Research*. **23(9)**, pp.1267-1275.

Rao, H., Monin, P. and Durand, R. (2003). Institutional Change in Toque Ville: Nouvelle Cuisine as an Identity Movement in French Gastronomy. *American Journal of Sociology*. **108(4)**, pp.795-844.

Reed, M. (1996). Expert Power and Control in Late Modernity: An Empirical Review and Theoretical Synthesis. *Organization Studies*. **17(4)**, pp.573-597.

Reynolds, M. (2000). Bright Lights and the Pastoral Idyll: Ideas of Community Underlying Management Education. *Management Learning*. **31(1)**, pp.67-82.

Riege, A. and Lindsay, N. (2006). Knowledge Management in the Public Sector: Stakeholder Partnerships in the Public Policy Development. *Journal of Knowledge Management*. **10(3)**, pp.24-39.

Ritzer, G. (2004). The McDonaldization of Society, Revised New Century Edition. Sage Publications Inc.

Roberts, J. (2006). Limits to Communities of Practice. *Journal of Management Studies*. **43(3)**, pp.623-639.

Russell, B. (1961). History of Western Philosophy. Routledge.

Saldana, J. (2005). Theatre of the Oppressed with Children: A Field Experiment. *Youth Theatre Journal*. **19**, pp.117-33.

Saldana, J. (2016). The Coding Manual for Qualitative Researchers. Sage Publications Limited.

Saunders, M., Lewis, P. and Thornhill, A. (2016). Research Methods for Business Students. Pearson Education Limited.

Schultze, U. and Stabbell, C. (2004). Knowing What You Don't Know: Discourse and Contradictions in Knowledge Management Research. *Journal of Management Studies*. *41(4)*, pp. 549-573.

Schutz, A. (1967). Collected Papers, 1. The Problem of Social Reality. The Hague: Nijhoff.

Seba, I. and Rowley, J. (2010). Knowledge Management in UK Police Forces. *Journal of Knowledge Management*. **14(4)**, pp. 611-626.

Sewell, G. (2005). Nice Work? Rethinking Managerial Control in an era of Knowledge Work. *Organization*. **12(5)**, pp.685-704.

Shen, W. and Cannella, A.A. (2002). Power Dynamics within Top Management and their Impacts on CEO Dismissal Followed by Inside Succession. *The Academy of Management Journa*l. **45(6)**, pp.1195-1206.

Shotter, J. (1993). Conversational Realities: Constructing Life Through Language. London: Sage Publications Limited.

Sole, D. and Edmondson, A. (2002). Situated Knowledge and Learning in Dispersed Teams. *British Journal of Management*. **13**, pp.17-34.

Spender, J.C. (1996). Making Knowledge the Basis for a Dynamic Theory of the Firm. *Strategic Management Journa*l. **17**, pp.45-62.

Stake, R.E. (1995). The Art of Case Study Research. Sage Publications Limited.

Stake, R.E. (2005). Qualitative Case Studies. In: N.K. Denzin and Y.K. Lincoln. (eds). *The Sage Handbook of Qualitative Research* (3rd ed). Thousand Oaks CA: Sage, pp.443-466.

Strati, A. (2007). Sensible Knowledge and Practice Based Learning. *Management Learning*. **38(1)**, pp.61-77.

Suchman, L. (1987). Plans and Situated Actions: The Problem of Human Machine Communication. Cambridge University Press, New York.

Szulanski, G. (1996). Exploring Internal Stickiness: Impediments to the Transfer of Best Practice within the Firm. *Strategic Management Journal*. **17**, pp.27-43.

Teddlie, C. and Tashakkori, A. (2009). Foundations of Mixed Methods Research: Integrating Quantitative and Qualitative Approaches In The Social And Behavioral Sciences. Sage Publishing Limited.

Thomas, A. (2016). Independent Review of Conditions of Service for Fire and Rescue Staff in England. [Online]. [Accessed on 8 August 2017]. Available from: https://www.gov.uk/.../conditions-of-service-for-fire-and-rescue-staff-independent-rev.

Thompson, P. (2007). How Much Did the Liberty Shipbuilders Forget? *Management Science*. **53(6)**, pp. 908-918.

Thompson, M.P.A. and Walsham, G. (2004). Placing Knowledge Management in Context. *Journal of Management Studies*. **41**, pp.725-747.

Thompson, P., Warhurst, C. and Callaghan, G. (2001). Ignorant Theory and Knowledgeable Workers: Interrogating the Connections Between Knowledge, Skills and Services. *Journal of Management. Studies*. **38(7)**, pp.923-942.

Townley, B. (1994). Reframing Human Resource Management: Power, Ethics and the Subject at Work. London: Sage Publishing Limited.

Tracy, T.J. (2014). Qualitative Research Methods, Collecting Evidence, Crafting Analysis, Communicating Impact. Wiley-Blackwell.

Travers, M. (2008). Qualitative Research Through Case Studies. Sage Publications Limited.

Tsang, E.W.K. and Zahra, S.A. (2008). Organizational Unlearning. *Human Relations*. **61(10)**, pp.1435-1462.

Tsoukas H. (2003). Do We Really Understand Tacit Knowledge? In: Easterby-Smith, M. and Lyles, M.A. (eds). *The Blackwell Handbook of Organizational Learning and Knowledge Management*. Blackwell Publishing, Oxford, pp.410-27.

Tsoukas, H. and Vladimirou, E. (2001) What Is Organizational Knowledge? *Journal of Management Studies*. **38(7)**, pp.973-993.

Turri, J. (2011). Manifest Failure: The Gettier Problem Solved, *Philosopher's Imprint 11*, No. 8:1-11.

Warhurst, C. and Thompson, P. (1998). Hands, Hearts and Minds: Changing Work and Workers at the End of the Century. In: Thompson, P. and Warhurst, C. (eds). *Workplaces of the Future*. London: Macmillan, pp.1-24.

Watson, T.J. (1994). In Search of Management: Culture, Chaos and Control in Managerial Work. London: Routledge.

Watson, T.J. (2011). Ethnography, Reality and Truth The Vital Need For Studies Of How Things Work In Organizations And Management. *Journal of Management Studies*. **48(1)**, pp.202-217

Whyte, W.F. (1943) Street Corner Society: The Social Structure of an Italian Slum. Chicago: University of Chicago Press.

Willem, A. and Scarbrough, H. (2006). Social Capital and Political Bias in Knowledge Sharing: An Explanatory Study. *Human Relations*. **59(10)**, pp.1343:70.

Weick, K.E. (1995). Sensemaking In Organizations. Thousand Oaks, CA: Sage.

Wenger, E.C. (2005). Communities of Practice: Learning, meaning and Identity. New York and Cambridge: Cambridge University Press.

Wenger, E.C. (1998). Communities of Practice. Learning, Meaning and Identity. Cambridge University Press, Cambridge.

Winch, P. (1958). The Idea of a Social Science and its Relation to Philosophy. Routledge & Kegan Paul Limited.

Wittgenstein, L. (1953). Philosophical Investigations. London: Blackwell.

Yannow, D. (2004). Translating Local Knowledge at Organizational Peripheries. *British Journal of Management*. **15**, pp.71-86.

Yin, R.K. (2009). Case Study Research: Design and Methods (4th ed.). Los Angeles: Sage.

Venikitachalam, K. and Busch, P. (2012). Tacit Knowledge: Review and Possible Research Directions. *Journal of Knowledge Management*. **16(2)**, pp.357 – 372.

Zagzebski, L. (1994). The Inescapability of Gettier Problems. *Philosophical Quarterly*. **44(174)**, pp.65-73.

Zak, M. (1999). Managing Codified Knowledge. *Sloan Management Review*. **40(4)**, pp.45-58.

Appendix A

Focus Group Interview Schedule

Date	Duration	Gender	Watch	Number of Fire fighters
02.12.2015	1 hour 53 minutes	Male	Blue	4
12.12.2015	2 hours 22 minutes	Male	Red	5
20.01.2016	1 hour 51 minutes	Male	White	6
*11.01.2016	1 hour 46 minutes	Male	Red	5
06.01.2016	1 hour 41 minutes	Male	White	5
25.01.2016	2 hours 19 minutes	Male	Red	4
09.01.2016	2 hours 4 minutes	6 Male 1 Female	White	7
17.01.2016	1 hour 35 minutes	Male	Red	4
27.02.2016	1 hour 55 minutes	Male	Red	4
*05.03.2016	2 hours and 17 minutes	6 Male 1 Female	Red	6
19.03.2017	1 hour 52 minutes	Male	Green	4
26.03.2016	1 hour 57 minutes	Male	Red	4
				Total: 58

* Denotes a focus group that was stopped due to an emergency call out and then reconvened when the Watch had returned from that emergency.

Appendix B

Semi-Structured Interview Schedule

Duration	Department	Gender	Job Title
1 hour 17 minutes	Human Resources	Male	HR Director
48 minutes	Senior Management Team	Male	ACO
2 hours 29 minutes	Senior Management Team	Male	DCO
1 hour 52 minutes	Senior Management Team	Male	DCO
2 hours 5 minutes	Senior Management Team	Male	DCO
53 minutes	Fire Protection	Male	Fire Protection Manager
57 minutes	Fire Protection	Male	Fire Protection Officer
48 minutes	Emergency Response Team	Female	Team Leader
56 minutes	Emergency Response Team	Female	Emergency Response Call Handler
1 hour 12 minutes	Fire Prevention	Male	Fire Prevention Manager
55 minutes	Fire Prevention	Male	Fire Prevention Officer
1 hour 57 minutes	Policy & Procurement	Female	Policy Advisor
37 minutes	Policy & Procurement	Male	Manager
36 minutes	Administrative Support	Female	Support Assistant

Appendix C

Participant Observation Schedule

Red Watch

Month	Date	Time
February 2016	Thursday 25th	10.00 am to 12.00 pm
March 2016	Thursday 3rd	10.00 am to 12.00 pm
	Saturday 12th	9.00 am to 12.00 pm
	Saturday 19th	9.00 am to 12.00 pm
April 2016	Thursday 21st	10.00 am to 12.00 pm
	Thursday 28th	10.00 am to 12.00 pm
May 2016	Saturday 7th	9.00 am to 12.00 pm
	Saturday 14th	9.00 am to 12.00 pm
	Sunday 22nd	9.00 am to 12.00 pm
	Monday 23rd	9.00 am to 4.30 pm

Appendix D

RESEARCH BRIEFING NOTE

KNOWLEDGE TRANSFER

[NB: Deleted] AND RESCUE SERVICE

Introduction and Overview

The purpose of this briefing note is to give a general overview of the key elements of the research. It is by no means meant to be comprehensive. Rather it hopefully assists those who are being interviewed and helps focus the mind on the types of questions being asked and topics to be explored.

The research looks at how [NB: deleted] transfers valuable knowledge within the Service. There are two types of knowledge namely explicit and tacit. Explicit knowledge is usually written down, codified and easily transferable. By way of example, explicit knowledge is contained within the Service's training manuals and documents. Tacit knowledge is essentially know how built up over time that is not necessarily capable of being written down. For example, on the job experience or dealing with a major incident involve tacit knowledge. Skill, judgment and actual experience of doing the job often exist in people's heads. One of the key aims of the research is to explore how the Service can best capture and disseminate this type of knowledge. This is particularly relevant given the fact that the number of incidents is generally decreasing. This begs the question how do we capture the experience we currently have in the Service and pass this on?

There may be gaps in knowledge transfer within the service and what the research looks at is how best to address this issue for the benefit of the Service. Equally there may be areas where we are very strong and this needs to be recognized and celebrated.

Interviews

A number of interviews will be conducted with Firefighters and Service Personnel. The interviews will be semi-structured. This means that questions will follow a

general structure but be flexible so that individual responses can be fully explored. Interviews will be conducted at Fire Stations across the region and also at Service Headquarters.

The main topic areas for discussion are as follows:

- How we transfer explicit knowledge in the Service;
- How is this passed on through the organization (e.g. from FDS to individual stations) and how effective this is;
- How effective is knowledge transfer through specific training (e.g. BA, CARP or Building Construction);
- How effectively do manuals or guides transfer knowledge;
- Given the reduced number of incidents, how do we transfer tacit skills and knowledge as groups or ‘communities of practice’;
- How effective is this and how might we improve;
- How can we encourage experiential learning from incidents given the above;
- What does the Service ‘forget’ (i.e. organizational memory) and also ‘retain’;
- What are the thoughts, perceptions and feelings of Firefighters and Service Personnel that arise from the above.

Confidentiality is very important so that interview participants feel free to contribute within a free and safe space. All interview participants will be anonymized and their identities will not be revealed or mentioned. Interviews will be recorded and then transcribed so that the data collected during the research can be fully analyzed

<u>Observation</u>

The research will be conducted over a period of approximately six months. As part of that process it is anticipated that some observations of work and learning at Fire Stations will be conducted. This will help better understand the knowledge transfer process and how experiential learning actually takes place.

Written report

Upon completion of the research a detailed Management Report will be submitted to the Service. This will include a detailed breakdown of all the data and make recommendations (where necessary) and observations on knowledge transfer within the Service. All data collected from interviews and observation will be included in the final report.

Appendix E
BA Assessment Criteria

Breathing Apparatus Training & Assessment (BATA) 2016 -2017

This is a 1 day course designed to give operational personnel relevant input and updates on changes to BA procedures. This course is also designed to assess operational personnel on their practical ability and knowledge of BA procedures. Practical scenarios will give crews the opportunity to wear BA in live fire scenarios, and also to demonstrate other practical applications of BA procedures.

Knowledge and understanding of Operational Guidance for Breathing Apparatus, Operational Procedure 30 (Breathing apparatus) and Operational Procedure 32 (ventilation) is required along with BTB 13 – BA equipment prior to attendance. The course will provide up to date information and highlight best practice whilst wearing Breathing Apparatus.

This is a mandatory course that all personnel MUST attend on a 1 yearly basis. Watches will be nominated and joining instructions sent accordingly, however the occasion will arise when some shift based personnel don't attend along with their watch due to leave etc. Should this happen it is the responsibility of the Watch Manager to ensure the individual nominates themselves for a catch up course through SAP.

If you have any questions or need additional support throughout the course please contact the BA Department or Email

Joining Instructions

Prior to attending this course all delegates must complete the BATA course pre-learning PowerPoints these can be located on the firespace - BA Training page → Courses → BATA Course Pre-Learning 2016-2017
Upon completion delegates are required to sign for the Pre-Learning in their individual EMOC records, this is found in the –
View Units/Training → View Units →(Area)Presentation Awareness →(Unit)Breathing Apparatus Pre-Learning section of the EMOC's.

This course will take place at Training Centre.

Appliances to arrive no later than 08:55hrs. The course will commence promptly at 09:00hrs.

Upon arrival delegates are to make their way to the BA classroom, fire kit is to be placed in the drying room located behind the BA classroom.

Delegates will be required to wear a long sleeved fire service top under your fire kit during the live fire exercises, there will be multiple live fire exercises so it is advised that additional/spare undergarments (long sleeve t-shirt & trousers) and fire-fighting gloves are brought when attending this course.

The BA block has showering facilities and you are invited to use them after each day however you will need to bring your own towels and toiletries. Lockers are provided for valuables.

Individuals – Please use the entrance from Whitehall Road and park in the main car park.
Appliances - Please use the entrance from Bradford Road and park on the drill square between the Technical Rescue Training Building and the fire attack box

For further information contact: [ ] or [ ] [ ] or [ ]

Special Requirements

Please let us know if there is anything you need which will enable you to participate fully in the training session, such as reasonable adjustments. If you require reasonable adjustments please contact either [ ], [ ] or the Workforce Development team in confidence on [ ] to discuss further.

Course Timetable

09:00 – Commencement of course/course Introduction

Morning Session – Branch Techniques Session

- This session will be lead by the WBAI of the attending crew(s), if the WBAI is not present or the attending crew do not have a WBAI the CC or WC will take on this role.
- The WBAI will be required to run a 20 minute session on branch techniuqes, they must include in this session: -
  - How to effectively test a branch
  - How to effectively control the branch by adjusting the settings
  - How to rectify a branch that has been placed in the flush position
  - Demonstrate the different gas cooling techniques:
    - Short Pulse
    - Long Pulse
    - Painting (Direct water application to the fire)
    - Arcing
    - Figure 8
    - Safety Zone
  - Demonstrate a knowledge and understanding of water application
  - Hands on practice for each delegate with coaching and instruction as required

- Fire Attack Exercise (Live Fire)

- During this exercise delegates will be assessed on their ability to demonstrate
  - Correct Start-up procedure
  - Door entry procedures
  - Effective branch techniques to deal with flammable gases
  - Safe advancement through a fire compartment
  - Effective branch techniques when applying water directly onto a fire
  - How to safely exit a fire compartment

Mid-Morning Session – Fire Science Lesson

- During this lesson delegets will discuss the various elements of fire science relevant to fire-fighting, this lesson will involve demonstrations of explosive limits, backdraught and other practical demonstrations.

Afternoon Session – Live Fire Scenario Based Exercise

- During this sesson all delegates will be observed and assessed in the following areas: -
  - Correct Start-up procedure
  - Door Entry
  - Branch Techniques
  - Use of Thermal Image Camera
  - Casualty Handling
  - Stairs Procedure
  - Search Techniques