

# **Assessing Safety Culture and Safety Performance in a High Hazard Industry**

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**Thesis Submitted to the University of Nottingham for the  
Degree of Doctor of Applied Psychology**

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# Abstract

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In the UK 27 million working days are lost due to work-related illness or injury; at an estimate of £13.4 billion to the economy. Over the last 30 years researchers have examined safety culture and its relationship to poor safety performance. An organisation in the high hazard construction industry wanted to understand the factors that shaped and influenced safety performance and safety culture. This thesis details a research project which addresses that aim. A multi-method, triangulated approach was adopted combining both qualitative (focus groups and interviews) and quantitative (safety climate questionnaire) methods. The results of the qualitative studies informed the development of the safety climate questionnaire that included a measure of self-reported accidents and near misses.

The qualitative studies identified 6 main themes; *Communication, Leadership, Employee Engagement & Involvement, Safety Prioritisation, Job Demands* and *Culture*. Quantitative study results show, Upward Communication, Perceived Organisational Support (POS), Employee Engagement, Leader Member Exchange (LMX) and Organisational Commitment demonstrate a significant relationship with Safety Climate. Safety Climate, POS had a significant, positive, predictive relationship with both accidents and near misses reported. Upward communication had a significant, negative, predictive relationship with accidents and near misses. LMX and Organisational Commitment show a significant, negative, predictive relationship with accidents reported only.

Results can be explained in the context of social exchange relationships. Reporting behaviour is being measured, this can be conceptualised as organisational safety citizenship behaviour. The probability of increasing or reducing reporting behaviours is shaped by social exchanges such as; a) the degree that employees feel supported by the organisation, b) and their manager, c) the safety climate, d) their commitment levels e) and opportunities to raise safety concerns. Interventions should aim to develop leaders and organisational practices to be more supportive, to increase reporting behaviour and to create a more accurate picture of safety performance.

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# Chapter 1: Introduction

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## 1.1. Introduction

This chapter introduces the concept of safety climate and culture, organisational safety performance and its real world significance. The chapter outlines the emergence of the Ph.D. thesis and details the sponsor organisation where the research was conducted. The chapter also outlines the challenges of industry, academic collaborations in the context of this thesis. The chapter concludes with the overview of the general aims of the thesis and the thesis structure.

## 1.2. Emergence of the Ph.D.

The author spent a number of years working in industry as a consultant for Right Management, part of the Manpower Group, a global consultancy providing workforce solutions. During her time there she built up a number of relationships with key personal in large PLC's. Driven by her passion for research to practice, she decided to undertake a Ph.D. at the Institute of Work Health and Organisations at the University of Nottingham. It was through her existing relationship with the Health and Safety Director of the sponsor organisation, that an opportunity for some 'real word' research was identified. The Health and Safety Director wished to understand the factors that were influencing safety culture and safety performance in the sponsor organisation. The Ph.D. developed as a collaborative research project between at the Institute of Work Health and Organisations and the sponsor organisation. The sponsor organisation operated in a high hazard construction engineering industry. The following sections discuss the real world significance of the research followed by an overview of the sponsor organisation.

### 1.3. Preface

Every day globally 6,300 people die as a result of occupational accidents or work-related diseases. There are 317 million accidents at work annually with 2.3 million deaths per year as a result of workplace accidents. Loss of life is compounded by the financial cost of incidents and accidents. The estimated economic burden of poor occupational safety and health practices is estimated at 4 per cent of global Gross Domestic Product each year (ILO).

According to the Health and Safety Authority (HSE) each working day in the UK, at least one person will lose their life as a direct result of their work activities (HSE, 2009). In the UK, 27 million working days are lost due to work-related illness or injury, and workplace injury and ill health cost the UK an estimated £13.4 billion (HSE, 2012). Whilst there have been reductions in the number and rate of injury in the construction industry over the last 20 years, in the UK it still remains a high risk industry. While the industry only accounts for about 5% of the working population, in the UK it is still responsible for 22% of all fatal injuries (HSE, 2012).

The last 30 years has seen a shift in focus for occupational safety. There has been a move away from the technical explanations of accident causation to examining the organisational causes of incidents (Reason, 1990) in particular an organisation's safety culture. This shift in focus was as a result of some high profile far reaching industrial accidents such as; Chernobyl (Choudhry et al., 2007) the Herald of Free Enterprise (Sheen, 1987), Kings Cross (Fennel, 1988), Piper Alpha (Cullen, 1990), Grangemouth (HSE, 2003) Texas City (Baker, 2007) and more recently Deepwater Horizon (Safina, 2011), where the BP/Transocean rig sank in the Gulf of Mexico. Eleven workers were killed and 205 million gallons of oil were leaked into the Gulf of Mexico.

Many of the investigations into these industrial accidents made reference to poor safety culture. For example, the accident investigation of Chernobyl revealed many irregularities in organisational safety. The International Nuclear Safety Group's (INSAG) summary report on the *Post-Accident Review Meeting* on the Chernobyl Accident used the term 'safety culture' for the first time to describe a set of factors related to the organisational aspects of safety (Choudhry et al., 2007). The Lord Cullen report (1990) on the Piper Alpha disaster was highly critical of the company's safety culture.



The Center for Catastrophic Risk Management's report (DSSG, 2011 p.98) concluded: '...these failures (to contain, control, mitigate, plan, and clean-up) appear to be deeply rooted in a multi-decade history of organizational malfunction and shortsightedness. There were multiple opportunities to properly assess the likelihoods and consequences of organizational decisions (i.e. Risk Assessment and Management) that were ostensibly driven by the management's desire to "close the competitive gap" and improve bottom-line performance. Consequently, although there were multiple chances to do the right things in the right ways at the right times, management's perspective failed to recognize and accept its own fallibilities despite a record of recent accidents in the U.S. and a series of promises to change BP's safety culture.' The cost to BP so far is 42 billion dollars, with claims still to be settled in from some local and state governments. BP has had to sell off many of its assets to foot the bill. These industrial accidents not only resulted in significant loss of life but huge financial penalties for the organisation.

There are also legal consequences for fatalities caused by poor safety in organisations. In the UK, the Corporate Manslaughter and Corporate Homicide Act 2007 is designed to establish corporate criminal liability, where it can be demonstrated that the way an organisation's activities were managed or organised by its senior management was a substantial element in causing a person's death, amounting to a gross breach of a duty of care owed to that person. The Act aims to target the behaviour of companies but, in the prosecutions to date, senior management have also found themselves in the dock alongside their organisations. The Act requires the police and Crown Prosecution Service (CPS) to consider the position of the individuals at a senior level in the organisation that may have been at fault, when examining the organisations potential manslaughter liability. There have only been a handful of prosecutions to date. As with all new legislation, the cases have been slow to result in prosecution, but as the police and CPS gain confidence in using this legislation, more case organisations will be targeted and prosecuted.

The law is not just relevant in the private sector. The Francis Enquiry report (Francis, 2013) detailed the results of a public inquiry that investigated Mid Staffordshire NHS Foundation Trust, a large UK hospital where thousands of patients are thought to have died unnecessarily due to poor care. The report identified the culture of the hospital had a negative influence on patient care and described the culture as one that tolerated poor standards and risks to patients. The HSE, in light of these findings investigated the death of one of the patients in 2007 and concluded there is sufficient evidence and it is

in the public interest to bring criminal proceedings in this case under the Corporate Manslaughter and Corporate Homicide Act (2007).

BP as a result of Deepwater Horizon also received much negative publicity and remains in the global press three years on. BP was found guilty of criminal misconduct in the USA. Four current or former BP employees have been indicted on separate criminal charges, including seaman's manslaughter and involuntary manslaughter. This is the single largest criminal case in U.S. history.

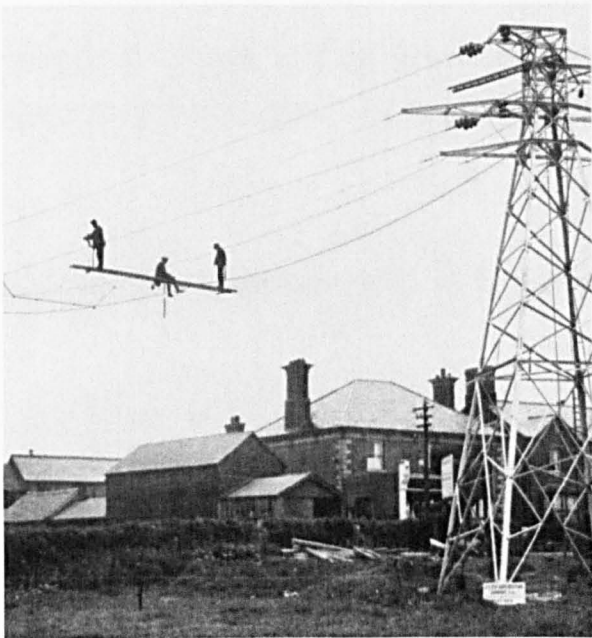
As can be seen from the examples highlighted above, the cost of poor safety is far reaching. Poor safety performance can result in huge financial costs for the organisation, negative publicity and legal action not only for the organisation but also its management. Hence poor safety culture and safety performance can represent a significant risk for the sponsor organisation and its management in terms of financial and legal risks and the negative publicity a fatality could generate.

#### **1.4. Introduction of the Sponsor Organisation**

For over 80 years the sponsor organisation has operated in the high hazard, power distribution construction industry, maintaining the high-voltage overhead lines and steel lattice towers, required for electricity transmission and distribution throughout the UK. Key activities include power transmission and distribution, end-to-end lifecycle services for high voltage power lines. Many of the power lines need to be upgraded to meet both the UK's future demand and renewable energy targets set by the EU for 2020 (2009/28/EC). The sponsor organisation was at the time of the research one of the leading contractors, upgrading the power lines, for the major energy suppliers in the UK. The sponsor organisation was supported by a nationwide supply chain, storage and logistics service.

The sponsor organisation employed managers, project managers, designers, engineers and field teams of foremen, charge hands and Linesmen based at different client sites across the UK. These field teams worked and lived on site for up to three weeks at a time, working on projects commissioned by the main electricity suppliers in the UK, maintaining and upgrading the electricity pylons. The organisation employed approximately 400 employees with half of these based on site.

In the 1930's the sponsor organisation designed and constructed steel lattice towers for the new National Electricity Scheme which aimed to bring electrification to the whole of Great Britain creating National Grid (see Figure 2). The sponsor organisation was a small family ran business which grew substantially due to a huge post war growth in electricity demand. Attitudes to safety were very different during this period and protective clothing was almost non-existent (see Figure 2), risk taking was normal and only extreme hazards were managed. Accidents were seen as an inevitable consequence of working in a dangerous industry.



*Figure 1: Early Steel Lattice Tower 1930's*



*Figure 2: Post War Working*

The regulatory requirements, PPE, and working practices have changed significantly over the years to virtually eliminate fatalities and serious accidents in the industry. The sponsor organisation is no longer a small family run business but part of a large PLC. However the risks, working at height and working with high voltage electricity still remain. Safety is a key priority for the sponsor organisation. The Health and Safety Team had spent a significant amount of time revising and updating the organisation's safety policies and procedures and sponsor organisation safety statistics were improving year on year (see Table 1).

Table 1: Sponsor Organisation Accident Statistics

	2008/09		2009/10	
	Number of injuries	rate	Number of injuries	rate
Total Injuries	69	3.62	45	2.15
RIDDOR	4	0.21	4	0.19

In order to understand the underlying influences of safety culture and safety performance the sponsor organisation sought to collaborate with the Institute of Work Health and Organisations. The three studies and methodological approach undertaken to do this form the basis of this thesis. The next section outlines some of the challenges to conducting collaborate research in the context of this thesis.

1.5. Real World Research

Collaborative 'real world' research projects can be challenging. Buchanan et al. (1988) argue that researchers should adopt an opportunistic approach to applied 'real word research' in organisations. Tensions can arise in between what is theoretically desirable on the one hand and what is practically possible on the other. In an ideal world it is desirable to ensure a representative sample and adequate data collection across a range of topics to be explored etc., however the practical reality is during the timeframe of the research many factors can compromise the desirable scenario, for example, participants refusing to take part, members of the organisation blocking access to information, organisational change such as mergers and acquisitions creating redundancies and loss of key stakeholders. Right from the conception of the research idea, it was important to ensure the research was able to meet the dual purpose of the project. The purpose of the research was for the findings to theoretically contribute to the safety climate and culture literature and for the sponsor organisation to gain practical knowledge and an in-depth understanding of the factors that affect safety performance in the company, in order to inform and benchmark any future safety interventions.

Academia and industry often have contradicting goals and this can create challenges for any collaborative research projects. Frequently there was a continued negotiation between the researcher and sponsor organisation's key stakeholders, as to what was reasonably practical whist still retaining

the methodological robustness and integrity of the thesis. The researcher held regular monthly meetings with the key stakeholder in the sponsor organisation to keep them informed of the project developments, this also served to highlight any conflicting priorities and gave both parties an opportunity to identify mutually agreeable solutions. Another key aspect to ensuring the continued support of the sponsor organisation and the participation of its employees in the research studies was the familiarisation process. The researcher worked closely with the marketing manager to put together a marketing and communication campaign (see Figure 3.) to raise awareness of the research project and keep the employees regularly updated.



Figure 3: Update Article in the Internal Magazine

Second, the researcher took part in numerous safety meetings, site visits and attended winter training with the front line workers. This ensured the researcher became a ‘familiar face’ in the sponsor organisation, gaining trust and ‘buy in’ from the employees. A further objective achieved through this process was that the researcher gained an in-depth understanding of the employees, their job roles and the challenges they faced. More details on this process can be found in Chapter 4. The next section outlines the overall thesis aims and concludes with a summary of the thesis structure, with a brief description of each chapter.

## **1.6. Thesis Aims**

The thesis aims are twofold:

- 1) To identify the factors that shape safety culture in the sponsor organisation
- 2) To identify the factors that shape safety performance in the sponsor organisation

The thesis had both an academic and practical purposes; the academic purpose to theoretically contribute to the literature on safety culture and climate, the practical purposes to identify factors shaping safety culture and safety performance in the sponsor organisation. This information can then be used to inform the development of future safety initiatives and provide quantitative data to provide a benchmark for improvements in safety culture and safety performance.

In order to achieve the study aims, the historical development of safety culture and climate as a concept was examined (Chapter 2) and a review of the systematic reviews and meta-analysis on the topic was conducted (Chapter 3) to inform the development of the studies. Three exploratory studies were conducted, two qualitative (Chapter 5 and 6) and one quantitative (Chapter 7) using a triangulated methodology (Chapter 4) to assess the factors shaping safety culture and safety performance in the sponsor organisation. The in-depth understanding of the contextual factors affecting safety performance in the sponsor organisation informed the development of the quantitative study, a safety climate questionnaire. Finally the results of the three studies are summarised and discussed in the final chapter (Chapter 8), where the knowledge gained from the research is made clear along with the implications for theory and practice.

## 1.7. Thesis Structure

**Chapter 1:** this chapter outlines the emergence of the Ph.D. thesis and details the sponsor organisation. The chapter describes the real world significance of safety culture and climate research and describes the challenge of academic, industry collaborations in this context. The chapter concludes with the overall thesis aims and thesis structure.

**Chapter 2:** details the background and historical development of organisational culture and climate research, their different epistemological stand points and associated methodologies. The chapter goes on to describe the historical developments of safety culture and climate, their definitions, conceptual similarities and differences. Finally the concept of organisational subcultures and the influence of managers and supervisors are discussed. Concluding with how these subcultures might function in the construction industry, which the sponsor organisation operates in.

**Chapter 3:** reports a review of the recent systematic reviews and meta-analysis of safety culture and climate dimensions, antecedents and outcomes. The chapter then goes on to examine the antecedents and outcomes of safety culture and climate identified in the reviews in more depth. The conclusions of this chapter inform the qualitative (Chapter 5 and 6) and the quantitative studies (Chapter 7).

**Chapter 4:** details the different methodical approaches, both quantitative and qualitative, to measuring safety culture and climate. The chapter outlines the methodological approach in this thesis, a multi-method, triangulated approach. Triangulated approaches combine both qualitative (focus groups and interviews) and quantitative (safety climate questionnaire) methods and are advocated in the literature, to study complex phenomenon such as safety climate. The four phases of the thesis are detailed: Phase 1, *Literature Review*, Phase 2, *Familiarisation and Focus Groups*, Phase 3, *Interviews* and Phase 4, *Safety Climate Questionnaire*.

**Chapter 5:** describes the comprehensive familiarisation process undertaken by the researcher to familiarise herself with the sponsor organisation, its employees and their job roles. This process also

served to familiarise the employees with the research project and increase participation rates. The chapter then reports the first qualitative study, focus groups ( $n=7$ ) conducted with front line site based employees ( $n=49$ ). The methodology and analytical process is reported along with the main themes identified from the thematic analysis.

**Chapter 6:** reports the second qualitative study, semi-structured interviews ( $n=27$ ) with a cross section of employees from front line workers to senior management. The chapter describes the methodology, the sample and the sampling procedure. The chapter then details the analysis procedure - template analysis, and the themes and sub themes identified from the analysis. The main themes identified from both quantitative studies (Chapter 5 and 6) inform the development of the final study (Chapter 7) a quantitative safety climate questionnaire.

**Chapter 7:** reports the third quantitative study, a safety climate questionnaire. The chapter describes the development of the safety climate questionnaire including how the measures and questions were selected in line with the findings of the qualitative studies (Chapter 5 and 6). The administration process and ethical considerations is detailed. The chapter then goes on to test a number of hypotheses relevant to thesis aims. The statistical analytical procedures and the rationale for their use are outlined. The results in relation to safety climate antecedents and safety outcomes are reported.

**Chapter 8:** discusses the results of the studies (Chapter 5, 6 and 7) in more detail. The knowledge gained from the research is made clear along with the implications for theory and practice. Strengths limitations and suggestions for further research are discussed.



# Chapter 2: Background and Development of Safety Culture

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## 2.1. Introduction

Chapter 1 described the background and context to the thesis. Work related illness and injury represents a huge cost to the UK, over 13 billion pounds annually (HSE, 2012) and each day on average at least one person will lose their life as a direct result of their work activities (HSE, 2009). Reducing injuries and improving safety performance remains a key focus for organisations particularly in high hazard industries such as the construction industry. The last 30 years has seen a shift in occupational safety management from a focus on identifying technical failures to understanding the organisational causes of accidents predominantly by examining an organisation's safety culture.

Although there is a wide literature on the topic of safety culture there is still a debate around the definitions, constructs, measures, antecedents and outcomes. One of the aims of this thesis is to add to the evidence base on organisational culture with regard to its antecedents and outcomes. The purpose of this chapter is to gain an understanding of safety culture examining its background and historical development. The chapter firstly discusses the development of organisational culture and climate, their differences and crossovers. The following section gives an overview of the historical development of safety culture and climate and the conceptual similarities and differences. Finally the concept of organisational subcultures and the influence of managers and supervisors are discussed, concluding with how safety climate and culture are translated in the construction industry.

### 2.1.1. Organisational Culture and Climate

Organisations have been examined from a culture perspective as early as the 1930s (Trice and Beyer, 1993). However organisational culture did not become a popular area of study until the 1980s. Climate was introduced in the 1960s primarily based on the theoretical concepts proposed by Kurt Lewin (1951) and empirical research conducted in organisational settings (e.g. Litwin and Stringer, 1968). There is no universal definition of culture or climate and a number of different theories and constructs have been

developed. There is a debate as to whether constructs of culture and climate are different, the same or interrelated (Denison, 1996; Payne, 2000; Schein, 2000). Many theorists suggest that culture and climate can be viewed as two complementary and overlapping constructs, each with distinguishable features (Schneider, 2000).

### 2.1.2. Organisational Culture

Organisational culture research is grounded in anthropology and is heavily reliant on qualitative methods such as; interviews, observations and examination of historical organisational information to understand how culture provides a context for understanding individuals. Organisational cultural research can be traced back to the human relations movement of the 1930s. In particular the works of Elton Mayo (1933) and Chester Barnard (1968) whose writings highlight the importance of informal social structures when trying to understand human behaviour in organisations (Parker, 2000). During the 1930s the Hawthorne studies were being conducted in the Western Electric Company. These qualitative studies attempted to investigate work organisations in cultural terms (Trice and Beyer, 1993). Although these studies results have been questioned, it represents one of the first set of qualitative studies of individual and group behaviour. Despite this early research the topic of organisational culture did not gain momentum until the 1980s after a series of seminal management books on the topic.

Pettigrew (1979) suggested that organisational cultures consist of cognitive systems explaining how people think, reason, and make decisions. Schein (1992) offers a more comprehensive definition of organisational culture and describes it as: *'A pattern of shared basic assumptions that the group learned as it is solved its problems of external adaptation and internal integration that has worked well enough to be considered valid and therefore, to be taught to new members as the correct way to perceive, think and feel in relation to those problems.'* (p.12)

Despite a wealth of research in the field, there is no universally accepted definition or model of organisational culture; it has a variety of meanings and connotations. For example Van der Post et al. (1997) refer to over 100 dimensions of organisational culture while Kroeber and Kluckhohn (1963) describe 164 definitions. Part of the reason there are many theoretical approaches and definitions of organisational culture is due to the fact that culture researchers come from a variety of different

disciplines such as sociology, psychology and management and often use different epistemologies and methodologies to investigate the phenomenon.

Despite the different definitions and models, theorists have proposed that organisational culture is composed of a number of layers or levels that vary along a continuum of accessibility and subjectivity (Hofstede et al., 1990; Rousseau, 1990, Schein, 1992). Schein, a well-known theorist in the area (1985, 1992), proposes that there are three fundamental layers at which culture manifests itself; observable artefacts, espoused values and basic underlying assumptions (Figure 4). Artefacts represent the visible manifestations of organisational culture such as the physical environment, technology, patterns of behaviour, symbolic manifestations and the use of language. Values include philosophies, morals and ideologies which serve to underlie and influence behaviour, while basic assumptions and enshrined beliefs underlie and drive these unconscious and internalised values and behaviours.

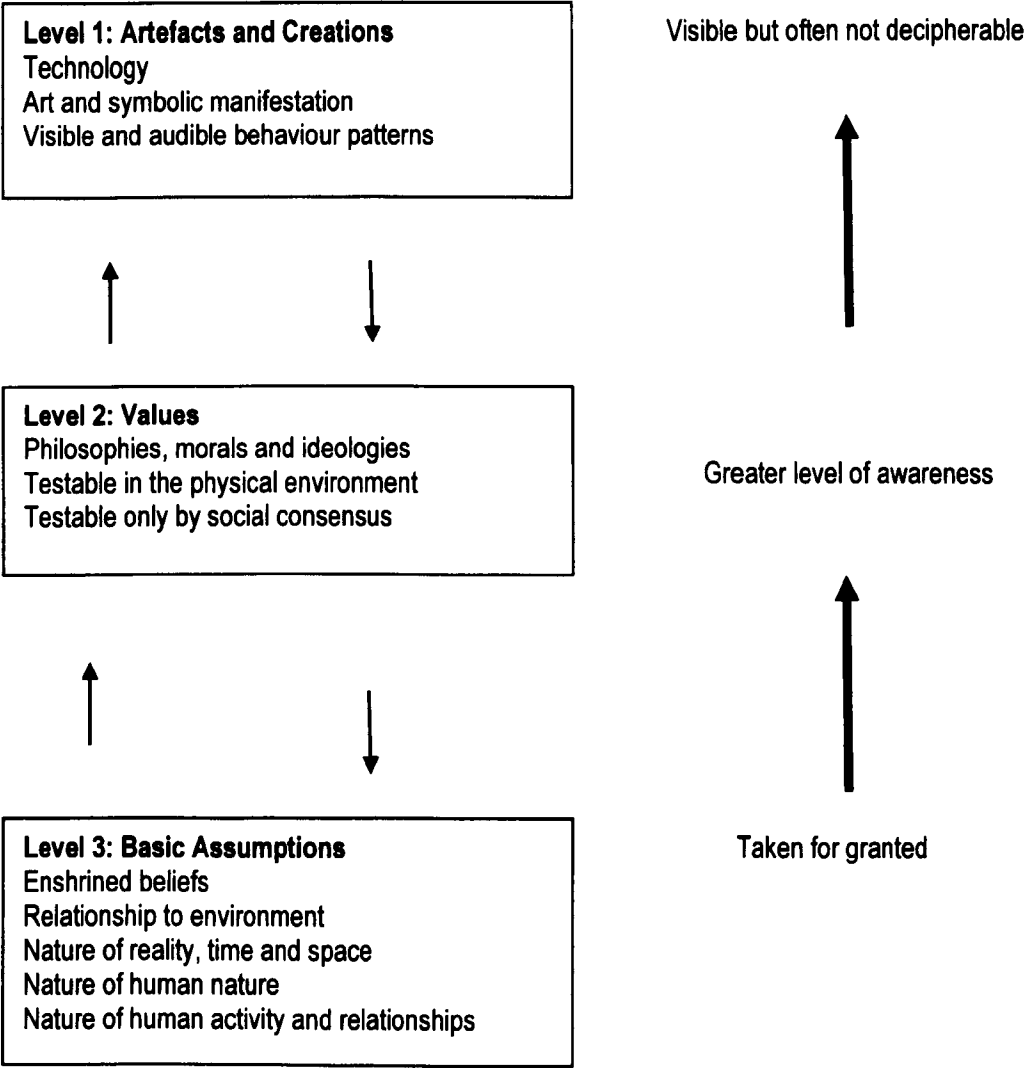


Figure 4: Levels of Organisational Culture (adapted from Schein, 1985)

Much of the literature on organisational culture conceptualises the various dimensions within these levels. For example Ott (1989) develops the model further by subdividing the artefact level into visible and behavioural manifestations and Hawkins (1995) expands it to five levels that include artefacts; behaviour; mindset; emotional ground and motivational roots (Table 2).

Table 2: Hawkins (1997) Organisational Culture (p. 426)

Level 1: Artefacts	Policy statements. Mission statements.
	Dress codes, furnishings, buildings, PR, etc.
Level 2: Behaviour	What do people do and say. What is rewarded.
	How is conflict resolved.
	How mistakes are treated, etc.
Level 3: Mindset	Organisational 'world view' – ways of thinking the constrain behaviour.
	Organisational values-in-use, basic assumptions, etc.
Level 4: Emotional Ground	Mostly unconscious emotional states and needs that create a context within which events are perceived.
Level 5: Motivational Roots	Underlying sense of purpose that links the organisation and the individuals.

In general there has been some consensus in the literature as to what the common characteristics of organisational culture are. Hofstede et al. (1990) conclude that across different definitions and models of organisational culture the commonalities are; that organisational culture includes multiple layers (Schein, 1992), aspects (i.e. cognitive and symbolic), layers of organisational context (Mohan, 1993), organisational culture is a socially constructed phenomenon, influenced by spatial and historical boundaries (Rowlinson and Procter, 1999; Schein, 2000) and the concept of 'shared' meaning is central to understanding an organisations cultured.

In his extensive review of the organisational cultural literature Guldenmund (2000) concluded that organisational culture had six main features:

- It is an abstract concept
- It is relatively stable
- It is shared by groups of people
- It consist of a variety of aspects i.e. different types of cultures can be distinguished within one organisation such as a service culture, innovation culture or safety culture
- It is made up of layers
- It is functional i.e. it supplies a frame of reference for individual behaviour

The numerous definitions and theoretical models of organisational culture suggest there is no universally accepted definition or model. However as discussed authors have identified some key underlying features of safety culture, (Hofstede et al., 1990; Guldenmund, 2000) and some theoretical models such as Schein's (1992) have been more widely accepted, developed and built upon. The next section will discuss the historical and conceptual development of organisational climate.

### 2.1.3. Organisational Climate

Climate literature has its roots in Kurt Lewin's (1951) Field Theory. Lewin and his colleagues were interested in examining the climate atmosphere created by different leadership styles and the consequences these different climates had on behaviours and attitudes of the group members. Field theory suggests behaviour (B) is a function of (f) a person (P) and environment (E) i.e.  $B = f(P, E)$ . Thus the environment is created by, or a construct that is separate from the people who operate within it (Roberts, Hulin and Rousseau, 1978; Denison, 1996). Climate can be described as abstraction of the environment, the sum of patterns of behaviour and experiences that (Schneider, Bowen, Ehrhart and Holcombe, 2000) the agents (e.g. management or leaders) and the factors that create the climate (e.g. strategy, structures and practices) are either assumed or not directly studied (Denison, 1996). Climate is perceived by employees yet can be measured separately from them. This perspective has continued to dominate much of the climate research literature.

The formation of climate has usually been regarded as an individual level process based on cognitive representation and sense making in organisations (Schneider and Reichers, 1983). This process is viewed as interactive and reciprocal (Ashforth, 1985). Climate can be defined as the perceptions of formal and informal organisational policies, practices, and procedures (Reichers and Schneider, 1990). Jones and James (1979 p.205) describe organisational climate as a '*set of perceptually based, psychological attributes*' that are distinct from job related attitudes and satisfaction but there is a 'dynamic interrelationship' between the two. Organisational climate assessments tend to use quantitative methodologies such as questionnaire and surveys which are similar to attitude measurements, assessing the aggregated attitudes of an organisation's members (Eagly and Chaiken, 1993). Early climate researchers focused on developing global or molar concepts of climate, under the

assumption that individuals develop global or summary perceptions of their organisation (e.g. Schneider and Bartlett, 1968; James and Jones, 1974).

Many researchers attempted to identify the different dimensions of organisational climate (e.g. Likert, 1967; Litwin and Stringer, 1968; Campbell, Dunnette, Lawler and Weick, 1970). By the early 1980s there were a large number of dimensions identified as relevant. New dimensions were being added to the conceptualisation of climate every time a researcher thought it could be valuable for understanding a particular phenomenon (Schneider, 2000). Schneider (1975, 1990) concluded that the molar concept of climate was too vague, inclusive, and multifaceted to be of any use and that climate research should shift from a molar, inclusive, abstract perspective to linking climate to a specific criterion or outcome i.e. a climate for something. The concept of a strategic criterion or a *climate-for* approach has gained common acceptance, addressing issues such as service (Schneider, 1990), innovation (Klein and Sorra, 1996) and safety (Zohar, 1980). The next section will discuss the crossovers and similarities between organisational culture and climate.

#### **2.1.4. Overlap between Culture and Climate**

As organisational climate focuses on its members perceptions of behaviour, policies, and practices (Sleutel, 2000) it can be perceived as a subset of the broader area of organisational culture (Bell and Koziowski, 2003) and understood as *'the perceived quality of an organisation's environment'* (Glendon and Stanton 2000 p.198). Some theorists suggest safety climate precedes safety culture research, and climate is culture in the making (Glick, 1985; Schein, 1992). Others believe organisational climate influences and is influenced by organisational culture (McMurray and Scott, 2003).

In an attempt to distinguish the concepts of organisational culture and climate Ekvall (1983) makes the distinction between organisational climate and culture by dividing an organisation's social systems into 1) organisational culture, i.e. values and beliefs about the organisation shared by the organisational members, 2) social structure, i.e. the informal organisation, 3) organisational climate, i.e. the common characteristics of expression of feelings and behaviour exhibited by the organisation's members, and 4) work relations in particular the relationships between employees and management. He argues that all

four categories are related but distinct. Reichers and Schneider (1990) in their review of organisational culture and climate as concepts concluded that *‘culture exists at a higher level of abstraction than climate, and climate is a manifestation of culture’* (p.29).

Despite this lack of clarity around the two concepts, Denison (1996) notes that cultural research tends to lean towards the evolution of social systems whereas climate focuses more upon the impact that organisational systems have on groups and individuals (Denison, 1996). In his review Denison defines the difference in the research perspectives in organisational culture and climate research. These differences are shown in Table 3.

*Table 3: Denison contrasting culture and climate prerpectives*

Element	Culture	Climate
Epistemology	Contextualised and idiographic	Comparative and nomothetic
Point of view	Emic (native point of view)	Etic (researcher's point of view)
Methodology	Qualitative field observations	Quantitative survey data
Level of analysis	Underlying values and assumptions	Surface-level manifestations
Temporal orientation	Historical evaluations	A historical snapshot
Theoretical foundations	Social construction; critical theory	Lewinian field theory
Discipline	Social anthropology	Psychology

Noting the differing perspectives Denison concluded that culture and climate represent *‘differences in interpretation rather than differences in phenomenon’* (Denison, 1996, p. 645).

### 2.1.5. Summary

In summary organisational culture and climate focus on how an organisation's members experience and make sense of their organisation (Schneider, 2000) and are the fundamental building blocks for describing and analysing this organisational phenomena (Schein, 2000). Although culture and climate have been approached from different perspective and have their roots in different disciplines, they are both about understanding psychological phenomenon in organisations and there are overlaps and

crossovers. Both concepts rest on the assumption of shared meanings and understanding of the organisation context. Organisational culture and climate research has shifted from a 'catch all' molar perspective to linking climate to a specific criterion or outcome such as; innovation, service and safety. The next section will describe the development of safety culture and climate as a concept, its background and history.

## **2.2. Safety Culture and Climate**

This section outlines the foundations and historical development of safety culture and climate. As with the organisational culture and climate research a number of different definitions and concepts have been theorised. There is still no consensus on these definitions of safety culture and climate, a brief overview of these different definitions, distinctions and epistemology is defined. The evidence of the possible influence managers and supervisors have on safety culture is examined. Concluding with the application of safety culture in the construction industry, which is directly relevant to the sponsor organisation.

### **2.2.1. Background and History**

The development of safety culture research is grounded in accident causation research and born out of a need to understand the non-technical causes of accidents in terms of root causes and system failures. The development of accident causation research has advanced historically in a number of stages. The first stage, the 1940s to 1960s, focused on machine and hardware improvements, due to the rapid development and implementation of new machinery and automations in the workplace when many accidents were attributed to mechanical malfunctions (Cooter and Luckin, 1997). The second stage from 1960s to 1980s, focused on human factors and human machine interactions. During this period employees were perceived as the weakest link in the system (Gordon, Flin, Mearns and Fleming, 1996). The third stage from the 1970s to 1990s, considered the interaction of human and technical factors (Cooter and Luckin, 1997). The most recent stage from the 1980s onwards considered organisational culture an influential factor in accident causation (e.g. Zohar, 1980; Cox and Cheyne, 2000; Wiegmann et al., 2002a).



Zohar (1980), based on the organisational climate research of Schneider (1975) developed the concept of safety climate. In the first paper on the topic, *Safety Climate in Industrial Organisations: Theoretical and Applied Implications*, Zohar defined safety climate as '*a summary of molar perceptions that employees share about their work environments...which acts as a frame of reference for guiding appropriate and adaptive task behaviours*' (p.96). In this study Zohar developed a multi-factorial safety climate structure which showed a strong relationship with safety programme effectiveness (Zohar, 1980).

This publication led to a number of studies using Zohar's scale with some minor alterations (Brown and Holmes, 1986; Dedobbeleer and Beland, 1991; Coyle et al., 1995; Hofmann and Stetzer, 1996). A number of further safety climate scales were developed (Rundmo, 1992; Lee, 1993; Cheyne, Cox, Oliver and Tomas, 1998; Cox and Cheyne, 2000) broadening the safety climate literature.

At around the same time as Zohar was developing the concept of safety climate there were a number of large scale nuclear accidents such as the Three Mile Island in the USA (1979) and Chernobyl in the Ukraine (1986). The accident investigation of Chernobyl revealed many irregularities in organisational safety. Chernobyl occurred at a time of nuclear investment and expansion in the UK (Reason, 1997), leading to nuclear safety being a key political area of focus. The International Nuclear Safety Group's (INSAG) summary report on the *Post-Accident Review Meeting* on the Chernobyl Accident used the term "safety culture" for the first time to describe a set of factors related to the organisational aspects of safety (Choudhry et al., 2007). However INSAG's publication made no reference to the academic literature on safety climate at the time. This suggests that the term 'safety culture' in this context was not developed on the basis of safety climate of culture studies (Choudhry et al., 2007). The terms meaning was left open to interpretation. Following on from this 'safety culture' was cited in other major accident investigation reports, such as the King's Cross Underground fire (Fennel, 1988), the Clapham Junction disaster (Hidden, 1989) and Piper Alpha, (1988). Historically, the two concepts of 'safety culture' and 'safety climate' were developed separately: 'safety climate' had its origins in the subject research literature and 'safety culture' was used arbitrarily by accident investigators with no reference to any scientific source of information (Choudhry et al., 2007).

The concept of safety culture captured the interest and imagination of researchers and safety practitioners alike, with safety culture and climate research gaining increased momentum in 1980s and 1990s. Frequent research publications and numerous references in major incident/accident

investigations illustrate the significance of the concept. Safety climate and safety culture are used interchangeably as these two concepts are not explicitly distinguishable, despite this there is confusion between safety culture and safety climate a concept and researchers have attempted to distinguish between the two terms. The next section discusses these similarities and differences.

### **2.2.2. Safety Climate and Safety Culture Definitions**

Safety culture and safety climate are used interchangeably in the literature to describe a similar phenomenon. The distinction between safety climate and safety culture can be seen as similar to that of organisational climate and organisational culture, the former relating to attitudes towards safety and later being the strong beliefs held within the organisation underlying these attitudes (Guldenmund, 2000). Within the field of safety culture research both terms, safety climate and safety culture, are still used often interchangeably. Safety culture can be defined as *'the attitudes, beliefs, perceptions, and values that employees share in relation to safety'* (Cox and Cox, 1991, p.93) and climate can be defined as *'the objective measurement of attitudes and perceptions toward occupational health and safety issues'* (Coyle et al., 1995, p. 247). Many researchers in the field of safety advocate the retention of both terms (Cox and Flynn, 1998, Glendon and Staton, 2000, and Guldenmund, 2000).

Safety climate is associated with words such as 'snapshot' (Flin et al., 2000, p. 178), 'superficial' (Glendon and Stanton, 2000, p. 198) and 'state' (Cheyne et al., 1998, p. 256) and can be described as the surface features of the safety culture derived from the workforces' attitudes and perceptions at a given point in time, as indicator of the state of the safety culture and the safety of the organisation (Flin et al., 2000). Climate is seen as directly measurable whereas culture is too abstract to be measured directly (Mearns et al., 2003). Safety culture is referred to as 'trait' (Cheyne et al., 1998, p. 256), 'deep' (Hale, 2000, p.5) and 'quantitative' (Guldenmund, 2000, p. 220). Climate can be described as a manifestation of culture at a particular point in time (Hale, 2000). Wiegmann and colleagues (2002) analysed 18 articles that provide 'safety culture' definitions and 12 articles that provide definitions of 'safety climate'. They suggest a hybrid definition for the two terms: *'Safety culture is the enduring value and priority placed on worker and public safety by everyone in every group at every level of an organisation. It refers to the extent to which individuals and groups will commit to personal responsibility for safety, act to preserve, enhance and communicate safety concerns, strive to actively learn, adapt*

*and modify (both individual and organisational) behaviour based on lessons learned from mistakes, and be rewarded in a manner consistent with these values' (p. 8).*

*'Safety climate is the temporal state measure of safety culture, subject to commonalities among individual perceptions of the organisation. It is therefore situationally based, refers to the perceived state of safety at a particular place at a particular time, is relatively unstable, and subject to change depending on the features of the current environment or prevailing conditions' (p.10).*

Despite many conceptual papers on the topic, there is still no common agreement on these definitions and the terms are still being used interchangeable in the literature. Thus in this thesis the assumption is directed by the evidence that safety climate and safety culture are facets of the same phenomenon and both terms will be used. The next section will discuss the distinction between management and supervisors and highlight why this distinction is particularly important in the construction industry, which the sponsor organisation operates in.

## **2.4. Management and Supervisors**

Organisational culture can be investigated at various levels in the organisation, for example organisational, or sub unit and group. Clarke (2000) identified that there are layers of management within almost all organisations, and each layer of management has distinct but inter-related roles and responsibilities. Senior management for example may be responsible for developing and populating the health and safety policy, whilst middle management identifies the necessary requirements to deliver the policy. Then it falls to the supervisors to understand, apply and enforce these policies on a daily basis. Clarke (2000) recognised the critical role of the supervisor when examining the influence of safety culture on behaviour. Clarke's model differentiates senior managers, line managers, supervisors and workers. However the author noted that many studies (Cox and Cox 1991; Cheyne et al., 1998) tended to include supervisors and managers in one broad leadership category or fail to make the distinction between the two leading to a 'paucity of information about the role of supervisors in promoting good safety culture' (Clarke, 2000, p. 83).

Recognising these differences in management levels some authors draw a distinction between supervisors and management in their safety climate questionnaires. Flin et al. (2000) in their review of 27 safety climate questionnaires identified four safety climate tools with separate factors relating to supervision; HSE, Niskanen (1994), Mearns et al., (1997) and Budworth (1997). Both the HSE and Niskanen included separate supervisor items while Mearns et al. (1997) and Budworth (1997) had a section dedicated to supervisors embed in a single questionnaire.

Some researchers have examined the level of agreement of supervisor and workforce attitudes in relation to safety. Niskanen (1994) found a degree of agreement between supervisors and workers attitudes, both felt safe working practices improved production and the prevention of accidents is everybody's responsibility. There was however some disagreement as supervisors felt they gave safety instructions more frequently than perceived by employees. Thompson, Hilton and Witt (1998) analysed the differences between management and supervisor support for safety and found management support mediated the relationship between organisational politics and safety conditions, whereas supervisor support mediated the relationship between perceived fairness and safety compliance.

Zohar (2002) developed an intervention to enhance supervisory practices to improve safety performance. His intervention lasted eight weeks and differentiated between supervisors and departmental managers. The intervention aimed to modify supervisors monitoring and rewarding of workers safety performance (Zohar, 2002). Baseline rates for micro accidents, safety climate scores and supervisory interactions were collected prior to the intervention. Feedback was given to supervisors and section managers over the eight weeks. This feedback comprised of cumulative frequencies of reported interactions between the workforce and supervisors where safety was the approval or disapproval criteria. Supervisors were fed this information individually but the managers could access information about all supervisory actions. The intervention increased the number of supervisor/operator safety orientated interactions, reduced minor incident rates, increased PPE use and improved safety climate scores (Zohar, 2002).

The evidence suggests that supervisor's behaviours and actions can, in turn, drive those of others (Cheyne et al., 2002). Supervisors can have a direct and indirect effect on employee's safety behaviour; directly by modelling unsafe behaviours and reinforcing these through monitoring and

control or indirectly by establishing the norms of safety behaviour through accepted practice. These actions influence the expectations and motivations of employees and as a consequence the likelihood that a particular safety behaviour will be repeated or suppressed (Flin and Yule, 2004). Unsafe practices for example, may be naturally reinforced when there is pressure on managers to meet tight deadlines. This is not uncommon in the construction industry operating in competitive environments. The next section will discuss safety culture and climate in the context of the construction industry.

## **2.5. Safety Culture and Climate in the Construction Industry**

The construction industry is a highly complex, dynamic environment. Typically contracts are won through price sensitive competitive tenders and often office and site functions are independent of each other with workers moving from site to site, making them difficult to supervise and manage centrally (Rowlinson, 2004). These complex working relationships and competitive environments can have negative consequences for health and safety (Mayhew and Quinlan, 1997). The distance between office and site functions limits opportunities for face to face communication. Many construction organisations contract to a client and are based on the client's site this can lead to competing priorities and influence from both the client and the employing organisation. This can result in the contracting organisation having limited power and influence to shape a sites safety culture.

Supervisors have been shown to have the power to shape the safety culture (Zohar, 2002), as a result site managers and supervisors can have a large influence over the culture and climate of their site. Organisational culture can be investigated at various levels, e.g. organisational, sub-unit and group. Top level managers develop and establish policies and procedures, and group level managers carry out these policies in the form of safety practices. By comparing how these policies are implemented by different site managers and supervisors and observing how higher level management supports decisions made by site managers, employees are capable of perceiving the difference between the procedures established by top managers and their own site managers (Zohar, 2003). This is particularly relevant in construction industry as typically there are many regulatory requirements to adhere to so numerous health and safety policies and procedures are produced. Yet these may not manifest themselves in the practices of the front line workers, as site managers and supervisors can mediate this process by either directly or indirectly reinforcing or inhibiting safety behaviour.

## 2.6. Summary

Organisational culture and climate research was derived from two different epistemological positions; organisational culture research is grounded on anthropological qualitative methodologies whereas safety climate research is based on quantitative approaches. Nevertheless, organisational culture and climate focus on how an organisation's members experience and make sense of their organisation (Schneider, 2000). There are many crossovers between culture and climate; both concepts assume shared meanings and understanding of the organisational context. Organisational climate research moved from a 'catch all' phenomenon to researching a '*climate for something*'. Zohar (1980) was one of the fore founders of safety climate research building on the organisational climate research of Schneider (2000). The origins of safety culture research were driven from large scale accident investigations that recognised the organisational context and influence on accident causation. There is no universal definition of safety climate or culture and the terms are used interchangeably in the literature, however safety climate can be seen as a 'snapshot' (Flin et al., 2000) of safety culture. Further work has examined the differences between manager and supervisor influence on safety climate and this is particularly relevant in the construction industry where supervisors and workers are site based and supervisors are influential in implementing and monitoring safety policies and performance. The next chapter presents a review of the systematic reviews and meta-analysis on safety climate and culture and goes on to discuss safety climate dimensions, antecedents and outcomes.

# Chapter 3: Evidence Synthesis

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## 3.1. Introduction

Chapter 2 described the development of organisational safety culture and climate. As can be seen from the previous chapter there is a wide literature on the topic of safety culture spanning over 30 years. However there is still debate as to its dimensions, antecedents and outcomes. One of the aims of this thesis is to add to the evidence base on organisational culture and climate, with regard to its dimensions, antecedents and outcomes in the particular context of the construction industry which the sponsor organisation operates in. Due to the large number of studies over the last three decades on safety climate and culture, a number of researchers have sought to draw conclusions about the dimensions of safety climate through systematically reviewing the literature on the topic (e.g. Flin et al., 2000; Seo et al., 2004; O'Connor et al., 2011). Recently researchers have used meta-analytical principles to understand the relationship between safety climate and safety outcomes (Clarke 2006; Christian et al., 2009; Beus et al., 2010), and wider organisational psychosocial factors (Clarke, 2010; Nahrgang et al., 2010). The purpose of this chapter is to gain an understanding of a number of reviews and meta-analyses of safety culture and climate to inform the development of a safety climate measure for use in the sponsor organisation.

### 3.1.1. Dimensions of safety culture, climate and safety outcomes

Since the 1980s there have been hundreds of studies of safety culture and safety climate. A number of reviews and meta-analysis have attempted to identify common dimensions of safety climate and culture, its outcomes and antecedents. Given that there have been a number of reviews of the phenomenon it seems valuable to systematically review these reviews to allow the findings to be compared and contrasted to provide a greater insight into safety culture and climate commonalities, antecedents and outcomes, then explores this evidence.

### **3.1.2. Method**

A systematic approach was adopted to review the recent reviews and meta-analysis in the field of safety culture. In order to identify systematic reviews and meta-analysis for inclusion a systematic search strategy was used. Online databases Ovid, PsycArticles, Embase, Medline and PsycINFO were searched for relevant articles using the following search terms 'safety climate' AND 'review', 'safety culture' AND 'review', 'safety climate' AND 'meta-analysis', 'safety culture' AND 'meta-analysis'. In addition, other experts in the field were consulted ( $n=2$ ) and the references of all articles located were scanned for further relevant references. No date or language restrictions were applied.

This search generated 207 articles. Only non-healthcare systematic reviews and meta-analyses of safety climate and safety culture were included. Healthcare climate and culture reviews and non-systematic reviews (or the systematic process was not detailed in the published paper) were excluded. All articles were evaluated by the author. This resulted in eight papers that met the inclusion criteria. An overview of the results can be found in Table 4.

### **3.1.3. Results – Systematic Reviews**

In one of the earliest systematic reviews of safety climate measures Flin et al. (2000) reviewed 18 published articles of safety climate questionnaires. Authors and industries included in the review are as follows; energy and chemical industry, Rundmo (1990, 1994), Cox and Cox (1991), Ostrom et al. (1993), Donald and Canter (1994), Alexander et al. (1995), Budworth (1997), Meams, et al. (1997), Carroll (1998), Lee (1998), manufacturing, Zohar (1980), Browns and Holmes (1986), Philips et al. (1993), Janssen et al. (1995), Williamson et al. (1997), transport, Diaz and Cabrera (1997), construction, Dedobbeleer and Beland (1991), Niskanen (1994) and generic HSE (1997). The inclusion criterion was that the sample size was above 100, the report was in English and only industrial sectors were included (i.e. excluding retail, clerical, health etc.). Fifty percent were from the energy/petrochemical sector. One hundred themes were extracted and re-categorised into a smaller number ( $n=35$ ) of simplified themes. A wide range of climate features were assessed, these were mainly workforce perceptions and attitudes towards safety and in some cases others measured individual dispositions, personality or self-reported work behaviours. Three themes appeared in two thirds of the questionnaires; these related to management. Safe systems and risk appeared more than



once in some questionnaires. Two other themes occurred in a third of the questionnaires, these were competence and work pressure. Flin et al. (2000) detailed the identified dimensions of safety climate as follows:

- *Management*: This dimension refers to management attitudes and behaviours in relation to safety as well production, or other issues (selection, discipline and planning). This dimension appeared in 13 of the studies.
- *Safe system*: The second dimension was identified in 12 of the studies. This was defined as the different aspects of the organisations safe management system including safety officials, safety committees, permit to work systems, safety policies and safety equipment. Generally respondents were asked to rate their satisfaction with these aspects.
- *Risk*: This dimension refers to self-reported risk taking, attitudes towards risk and safety and perceptions of risks and hazards on the worksite, this was apparent in 12 of the questionnaires.
- *Work pressure*: This dimension refers to the workplace, workload and pressure for production. This appeared in six of the questionnaires.
- *Competence*: This dimension refers to the workforce's perceptions of the general level of workers qualifications, skills and knowledge. This is apparent in six of the questionnaires.
- *Procedures/rules*: This dimension refers to perception of safety rules, attitudes to rules, compliance or violation of procedures. This theme related to risk taking behaviours and this dimension only emerged in three of the studies reviewed.

Flin et al. (2000) concluded that there are a number of common themes or dimensions safety climate measures use. The most common relates to management, safe systems and risk followed by work pressure and competence. However the authors concluded that the components of each dimension are variable and are likely to be industry or organisation specific.

Seo et al. (2004) tested a five factor structure of a safety climate scale developed through an extensive literature review. The selection and inclusion criteria of the safety climate scale development studies included in the systematic review was that the study should be published on an electronic database in a refereed journal, presented in English and based on a sample greater than 150 employees. Sixteen studies were included in the review, these were; Zohar (1980), Brown and Holmes (1986), Cox and . Cox (1991), Dedobbeleer and Beland (1991), Niskanen (1994), Coyle et al. (1995), Diaz and Cabrera

(1997), Williamson (1997), Cheyne et al. (1998), Mearns et al. (1998), Brown et al. (2000), Cox and Cheyne (2000), Lee and Harrison (2000), Glendon and Litherland (2001) and O'Toole (2002).

The systematic review found that leadership support, including management commitment to safety and supervisor safety support was the most common dimension identified in the review. This dimension appeared in two-thirds of the questionnaires. The next most common dimension was employee participation appearing in seven questionnaires. A third of the questionnaires included pressure, hazard level in the work environment, and competence level. Others were co-worker safety support, perceived risk and barriers to safety. Seo et al, (2004) concluded that amongst these nine dimensions, 1) *management commitment to safety*, 2) *supervisor safety support*, 3) *co-worker safety support*, 4) *employee participation in safety-related decision making and activities* and 5) *competence level of employees with regard to safety* are the five constructs that constitute the core of the generic safety climate concept. This review also provided evidence of a significant relationship between organisational safety climate and injury involvement.

O'Connor et al. (2011) reviewed studies that examined safety climate within commercial and military aviation industry. The authors conducted a computerised search of the literature using PsycINFO, Google Scholar, Medline, and Defence Technical Information Centre. Keywords used in the search were 'aviation' with 'safety climate' or 'safety culture'. The reference lists of published aviation safety climate studies were also examined. From this methodology 23 studies were identified, of these 48% were published in peer reviewed journals. The studies included in the review were; Diaz and Cabrera (1997), Patankar (2003), Gill and Shergill (2004), Gibbons et al. (2006), Evans et al. (2007), Gordon et al. (2007), Kao et al. (2008), CSAS and MCAS. Nine safety climate measures were identified. The authors measured construct validity of the questionnaires by examining whether the dimensions identified by each are consistent with the wider safety climate literature and whether these dimensions converge upon a universal set of safety climate themes that are consistent across all of the questionnaires. The dimensions identified were categorised into eight broad safety climate themes and these were broadly in line with other reviews of safety. These were:

- *Management/supervision*: This dimension was apparent in all of the questionnaires included in the review.
- *Safe system*: This dimension was apparent in eight of questionnaires included in the review.

- *Procedures/rule*: Procedure and rule compliance was apparent in four of the questionnaires included in the review.
- *Risk*: Perception of risk was a dimension apparent in three of the questionnaire included in the review.
- *Training and Education*: This referred to the workforce's perceptions of the general level of workers qualifications, skills and knowledge this dimension was apparent in two of the questionnaires included in the review.

The authors identified another three dimensions which were particularly relevant to aviation these were:

- *Communication*: Four of the questionnaires included in the review had dimensions concerned with communication. As the aviation industry consists of a number of different occupational groups that are not co-located, this creates particular challenges to communication as these groups are not able to engage in informal and spontaneous interaction.
- *Resources*: Three aviation safety climate questionnaires had dimensions characterised as resources. This is concerned with the availability of resources for safety; the author hypothesises that this may not be an aviation specific issue but may be more a recent economic development due to the fact it was included in the three most recently developed questionnaires.
- *Operational personnel*: This dimension was included in five of the questionnaires and is concerned with the commitment of operational personnel to safety.

Table 4: An overview of the systematic reviews

Author(s) and Year	N	Countries	Industries	Safety Climate/Culture Dimensions
<i>Flin et al.</i> (2000)	18	UK Norway USA Israel Argentina France Australia Spain Finland	Energy Chemical Transport Construction Manufacturing	Management /Supervision (13) Safety Systems (12) Risk (12) Work Pressure (6) Competence (3)
<i>Seo et al.</i> (2004)	16	Israel USA Finland Australia Europe UK	Factories Manufacturing Gas distribution Road Administration Construction Clerical/Healthcare Airport Steel Oil and Gas Nuclear	Management Commitment/Supervisor Support (11) Employee Participation (7) Work Pressure (5) Hazard Level (5) Competence (4)
<i>O'Connor et al.</i> (2011)	23	Australia USA Taiwan Spain Sweden	Commercial and Military Aviation	Management/supervision (9) Safe Systems (8) Operational Personnel (5) Procedures/Rules (4) Communication (4) Resources (3) Risk (3) Training and Education (2)

### 3.1.4. Summary

These reviews suggest there is some conceptual ambiguity when it comes to safety climate dimensions, however despite the variations, the results reveal some commonalities. Management attitudes and behaviours in relation to safety seems to be a key dimension included in at least two thirds of the safety climate measures reviewed. Safe systems, risk and work pressures are also identified in about a third of the safety climate measures. O'Connor et al. (2011) also identified communication as a key dimension in almost half of the questionnaires included in the review. The authors suggested that communication is a specific issue in the aviation industry due to different occupational groups who work together not being based at the same location which means they are not

able to engage in informal spontaneous communication. This may also be a particular issue in the construction industry which the sponsor organisation operates in, as many employees are based out on remote sites away from the main office functions. The next section will describe the meta-analysis included in the review. Meta-analyses can allow a more objective appraisal of the evidence than traditional systematic reviews.

### **3.1.5. Results- Meta-analysis**

There were five meta-analytic studies identified through the review processes. Three of the meta-analytic studies sought to understand the predictive validity of safety climate and safety outcomes (Clarke, 2006; Christian et al., 2009; Beus et al., 2010). A further two, and examined safety climate in the wider organisational context; in relation to the Job Demand Resource (JD-R) model (Nahrgang et al., 2010) and psychological climate and work attitudes (Clarke, 2010). An overview of the meta-analysis studies included in this review can be found in Table 5.

In the first meta-analysis on safety climate and safety outcomes Clarke (2006) examined the relationship between safety climate and safety performance. The author distinguished between retrospective designs (accidents or injuries assessed before safety climate assessments) or prospective designs (accidents or injuries after safety climate assessments). The author conducted a systematic literature search of the PsycINFO, and other electronic databases using the following search terms: 'safety climate', 'safety culture', 'safety attitudes', 'safety perceptions' and 'safety compliance'. This systematic search was supplemented by a manual search of articles included in Flin et al. (2000) and Guldenmund (2000). The inclusion criteria was that the article must contain both a measure of safety climate and a criterion measure in terms of occupational accidents, injuries, safety compliance or safety participation, and a measure of occupational injuries or accidents. A total of 35 articles were identified. Statistical analysis of the studies found that safety climate shows a small positive correlation with occupational accidents and injuries ( $p=.22$ ), indicating that the more positive the safety climate, the lesser the rate of injuries and accidents. Results showed that the relationship between safety climate and accident involvement was moderated by the study design.

Christian et al. (2009) conducted a meta-analysis of the role of person and situational factors in relation to safety performance behaviours and safety outcomes (accidents and injuries). Christian et al. (2009) clarified the concept of safety performance and concluded that the term safety performance can be used to refer to two separate concepts; a metric for safety outcomes, such as number of injuries per year or a metric of safety related behaviour of individuals (e.g. Neal and Griffin, 2004). The authors felt it was important to distinguish between these two concepts as each might have a different relationship with the antecedents and considered safety performance behaviours and safety outcomes to be separate. In contrast to safety performance behaviours, safety outcomes are tangible events or results such as accidents, injuries or fatalities. The authors suggest that conceptualising safety performance as individual behaviours creates a measurable criterion which is more closely related to psychological factors, than safety outcomes (accidents and injuries). These can be predicated with better accuracy than safety outcomes that have a low frequency and skewed distributions.

Christian et al. (2009) built on Neal and Griffins (2004) conceptual model that the antecedents of safety performance are safety climate and personality, this directly affects safety motivation and knowledge, that in turn affects safety performance behaviours which relate to safety outcomes such as accidents and injuries. They used a modified version of this model to examine the safety literature, see Figure 5. They classified antecedents as person related and situation related. More distal person related antecedents included; measures of personality and propensity for risk taking. Situational related referred to psychological safety climate and group level safety climate.

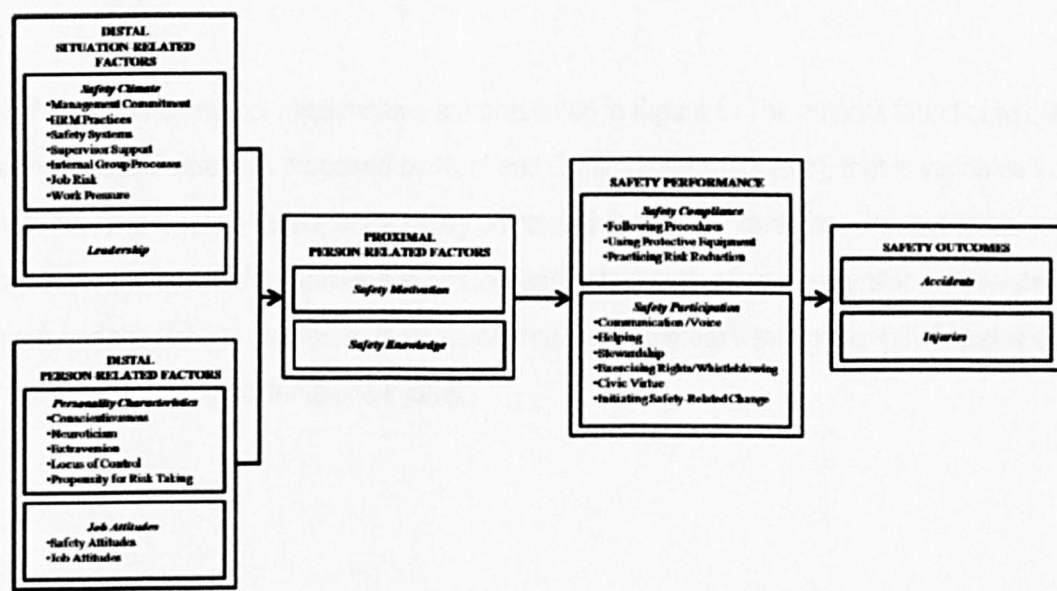


Figure 5: An integrated model of workplace safety (from Christian et al., 2009 p. 1105)

The authors conducted a search to identify all peer reviewed published articles about predictors of occupational safety performance and outcomes. Included in their definitions of safety outcomes were accidents, injuries and fatalities as well as safety performance behaviours. Key words in the literature searches included combinations of 'safe(ty) climate'; 'safe(ty) behaviours'; 'safe(ty) performance', ('workplace', 'organisational', or 'occupational') and ('injuries', 'accidents', or 'fatalities'). A number of electronic databases were searched including PsycINFO, Social Science Citation Index, and MEDLINE. In addition manual searches were conducted of major journals relevant to industrial-organisational psychology and occupational safety (e.g. *Academy of Management Journal*, *Journal of Applied Psychology*, *Personnel Psychology*, *Journal of Safety Research*, *Journal of Occupational Health Psychology*, *Accident Analysis and Prevention* and *Safety Science*) to locate articles that did not surface in the database searches as well as hand searching the reference sections of the reviewed articles to identify additional studies.

Driving outcomes were excluded as these studies did not differentiate between work related driving with personal driving. Ninety studies and 1,744 effect sizes were identified for meta-analysis, 477 of these were used in the predictor-criterion analysis. The authors found that criterion variables safety outcomes, accidents and injuries were often treated interchangeably with regard to their predictors, so computed an overall composite of accidents, injuries and safety performance. This was conceptualised as either at an individual level or aggregated (e.g. group of workers). Safety performance was defined as safety compliance and safety participation (cf. Neal and Griffin, 2004).

Results of the meta-analytical relationships are presented in Figure 6. The authors found consistency with the theoretical framework proposed by Neal and Griffin (2004) (Figure 5), that is variables that were more proximally related were more highly correlated than distal variables. Safety climate was positively related to both safety knowledge ( $p=.24$ ) and safety motivation. Leadership was related to safety performance ( $p=.31$ ) and the authors found that group climate was significantly correlated ( $p=-.39$ ) to safety outcomes (accidents and injuries).

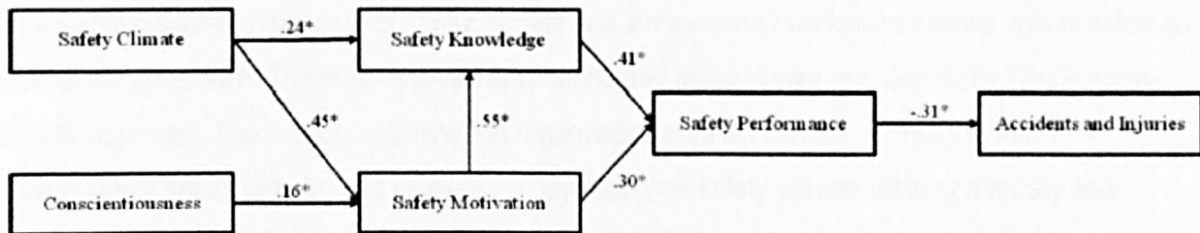


Figure 6: Maximum-likelihood parameter estimates for the hypothesised model. Standardised path coefficients  $p^* < .001$  (from Christian et al., 2009 p.1123)

Beus et al. (2010) conducted a meta-analysis of safety climate and injuries. The authors built on the classifications included in Clarke's (2006) meta-analysis which distinguished between retrospective designs (accidents or injuries assessed before safety climate assessments) or prospective designs (accidents or injuries after safety climate assessments) but did not disaggregate psychological and organisational climate. The authors hypothesised that previous retrospective studies purporting to measure the effect of safety climate on injuries have instead assessed the influence of injuries on safety climate i.e. injury  $\rightarrow$  safety climate. Their meta-analysis examines the relationship between safety climate  $\rightarrow$  injury and injury  $\rightarrow$  safety climate, whilst still retaining the distinction between psychological and organisational climate. The definitions were similar to Christian et al. (2009) where psychological safety climate was conceptualised as reflecting individual perceptions of safety policies, procedures, and practices in the workplace, whereas organisational safety climate was seen as the collective perceptions regarding the same. The authors hypothesised that safety climate informs behaviour outcome expectancies, a supportive safety climate in which safe behaviour is reinforced, is associated with fewer injuries, whereas an unsupported climate in which safe behaviours are not reinforced is associated with more frequent injuries.

The authors conducted an on-line literature search of PsycINFO, PubMed and dissertation databases using the key words 'safety climate' and 'injury', 'injuries', 'accident' or 'accidents'. In order to locate unpublished studies an additional search of *Society for Industrial and Organisational Psychology*, *Academy of Management*, and *Human Factors and Ergonomics Society* conference programmes from 2003 to 2009 was conducted. Additionally, requests for published and unpublished safety climate studies were posted on three Listservs. Further researchers in the field of safety climate and injuries were contacted directly seek unpublished studies. Studies were eligible for inclusion if they reported the



relationship between a measure of safety climate and a measure of workplace injuries and included an appropriate effect size. The meta-analysis was conducted using Hunter and Schmidt's (1982) meta-analytic approach. The authors examined a) organisational safety climate → injury b) injury → organisational safety climate; and c) injury → psychological safety climate meta-analytically and proposed moderators hierarchically. Results revealed that the predictive effects of injuries on organisational safety climate ( $p=-.29$ ) was stronger than that for psychological climate effect on predicting injuries ( $p=-.24$ ) Further the injury → safety climate relationship was stronger for organisational climate ( $p=-.16$ ) than psychological safety climate. The length of time over which injuries were assessed was found to be a significant moderator of the organisational safety climate → injury relationship, with long time frames yielding weaker relationships.

Supplemental analysis revealed that perceived management commitment to safety is the safety climate dimension with the most robust association with future injuries ( $p=.30$ ). Injury operationalization was not found to be a moderator for any of the safety climate injury relationships. Their findings suggest that injuries have a greater predictive effect on safety climate than safety climate has on injuries but the magnitude of this difference is very small. Safety climate's effect on workplace injury does not appear to be substantively different from the effect of injuries on safety climate. Although safety climate is most frequently hypothesised to affect injuries, these results suggest that injuries have a very similar and even slightly stronger effect on organisational safety climate.

Nahrgang, Morgeson and Hofmann (2010) examined the relationship between job demands, resources and burnout, engagement, and safety outcomes in the workplace based on the theoretical concept of the Job Demand-Resource model (JD-R) model (Bakker and Demerouti, 2007), The authors utilised the JD-R model to organise the various working conditions relevant for workplace safety and then explained the mechanisms through which job demands and resources relate to safety outcomes. Their theoretical model is illustrated in Figure 7. This meta-analysis builds on the meta-analysis of Clarke (2006) and Christian et al. (2009) by utilising the JD-R model to connect various job demands and resources to their potential impact on safety outcomes and to conceptualise how the health impairment process and the motivational process through which job demands and resources relate to workplace safety.

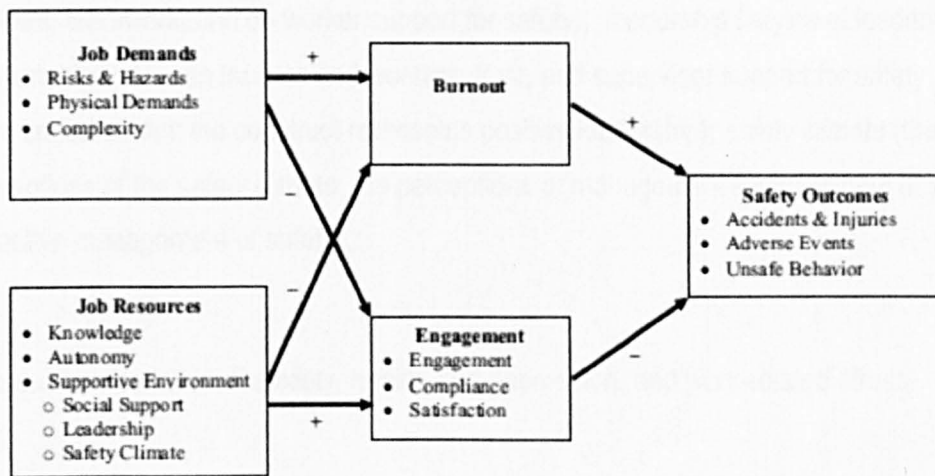


Figure 7: Job Demand-Job Resource Models of Workplace Safety (from Nahrgang et al., 2010 p. 2).

The authors conducted searches of online databases PsycINFO (1887 to 2009), ISI Web of Science (1970 to 2009), and Medline (1950 to 2009) to identify articles, search terms included 'workplace safety', 'safe behaviour', 'safe behaviour', 'safety performance', 'safety climate', and 'safety culture'. This resulted in 2,134 articles. The electronic search was supplemented with a manual search of reference lists of key empirical and theoretical articles on safety, conference programmes, and personal communication with safety researchers. Abstracts and articles were examined (960 studies) for appropriate content. If the study had sufficient information (e.g. effect sizes, description of variables, and description of sample) to code, it was included in the meta-analysis. The final set resulted in 179 studies, with 20 articles reporting more than one independent sample for a total of 203 independent samples ( $n= 186,440$ ). The samples were considered independent if participants in one sample were not participants in the other sample. The authors coding in relation to the JD-R model is as follows:

- Job demands were coded as; *risks and hazards* (perceived risk, level of risk, number of hazards, and perceptions of safety and perceptions of safety was reverse coded); *physical demands* (physical demands, workload, and work pressure or high work pace) and *complexity* (cognitive demands, task complexity, and ambiguity).
- Job resources were coded as; *knowledge* (employee understanding of safety, policies, rules and procedures, as well as safety training); *social support* ( involvement and support from co-

workers, teamwork, and co-worker support for safety); *leadership* ( styles of leadership, relationships between leaders and workers, trust, and supervisor support for safety, variables were coded so that the construct represents positive leadership); *safety climate* (the overall perceptions of the safety climate, the perceptions of management's involvement in safety, and proactive management of safety).

- Burnout included worker anxiety, health, and depression, and work-related stress.
- Engagement was coded as; *engagement* (worker participation in safety as well as safety communication and information sharing with workers), *compliance* (compliance with safety and preventative measures such as personal protection equipment and housekeeping), and *satisfaction* (job and organisational satisfaction and organisational commitment).
- Safety outcomes were coded as; *accidents and injuries* (accident and injury rates and injury severity), *adverse events* (near misses, safety events, and errors), *unsafe behaviour* (unsafe behaviours, absence of safety citizenship behaviours, and negative health and safety). Safety outcomes were coded such that a higher score on the variable represents increased frequency of occurrence.
- Industries were based on the sample description, the four primary industries represented were; construction, health care, manufacturing/processing, and transportation.

The authors findings displayed in Figure 8 are consistent with the JD-R model job demands such as risks and hazards and complexity impair employees' health and lead to burnout. Job resources such as knowledge, autonomy, and a supportive environment motivate employees toward higher engagement. Job demands were found to hinder an employee's progress toward engagement, whereas job resources were found to mitigate burnout. The authors found that burnout was detrimental to working safely but that engagement motivated employees toward working safely. Tests of mediation suggest that the health impairment process and the motivational process proposed by the JD-R model are both mechanisms through which job demands and resources influence safety outcomes. The authors found that across industries, risks and hazards were the most consistent job demand in terms of explaining

variance in burnout, engagement, and safety outcomes. A supportive environment, whether from social support, leadership, or safety climate, was also consistent in explaining variance across these safety outcomes.

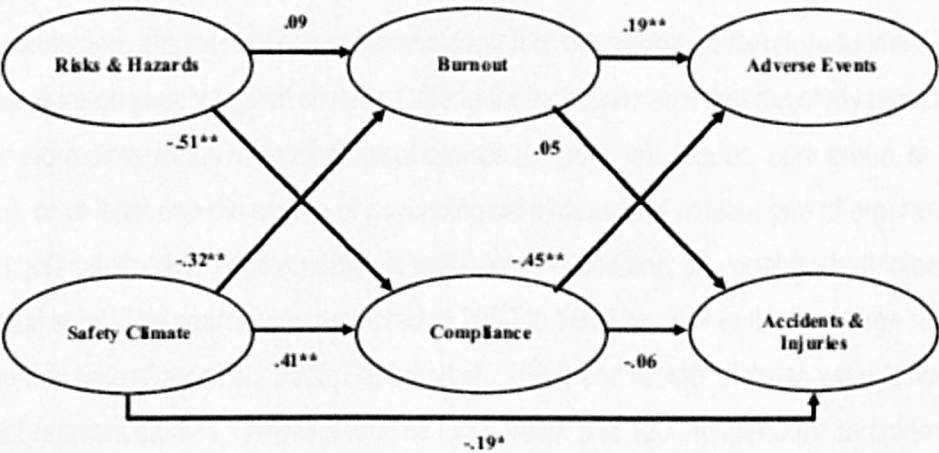


Figure 8: Hypothesised path model. Values represent standardised coefficients. \* $p < .05$  \*\* $p < .01$  (from Nahrgang et al., 2010 p.13)

In the final study identified in the review, Clarke (2010) conducted a meta-analysis to test an integrative model linking safety climate to psychological climate, work attitudes and safety outcomes. The study combined a meta-analysis to estimate a matrix of true score correlations, and structural equation modelling.

The author conducted an online systematic search of the PsycINFO database with the key search terms 'safety climate', 'safety culture', 'safety attitudes', 'safety perceptions'; or 'accidents', 'injuries', 'safety behaviour', 'safety compliance', 'safety participation' to identify relevant studies. Safety climate was defined as any measure which reflected employees' perceptions that safety was valued as a high priority within an organisation, this included studies which did not explicitly use the term safety climate. In addition, articles in press were sought via the websites of relevant journals including; *Safety Science*; *Journal of Safety Research*; *Accident Analysis and Prevention*; *Journal of Applied Psychology*; *Journal of Occupational and Organisational Psychology*; *Journal of Organisational Behaviour*; and the *Journal of Occupational Health Psychology*. A total of 55 relevant studies were identified, 51 met the inclusion criteria (data must be measured at the individual level). These studies examined relationships between

psychological climate, safety climate, organisational commitment, job satisfaction, general well-being, safety behaviour, and occupational accidents.

The author conducted a further online systematic search of the published literature to identify studies within the literature on psychological climate. Criteria for inclusion were that the study must include; either two or more dimensions of psychological climate (i.e. role, job, leader, work group, or organisation), or at least one dimension of psychological climate and at least one of organisational commitment, job satisfaction, or psychological well-being. In addition, all variables had to be measured at an individual level. The search was restricted to 2000 to 2005 as prior to this two large reviews were conducted in this area (Carr et al., 2003; Parker et al., 2003) and results of these were included. This resulted in 62 relevant studies. Overall a total of 113 studies and 120 independent samples were identified to be included in the meta-analysis.

Clarke (2010) used James and Jones (1979) taxonomy dimensions of psychological climate to code the studies. This resulted in five categories: *job* (e.g. autonomy, challenge and variety; job importance); *role* (e.g. role ambiguity; role overload; role conflict; subunit conflict; lack of organisational identification); *group* (e.g. work group cooperation; reputation for effectiveness, work group friendliness and warmth; esprit de corps); *leader* (e.g. leader trust and support; leader interaction facilitation; leader goal facilitation; psychological influence; hierarchical influence); and *organisation* (e.g. management awareness; innovation; openness of information). Measures of psychological well-being included: general health questionnaire scores (GHQ-12), sleep complaints, physical complaints, stress symptoms, psychological symptoms, burnout and tiredness.

Although safety behaviour is often measured along two dimensions (Neal and Griffin, 2000) in this study the author combined safety compliance and safety participation into one category of safety behaviour. The accidents category included all measures of occupational injuries and accidents and their immediate antecedents: unsafe behaviours, violations, near-misses, and incidents.

The author used the procedure by Hunter and Schmidt (1990) to conduct the meta-analysis and Structural Equation Modelling (SEM) was conducted using the AMOS 6.0 programme (Arbuckle, 2005),

the model is illustrated in Figure 9. The author found that safety climate had a significant association with psychological climate (particularly perceptions of organisational attributes), organisational commitment, job satisfaction, and general wellbeing. A partial mediation model was supported which demonstrated the relationship between safety climate and safety behaviour was partially mediated by work related attitudes (organisational commitment and job satisfaction) and the relationship between safety climate and occupational accidents was partially mediated by general health.

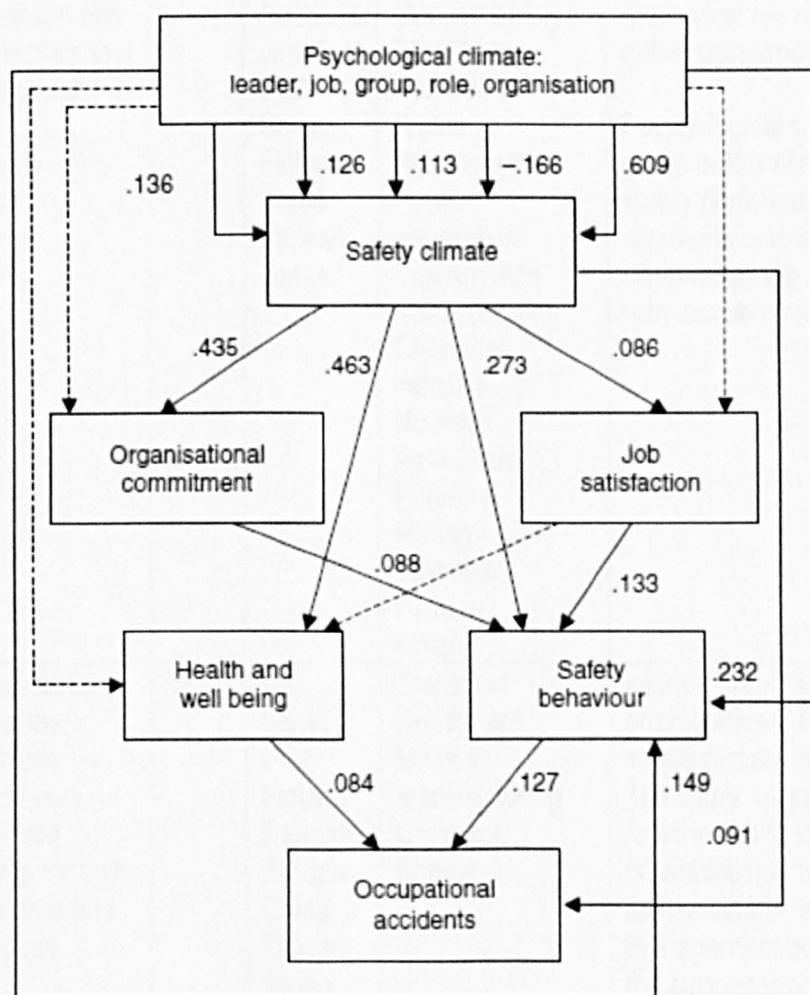


Figure 9: Model linking psychological climate, safety climate, work attitudes, and individual safety outcomes (from Clarke, 2010, p. 555).

Table 5: An overview of the meta-analysis included in the review

Author(s) and Year	Meta-analysis	N	Country	Industry	Outcomes
Clarke (2006)	Meta-analysis of the relationships between safety climate, safety performance and occupational accidents and injuries.	35	UK Israel China Australia USA Turkey	Manufacturing Construction Aviation Chemical Energy Oil and Gas	Organisational safety climate is related to employee safety compliance and strongly related to safety participation. Safety climate demonstrates weak link to accident involvement. The relationship between safety climate and accident involvement is moderated by the study design.
Christian et al. (2009)	Meta-analysis of the roles of person and situation factors that affect workplace safety.	90	UK Australia Israel USA Norway Finland China Taiwan Japan	Food Services Manufacturing Steel Mills Hazardous Waste Healthcare Power generation Construction Manufacturing Chemical industry Nuclear Agriculture Forestry Mining Veterinary Railway Military	Safety knowledge and safety motivation are strongly related to safety performance behaviours.  Psychological safety climate and group safety climate is related to safety performance, compliance and accidents and injuries. Group safety climate has the strongest association with accidents and injuries.
Beus et al. (2010)	Meta-analysis to examining the safety climate → injury and injury → safety climate relationship for both organisational and psychological climate.	53	UK Israel USA Finland Denmark Europe China Taiwan Japan	Transport Healthcare Military Manufacturing Chemical Energy	Injuries are more predictive of organisational safety climate than safety climate is predictive of injuries. The injury → safety climate relationship is stronger for organisational safety climate than safety climate is predictive of injuries. Management commitment to safety is the strongest predictor of occupational injuries.
Nahrgang et al. (2010)	Meta-analysis of the relationship between job demands and resources and burnout, engagement, and safety outcomes in	203	USA Europe Denmark Finland Israel UK Europe China	Construction Healthcare Manufacturing/ Processing Transportation	Job demands such as risks and hazards and complexity significantly impair employee's health and positively relate to burnout. Job resources such as knowledge, autonomy, and a supportive environment positively relate to engagement. Job resources



	the workplace based on the JD-R model.		Japan Australia Taiwan Sweden		negatively relate to burnout. Burnout negatively relates to working safety but engagement positively relates to working safety.
Clarke, 2010	Meta-analysis of perceived safety climate to organisational antecedents and individual outcomes.	113		Construction Healthcare Manufacturing/ Processing Transportation	Psychological climate is significantly associated with safety climate. The relationship between safety climate and safety behaviour is partially mediated by work-related attitudes (organisational commitment and job satisfaction), and the relationship between safety climate and occupational accidents is partially mediated by general health and safety behaviour. Safety climate is a partial mediator in the relationship between psychological climate and safety behaviour.

### 3.1.6. Summary

As can be seen from all three systematic reviews of the literature on safety climate and culture, management attitudes and commitment are identified in at least two thirds of safety climate measures regardless of industry (Flin et al., 2000; Seo et al., 2004; O'Connor et al., 2011). Safety systems, risk and work pressure were identified in approximately a third of the safety climate studies reviewed. The more recent meta-analysis progressed from looking specifically at the safety climate dimensions to identifying the relationship between safety climate and its outcomes such as safety participation, compliance and accident involvement (Clarke, 2006). Further authors went on to build on this meta-analytical approach by defining safety climate as personal, group or organisational (Christian et al., 2009; Beus et al., 2010) defining the safety climate → injury, and injury → safety climate relationship (Beus et al., 2010). These meta-analyses reveal safety climate offers a strong prediction of objective and subjective safety criteria across industries and countries.

The last two meta-analysis examined the relationship between safety climate and outcomes in a broader organisational context and found leadership, engagement and a supportive environment were related to working safely (Nahrgang et al., 2010) where safety behaviour was mediated by organisational commitment and job satisfaction (Clarke, 2010). The reviews and meta-analysis identify



that leadership and management attitudes are important dimensions of safety climate and safety climate is a robust predictor of safety outcomes. These results suggest that the wider organisational context, job resources, engagement, organisational commitment and a supportive environment are also important influences on safety outcomes. The next section will go on to discuss the antecedents and outcomes of safety climate in more depth.

## **3.2. Safety Climate Antecedents**

As it can be seen from the systematic reviews and meta-analysis identified in the previous section, there are a number of antecedents of safety climate. However there is limited empirical research on the antecedents of safety climate with one author noting there is a lack of investigation into the influence of organisational and social norms on safety climate and safety outcomes (Clarke, 2010). The next section will aim to summarise the literature on safety climate antecedents. This section will identify the main research supporting the relationship between safety climate and its proposed antecedents commencing with the main research supporting the relationship between leadership and management and safety climate, safety behaviours and safety outcomes. The section will go on to describe other antecedents of safety climate, perceived organisational support, engagement and organisational commitment in the context of the social exchange relationship (Blau, 1964).

### **3.2.1. Leadership**

There has been a long-held proposition that 'leaders create climate' throughout the history of safety climate research (Lewin et al., 1939). The concept of leadership as a climate antecedent has been constant ever since despite the limited empirical work (Kozlowski and Doherty, 1989; Ostroff et al., 2003; Dragoni, 2005). This idea has been reflected in safety climate research. As can be seen from the systematic reviews and meta-analysis, leadership and management is a key dimension of safety climate (Flin et al., 2000; Seo et al., 2004; O'Connor et al., 2011). Results also suggest that leadership acts as an antecedent to safety climate, safety behaviours and outcomes (Christian et al., 2009; Nahrgang et al., 2010; Clarke, 2010) in particular management commitment to safety which demonstrates a strong association with injuries (Beus et al., 2010).

Interest in leadership as an antecedent of employees' safety perceptions, attitudes and behaviour has increased over recent years (e.g. Barling, Loughlin and Kelloway, 2002; Zohar and Luria, 2004; Kelloway, Mullen and Francis, 2006; Conchie and Donald, 2009). There is widespread agreement between academics, safety practitioners and regulators that leadership is a key component of a safe organisation. The two theoretical models of leadership that have been most researched in relation to safety are Transformational Leadership and Leader Member Exchange (LMX).

#### *3.2.1.1. Transformational Leadership*

Transformational leadership as a concept has been researched in relation to both safety culture and safety outcomes. Bass (1985) conceptualised leadership style as a continuum ranging from transformational to transactional or laissez-faire. Transformational leaders act as role models and mentors, inspiring and challenging their subordinates. This style of leadership evokes changes in subordinates' value systems to align them with organisational goals. Unlike transformational leaders, transactional leaders' influence focuses on motivating subordinates to meet task objective and performance standards in exchange for rewards. They are less concerned with inspiring subordinates or understanding to their individual needs. Finally the very end of the continuum lies laissez-faire leadership which can be defined as an absence of leadership i.e. a complete avoidance of any leader responsibilities (Bass, 1985).

Transformational leadership encompasses the dimension of individualised consideration i.e. a leader that shows an interest and concern for subordinates' personal and professional development and listens to followers' concerns and needs. Leaders are conceptualised as influencing subordinates through two ways; firstly idealised influence, where the leader behaves in admirable and commendable ways and instils confidence in the subordinates this in turn makes the followers identify with them, and secondly inspirational motivation, where the leader inspires others towards achieving goals by articulating a vision which is appealing and inspiring, provides meaning this generates optimism and enthusiasm in others (Bass, 1985). These leader behaviours affect subordinates through the psychological mechanisms of personal identification with the leader and social identification with the work group (Kark, Shamir and Chen, 2003;). This results in the subordinates adopting the values espoused by the leader as their own and aligns their own self-concept with that of the group. Transformational leaders also employ intellectual stimulation such as challenging assumptions, taking

risks and encouraging subordinates to be creative to influence others. This results in subordinates developing cognitive (as opposed to affective) processes to develop new ways of solving problems and feel confident and supported in questioning the status quo (Bass, 1985).

The literature suggests transformational leadership is associated with reduced levels of occupational injuries (Barling et al., 2002), positive perceptions of safety climate (Clarke and Flitcroft, 2008; Mullen and Kelloway, 2009), safety citizenship behaviours (Conchie and Donald, 2009), higher levels of employee safety participation (Innes et al., 2010) and safety compliance (Lu and Yang, 2010). These findings also suggest transformational leaders influence subordinates both directly and indirectly. Indirect effects include enhanced safety knowledge and fostering perceptions of a positive safety climate (Barling et al., 2002; Kelloway et al., 2006; McFadden et al., 2009). Similarly, studies on transactional leadership have shown that a transactional leadership style is related to reduced accident rates, improved safety behaviours and higher perceptions of safety climate (Zohar, 2002a; Zohar and Luria, 2003; Luria et al., 2008).

The effects of both transformational and transactional leadership styles have been shown to predict safety participation and compliance (Clark and Ward, 2006; Lu and Yang, 2010). Zohar, (2002) found transformational and transactional leadership were associated with a reduction in injury rates through the promotion of a positive safety climate, and the benefits of a transactional leadership style are enhanced when safety is perceived to be a priority across different management levels. In contrast Laissez-faire, passive leadership has demonstrated negative effects on safety compliance, participation (Mullen, Kelloway and Teed, 2011) and higher injury rates (Kelloway et al., 2006).

### 3.2.1.2. *Leader Member Exchange*

Social Exchange Theory (Blau, 1964) implies that if one party acts in a way that benefits another party, an implicit commitment for future reciprocity is produced (Gouldner, 1960). Zohar (1980, p.10) noted in his initial study on safety climate that management commitment to safety '*is a major factor affecting the success of safety programmes in industry*' and that this commitment can become apparent through training programmes, management participation in safety committees and considering safety in job

design. Zohar argued that these management actions shape employees perceptions of the safety climate of the organisation. These safety related exchanges can be conceptualised from an exchange perspective (Hofmann and Stetzer, 1996).

Social exchange theory has been used to explain the relationship that develops between employees and their leader, this is known as Leader Member Exchange (LMX) (e.g. Liden, Wayne and Stilwell, 1993; Settoon, Bennett and Liden, 1996). LMX is acted out through a process of social exchange with subordinates. That is subordinates develop a mutual preference and trust in exchange for leaders' concern for their safety and well-being. The quality of this relationship influences a number of affective and behavioural subordinate outcomes (Glendon et al., 2006). High quality LMX is characterised by trust, mutual respect and support. Research has found that high quality LMX relationships are related to organisational outcomes such as higher levels of organisational commitment, job satisfaction and enhanced job performance (Graen et al., 1995; cited in Northouse, 2010).

Hofmann et al. (2003) examined the relationship between LMX and safety climate, safety citizenship role definitions (i.e. the extent that safety was seen as part of workers job role) and safety citizenship behaviours (i.e. the frequency with which workers got involved in safety activities, made safety related recommendation, took part in safety committees, protected others from safety hazards and initiated safety improvement changes). The sample was 94 workers across 25 military teams. Results suggested that in high quality LMX relationships, workers were more likely to view safety as part of their job role, which in turn resulted in higher levels of employee safety citizenship behaviours. In addition, the findings showed that workers were more likely to view safety as part of their job role when the supervisor promoted a positive safety climate (Hofmann et al., 2003). Empirical studies have also found that high levels of LMX leads to lower levels of accident involvement, fewer safety-related incidents (Hofmann and Morgeson, 1999; Michael, Guo, Wiedenbeck and Ray, 2006) and higher levels of upward safety communication (Kath et al., 2010).

### **3.2.2. Communication and Leadership**

The social exchange relationship has been used as the conceptual foundation for much of the LMX research. One aspect of this relationship that has received attention in the literature is how high-quality LMX's foster more open and constructive communication, for example Fairhurst (1993); Fairhurst and

Chandler (1989) found that high quality LMX's involve more open dialogue around non routine problems, strong value congruence, more joint decision making and minimal power distance between the leader and subordinate (Fairhurst, Rogers and Sarr, 1987).

Edmondson (1996) found that positive safety climates resulting from management demonstrating a committed and non-punitive approach to safety management, promotes more open communication and a free-flowing exchange of information about safety-related issues. However in negative safety climates, workers are more wary of raising safety issues for fear of retribution, blame and punishment. Edmondson (1996) suggested in negative safety climates when workers are forced to confront safety related issues, they will most likely look for the easiest way to placate their supervisors in order to escape getting the blame. This style of communication over time results in norms for communication that hamper the free flow of information, as the primary aim of the workers will be to protect themselves from any repercussions, blame or punishment. This type of communication has been referred to in the communications literature as defensive communication (Gibb, 1961; Eadie, 1982; DeSalvo and Zurcher, 1984; Mas, Alexander and Turner, 1991). Linked to this is the concept of upward communication. Hofmann and Stetzer (1996) define upward communication as the freedom employees feel to discuss safety issues with management. Upward safety communication has been linked to improved safety commitment as well as decreased injuries (Hofmann and Stetzer, 1996; Hofmann and Morgeson, 1999). According to previous research there are at least three broad predictors of upward safety communication, these are LMX, perceived organisational support, and safety climate (Hofmann and Stetzer, 1996; Hofmann and Morgeson, 1999).

Michael et al. (2006) examine the impact of LMX among supervisors and workers and safety communication on injuries safety-related event in a sample of 598 workers from five wood products manufacturers. Archival data on OSHA recordables was gathered from company records as this was seen as a more objective measure of safety-related events. Results showed that high quality LMX was negatively linked to self-report safety-related events but not to OSHA recordables. However safety communication was not related to either self-report safety-related events or OSHA recordables. The authors suggest that safety communication alone is not sufficient to ensure a low incident rate.

Kath et al. (2010) examined the factors that predict upward safety communication in a sample of 548 Canadian rail workers using a cross-sectional survey to examine the relationship between LMX, perceived organisational support (POS) and job safety demands (i.e. tension between job demands and safety) and upward safety communication. The authors found a positive association between LMX and upward safety communication suggesting that employees were more likely to discuss their safety concerns when there was a high quality relationship with their supervisors. Results also demonstrated a positive association between upward safety communication and perceptions of management safety attitudes (Kath et al., 2010).

It can be seen from the empirical research that upward, positive communication is important for good safety performance (Edmondson, 1996; Hofmann and Stetzer, 1996; Michael et al., 2006). Research has showed that poor communication is a key reason for reduced safety performance (Hofmann and Morgeson, 1999). Safety climate dimensions also appear to have a strong association with upward communication (Kath et al., 2010). By encouraging effective safety-related information sharing and giving feedback supervisors can develop an effective communication culture in the organisation which can influence safety practices and safety performance.

### **3.2.3. Summary**

There is consistent evidence that leadership is related to a number of safety related outcomes. Transformational leadership research has demonstrated a relationship with occupational injuries, safety climate, safety participation and safety compliance (e.g. Barling et al., 2002; Kelloway et al., 2006; Clarke and Flitcroft, 2008; Innes et al., 2010; Lu and Yang, 2010). Studies that have focused on LMX have shown that the quality of the leader subordinate relationships influences safety performance (Michael et al., 2006). High quality LMX relationships, characterised by openness, trust and respect, are associated with higher levels of upward safety communication (Kath et al., 2010b) and safety citizenship behaviours (Hofmann et al., 2003) and safety outcomes (Hofmann and Morgeson, 1999). The next section will discuss other antecedents of safety climate and safety outcomes in the context of the social exchange perspective.

### 3.2.4. Perceived Organisational Support

Another aspect of social exchange theory, Perceived Organisational Support (POS), has been linked to safety behaviours and outcomes. Eisenberger et al. (1986) defined POS as '*global beliefs concerning the extent to which the organisation values employees' contributions and cares about their well-being*' (p. 501). POS develops due to employees' tendency to give humanlike characteristics to their employing organisation (Eisenberger et al., 1986). POS focuses solely on the employer's side of the exchange as perceived by the employees (Coyle-Shapiro and Conway, 2005). Social goodwill can be gained (or lost) by employees through the extent that the behaviour is perceived to meet (or fails to meet) informal exchange obligations. When behaviour is perceived as meeting social obligations, the exchange process is generative and the cycle continues.

The concept of social exchanges occurring between an organisation and its member's has been well researched. Moorman (1991) and Konovsky and Pugh (1994) found that implied obligations arising through social exchanges could be reciprocated through employee citizenship behaviour. Eisenberger and colleagues (1986, 1990) suggested that when employees perceive their organisation values and is committed to them i.e. high POS, an implied obligation develops for future reciprocity aimed at benefiting the organisation. These beneficial actions have been shown to include engaging in organisational citizenship behaviours, making suggestions to improve the organisation, and performing better (Eisenberger et al., 1990, Wayne, Shore and Liden, 1997).

Construct definition and measurement for LMX and POS are fairly well-established (Eisenberger et al., 1986; Graen and Uhl-Bien, 1995; Wayne et al., 1997). Past research has explored the link between LMX and POS (Wayne, Shore, and Liden, 1997) and found that LMX and POS were distinct but strongly correlated. LMX involves a social exchange between employees and managers or supervisor and POS involves a social exchange between employees and the organisation as a whole. Rhoades and Eisenberger (2002) conducted a meta-analysis which examined the antecedents and consequences of POS. Their results indicate that there are three major categories of antecedents that help to develop perceived organisational support; (1) fairness treatment and the quality of the interpersonal relationship in how resources are distributed among employees; (2) the degree to which supervisors care about employee well-being and value employee contributions and (3) the

organisational recognition and reward of employee efforts together with the general work conditions in the organisation.

While the positive impact of POS as a desirable organisational outcome has been well researched, there is less empirical research examining the relationship between POS and safety climate and safety outcomes. Hofmann and Morgeson (1999) examined the effects of POS on safety communication, safety commitment and accidents. The study compared the safety perceptions of workers with high POS and low POS perspectives with job satisfaction, compliance with safety management policies and accident frequency. The authors found reciprocal actions resulting from high POS included raising safety concerns or increased upward communication, organisational citizenship behaviour, organisational commitment and safer behaviours. However Kath et al. (2010) was unable to replicate the finding that POS significantly predicted upward communication.

Shannon et al. (1997, p. 15) found that management practices that reflected a 'genuine concern of management about their workforce' rather than 'tinkering' with policies and procedures were seen as the most effective by employees. Mearns and Hope (2005) found evidence to suggest that employees' perceptions of organisational support for their health and well-being led to lower levels of unsafe behaviour and increased organisational commitment. Higher levels of POS have been shown to predict better safety citizenship behaviour (Mearns and Reader, 2008). Mearns et al. (2010) suggested that services which are seen as discretionary by employees such as organisational health investment practices that go beyond mandatory requirements can be conceptualised as POS and demonstrated this resulted in reciprocal behaviour from employees including increased organisational commitment and safety climate. Gyekye and Salminen (2007) in a sample of 320 Ghanaian industrial workers found that high POS were related to positive perceptions concerning workplace safety. High POS was also related to greater job satisfaction, increased compliance with safety management policies and lower accident rates.



### 3.2.5. Summary

While there has been less research in relation to POS and safety and the results are somewhat mixed, the exchange relationship suggests that when an organisation shows concern for employee wellbeing this can increase the likelihood that workers will be more committed and improve safety climate perceptions (Hope and Mearns, 2005; Gyekye and Salminen Mearns et al., 2010) and this can increase workers and participation in safety-related activities, increase upward communication and reduce accident frequency (Hofmann and Morgeson, 1999). The next section will describe organisational commitment in the context of safety outcomes as a social exchange relationship.

### 3.2.6. Organisational Commitment

Organisational commitment can be defined as the employee's involvement and identification with their employing organisation (Porter, Steers, Mowday and Boulian, 1974). The authors identified three components of organisational commitment; 1) employee belief in and acceptance of the organisation's values and goals; 2) the desire to exert extra effort for the organisation and 3) a want to remain with the organisation. This definition goes beyond loyalty to the organisation. Commitment is made up of *'an active relationship with the organisation such that individuals are willing to give something of themselves in order to contribute to the organisation's well being'* (Mowday et al., 1979, p. 226).

Organisational commitment can be explained through the theory of 'social exchange' (Blau, 1964) and the 'norm of reciprocation' (Gouldner, 1960), that workers are likely to reciprocate positive concern and regard from the organisation for their wellbeing with commitment to the organisation.

Organisational commitment, which reflects an individual's emotional attachment and identification with the organisation (Meyer, 1997), has been shown to have a significant influence on a range of work behaviours, including compliance with procedures (Shore and Wayne, 1994) and organisational citizenship behaviours (Organ and Ryan, 1995). A positive safety climate, in which employees perceive that safety is prioritised and that managers are committed to safety, is likely to increase employees' feelings of commitment to the organisation, and this will in turn affect safety behaviour and outcomes, this is described as a 'positive spillover' (Morrow and Crum, 1998, p. 130). There has been little research examining the relationship between organisational commitment and safety climate or safety behaviours and outcomes. However Mearns et al. (2010) found that a positive safety climate is related

to increased organisational commitment and Clarke (2010) in the meta-analysis identified in the previous section found that the relationship between safety climate and safety outcomes was partially mediated by work related attitudes including organisational commitment.

### 3.2.7. Employee Engagement

Employee engagement can be conceptualised in a number of ways. It can be conceptualised as a set of resources such as support and recognition from and supervisors and colleagues, opportunities for learning and development, performance feedback, and opportunities for use of skills. This approach has been particularly popular in industry with organisations using the 'Gallup-12' questionnaire to measure employee engagement. Harter, Schmidt and Hayes (2002) conducted a meta-analysis of studies using the measure in 36 companies their results showed that high levels of employee engagement were positively related to business-unit performance including safety.

Based on the work of Kahn (1990), Rich, Lepine and Crawford (2010) suggested that when employees are engaged in their jobs this results in desirable job performance outcomes. Engagement is conceptualised as an organisational members' willingness to *'harness their full selves in active, complete work role performances by driving personal energy into physical, cognitive, and emotional labours'* (Rich et al., 2010, p. 619). In contrast, disengaged employees *'withhold their physical, cognitive, and emotional energies, and this is reflected in task activity that is, at best, robotic, passive, and detached'* (Rich et al., 2010, p. 619).

Employee job engagement can be applied to safe job and task completion, and Rich et al. (2010) refer to the term 'safety-specific job engagement' for this function. Engaged employees are those who are intrinsically motivated to attain excellence in their work. Through emotional, cognitive and behavioural engagement, employees are more likely to carry out their work tasks safely. Engaged employees are more likely to be involved in the safety aspects of work and are hence more likely to be associated with a positive and strong safety culture. In the context of safety, barriers to engagement may be characterised as a lack of influence over safe work practices, a lack of commitment shown by management during the implementation of safety practices, poor safety knowledge, and a lack of

understanding about the risks inherent to the work or distractions that cause employees to lose physical and cognitive focus on job tasks (Rich et al., 2010).

Employee engagement can also be conceptualised through the JD-R model (Bakker and Demerouti, 2007) as a positive organisational outcome i.e. a fulfilling, positive, affective-motivational state of work-related well-being that is the opposite of job burnout (Maslach, Schaufeli, and Leiter, 2001). A number of studies have demonstrated links between employee engagement with organisational outcomes such as extra role behaviour (Schaufeli, Taris and Bakker, 2006), intention to leave, organisational commitment (Schaufeli and Bakker, 2004). In the meta-analysis highlighted in the previous section Nahrgang et al. (2010) found burnout was negatively related to working safely but engagement motivated employees and was positively related to working safely.

### **3.2.8. Summary**

Researchers have started to link social exchange theory (Blau, 1964) to safety related outcomes (Hofmann and Morgeson, 1999; Hofmann, Morgeson and Gerrass, 2003; Michael et al., 2006; Kath et al., 2010b). A supportive environment (POS) indicates to the employees that they are valued and that the organisation is committed to them (Hofmann and Morgeson, 1999; Mearns and Hope, 2005). As a result employees will more engaged, committed and motivated to engage in more upward safety communication, increase involvement in safety activities and safety compliance, and be more satisfied with their work (Hofmann and Morgeson, 1999). Organisational commitment and employee engagement can be seen as the employee's reciprocal behaviour for high perceived supportive relationships with the organisation and/or their leader. Some studies have found support for this, positive safety climates demonstrates increased organisational commitment (Mearns et al., 2010) and employee engagement is positively related to safety outcomes (Nahrgang et al., 2010). The next section will describe the relationship between safety climate and safety outcomes.

### **3.3. Safety Climate Outcomes**

Researchers have demonstrated that organisational safety climate has a significant relationship with safe practice (Zohar, 1980), accidents (Mearns et al., 1998, 2003) and unsafe behaviour (Hofmann and Stetzer, 1996; Cabrera and Isla, 1998; Tomas et al., 1999; Brown et al., 2000). There is less understanding regarding the mechanisms underlying the link between organisational safety climate and accidents (Griffin and Neal, 2000; Seo, 2005). The meta-analysis described in the previous section have sought to address this relationship and the predictive validity of safety climate and objective and subjective safety criteria across industries and countries and found safety climate to be a strong predictor of accidents and injuries (Clarke, 2006; Christian et al., 2009; Nahrgang et al, 2010; Beus et al., 2010). There are a number of outcome measures used to assess the effects of safety climate on safety performance, these include unsafe behaviours (Hofmann and Stetzer, 1996), minor injuries or 'micro accidents' (Zohar, 2000), involvement in safety activities (Cheyne et al., 1998), near misses (Morrow and Crum, 2004), observations of safe behaviour (Cooper and Phillips, 2004; Glendon and Litherland, 2001) or safety compliance (Neal et al., 2000). The next section will provide an overview of safety climate outcomes and their limitations.

#### **3.3.1. Safety Compliance and Safety Participation**

Safety compliance refers to employees adhering to the rules and regulations and conscientiously following safety procedures, and taking hazard precautions (such as wearing PPE). Research has found violations or lack of safety compliance are common place in the construction industry (Alper and Karsh, 2009). Violations are usually not employees deliberately taking risks but taking short cuts which make the work quicker, more efficient or more convenient, and these are naturally reinforced i.e. the consequences of doing so are immediate and positive (task completed in less time) (Reason et al., 1994). Whereas punishment may be delayed, infrequent (injuries are rare and often minor) (Sulzer-Azaroff, 1978). These behaviours can be reinforced by the immediate positive gains or the priorities the organisation and managers place on productivity over safety (Cox, Jones and Rycraft, 2006).

Safety participation can be seen as more voluntary than safety compliance which is in part an aspect of an employee's role, including behaviours beyond the formal role such as organisational citizenship behaviour (Griffin and Neal, 2000), when managers show concern for employees wellbeing and demonstrate a commitment to safety, employees are likely to reciprocate with safety related organisational citizenship behaviours (Hofmann, Morgeson and Gerras, 2003), as previously identified in the literature reviews, management commitment to safety is a key dimension of safety climate, as a result safety climate can promote safety participation through employees reciprocation of perceived management of safety (Flin et al., 2000). Griffin and Neal (2000) found that participation motivation and safety knowledge were significant predictors of safety participation. Barling and Hutchinson (2000) highlighted the benefits of a commitment based approach to safety, including higher productivity and lower turnover. This approach uses management practices to create trust and affective commitment among workers to ensure safe performance rather than a control based approach to safety, which emphasises compliance. Management practices which improve safety commitment and decrease occupational injuries (Zacharatos, Barling and Iverson, 2005) have been found to enhance trust in management.

### **3.3.2. Accident/Injury**

The relationship between safety culture/climate and injury rate is unclear and complex due to measurement issues and different studies using different levels of analysis. Self-report measures of injuries and accidents are common place in the safety literature (e.g. Hofmann and Stetzer, 1996; Tomas, Melia and Oliver, 1999; Bjerkkan, 2010; Nielsen, Rasmussen, Glasscock, and Spangenberg 2008), however other authors use information from organisations internal accident databases (e.g. Varonen and Mattila, 2000; Wallace, Popp and Mondore, 2006).

Clarke (2000) identified several limitations in the consistency of accident and injury measures including; comparing two groups of employees (high level and low level injury rates) within one organisation, aggregating climate scores across different employee groups or business units; comparing high and low injury rated organisations on aggregated climate scores; and differing definitions of injury i.e. injury as lower severity and accidents as high severity. In addition different organisations collect and record

accident and injury rates in different ways and there are different regulatory and legal requirements for reporting injuries and accidents across countries.

Despite these limitations there have been a number of studies and meta-analysis, as identified in the review demonstrate a relationship between safety climate and accidents and injuries (Guldenmund, 2000; Zohar, 2003; Neal and Griffin, 2004; Clarke, 2006a; Christian et al., 2009; Beus et al., 2010). Models that have tried to establish a relationship between safety climate and injury rate/accident rate with varying results. Accident rate has been found to be directly predicted by safety climate (Wallace et al., 2006) and the relationship is mediated by safety behaviour and hazards (Tomas et al., 1999; Oliver, Cheyne and Tomas, 2002). Clarke (2006) found that the more positive the safety climate, the lesser the rate of injuries and accidents. The further meta-analysis conducted by Christian et al. (2009) demonstrated group safety climate offers a strong prediction of accidents and injuries. Beus et al. (2010) replicated these finding and demonstrated that safety climate predicted injuries and management commitment to safety had the most robust association with injuries. Despite the limitations cited above there is a positive effect (direct or indirect) of safety climate on the injury/accident rate across industries and countries.

Whilst there is growing body of evidence to support the safety climate accident injury relationship, Thompson et al. (2007) suggests accident rates are not a good measure of an organisation's safety performance as accidents are usually rare so the frequency of accidents can be statistically unreliable due to the restriction of variance and accidents are not always accurately or consistently recorded. There is also evidence to suggest that with regard to organisational data accidents are often under reported. Probst and Estrada (2010) found that for every reported accident there were on average 2.48 unreported accidents. Van der Schaaf and Kanse (2004) in a review of under reporting in all industries found from the perspective of workers there are a number of factors that act as barriers, these are in order of influence:

- 1) Fear of disciplinary action and reprisals, embedded in a culture that seeks to blame individual employees for safety incidents
- 2) An overall acceptance of risk, a perception that these events are part of the job are not preventable coupled with in some industries a macho culture
- 3) Lack of feedback safety issues reported
- 4) The perception that data collection and management is difficult and time consuming

It has been widely accepted that accidents are just the tip of an iceberg. Heinrich (1950) suggested that it is estimated that 90.9% of all accidents produced no injuries, while 8.8% resulted in minor injuries and 0.3% caused major injuries. Similar conclusions were drawn in research by Bird and Germain (1996). Thus near miss reporting may be a more accurate reflection of an organisation's safety performance. The next section will describe near misses in relation to safety climate.

### **3.3.3. Near Miss Reporting**

Near misses are unplanned events that did not result in injury, illness, damage to property but had the potential to do so. Only a lucky break in the chain of events prevented a fatality, injury or damage occurring. Near misses are usually referred to as the precursors of accidents (Bier and Mosleh, 1990). Many organisations use the reporting and management of near misses as one of the key indicators of safety performance (Bird and Germain, 1996; Jones, Kirchsteiger and Bjerke, 1999).

As near misses occur much more frequently than accidents, they may indicate important areas for improvement in safety management (Van Der Schaaf, 1995; Hinze, 1997, 1999; Reason, 1997). Additionally using near misses to inform safety management can help strengthen the safety culture (Cooper, 2000; Glendon and Stanton, 2000), especially if workers are motivated to take part in the identification, analysis and understanding of those events (Reason, 1997). While there has been limited research linking safety climate to near misses, as they occur more frequently, they may represent a more accurate reflection of an organisation's safety performance.

The next chapter will discuss the different approaches to assessing safety culture and climate both qualitative and quantitative and the advantages and disadvantages of each. The chapter then outlines the methodology and research design of the overall thesis. The methodology is conducted in four phases and each phase will be summarised.

# Chapter 4: Method

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## 4.1. Introduction

As discussed in Chapter 2 workplace safety climate can be conceptualised as facet or 'snapshot' of organisational culture (Flin et al., 2000) and relates to the '*shared perceptions among members of an organisation with regard to organisational policies, procedures, and practices*' (Zohar, 2000, p. 587). As shown in chapter 3 reviews of safety climate measures identify management and leadership as a key dimension, and further meta-analysis identified a positive safety climate is associated with significantly better safety outcomes (Clarke, 2006; Christian et al., 2009; Beus et al., 2010) and that safety climate and safety outcomes is influenced by wider organisational factors such as engagement, job resources and organisational commitment (Clarke, 2010; Nahrgang et al., 2010). There have been a number of different approaches to measuring safety performance in organisations. This chapter will outline these approaches and discuss the overall research design and methodological approach to the thesis.

### 4.1.1. Leading and Lagging Indicators

In recent years there has been a move away from safety measures solely based on retrospective data or 'lagging indicators' such as loss time accidents, incidents, fatalities and compensation costs. These traditional approaches measure historical safety events and tend to be reactive or relatively infrequent which means the success of safety management is often measured by system failures (Flin et al., 2000). These lagging indicators do not appear sensitive enough to provide useful information about the safety problems of specific worksites and they do not provide a satisfactory means to evaluate risk exposure of employees (Glendon and McKenna, 1995).

More modern approaches advocate using more proactive measures or 'leading indicators' such as measurement of safety climate (Flin et al., 2000; Mohamed, 2002). These approaches focus on current safety activities to establish the success of safety management rather than system failures. Safety climate measures; can offer information about safety issues before they develop into accidents and



injuries (Lutness, 1987), are a tool for identifying trends in an organisation's safety performance, identify areas on which focus safety interventions (Cox and Cheyne, 2000) and provide both internal and external benchmarks (Coyle et al., 1995). When compared to other means of accident prevention, such as safety audits, safety climate questionnaires are much less costly and labour intensive (Seo et al., 2004). Approaches to measuring safety climate can be quantitative, such as surveys or questionnaire or qualitative such as observations and interviews or a combination of both. The next section will describe the different approaches to measuring safety climate.

#### **4.1.2. Quantitative Approaches**

In safety culture research the safety climate questionnaire has been the predominant measurement instrument (Guldenmund, 2000; Collins and Gadd, 2002) these are typically comprised of a series of questions that measure employees' beliefs, values, attitudes and perceptions along dimensions of safety thought to be important to the development of a safety culture (e.g. management commitment). One of the first safety climate questionnaires was developed by Zohar (1980) who developed a questionnaire based on seven dimensions that were found to discriminate between high and low accident rate companies.

These questionnaires are usually administered to the whole organisation, a sample or part of it. The results of the questionnaire are processed and are either subjected to factor or principal component analysis (PCA) or used to assess the organisation safety climate against existing scales already established in previous research. Both approaches are found in the safety culture and climate literature. This research has resulted in a large number of scales (e.g. Flin et al., 2000; Guldenmund, 2000). Furthermore, as in this thesis, researchers using safety climate questionnaires have been interested in the correlation between one or more scales and some criterion outcome variable, such as accidents, near misses or safety-related behaviour, possibly with reference to different subgroups (Guldenmund, 2007).

Solely using a safety climate questionnaire has some benefits and drawbacks. Questionnaires can be easily distributed among large groups of people in a relatively short timeframe. However, the possibility

to control unwanted influences affecting the responses is limited and for that reason the results could include a lot of random 'noise'. Large numbers of responses can cancel the effect of the unwanted influences as these are averaged out over the responses, provided that the unwanted influences are unsystematic and normally distributed.

Safety climate questionnaires are also very useful for measuring changes pre and post interventions and generating a broad picture of an organisation's safety issues. Their limitations can include; a lack of an in-depth understanding or explanation of results, low response rates due to misinterpretation of the objectives of the questionnaire or understanding of the questions, fear of reprisals or blame and low levels of employee literacy. This is particularly prevalent in the construction industry which the sponsor organisation operates in, where communication has been traditionally driven by verbal communication (Guldenmund, 2007).

#### **4.1.3 Qualitative Approaches**

Qualitative approaches to measuring safety climate can include observations, interviews, group discussions and document analysis (Cooper, 2000). Qualitative methodologies can provide rich, in depth, detailed information. Questionnaires aimed at determining the safety climate of the organisation can provide a generic, generalisable overview of the safety climate perceptions of the organisation's employees at that particular point in time, however qualitative approaches aim to understand why that climate exists and to identify the specific factors and dimensions of that safety climate (Farrington-Darby et al., 2005). There are some limitations of interviews such as a lack of objectivity as perceptions are shaped by the individual participants and the researcher who codes and records them. Using multiple raters to check inter-rater reliability and checking coded themes with participants are ways of increasing validity and objectivity.

Questionnaires can be viewed as objective due to the distance between the researcher and the respondents. However this distance can also explain why questionnaire responses rates can sometimes be low. Through using face to face qualitative methodologies a relationship between the researcher and participants develops, which can encourage openness and honesty. Especially if the participants believe the researcher is trustworthy, objective and independent from the sponsor

organisation. Additionally when there is a need to understand contextual factors in undefined areas qualitative methods are superior to quantitative methodologies (Pidgeon and Henwood, 1997).

## **4.2. Research Design**

The research design is in general a guideline indicating the research strategy and informing research actions. It helps specify what kind of evidence is to be gathered, from where, and in what ways it will be interpreted. The section below introduces the epistemological paradigms, and the overall research methodology.

### **4.2.1. Research Objectives**

The primary aim of this Ph.D. thesis was to understand the variables that affect safety culture and safety performance at the sponsor organisation. The research project was carried out in a subsidiary of a large PLC where the main function of the business is to maintain the electricity power distribution networks for the main electricity suppliers in the UK. The research question for the research was *'what are the factors shaping safety culture in the organisation'* and *'what are factors shaping safety outcomes'*?

### **4.2.2. Epistemology**

In the literature there are two main approaches to researching safety culture/climate, qualitative and quantitative. The quantitative approach is the most popular approach to measuring safety culture/climate. This approach can be described as positivist paradigm. Paradigm can be defined as a philosophy (rather than a methodology) on how the research is conducted (Kuhn, 1970). This then determines what the research questions are and how these should be answered. The positivist approach adopts scientific method as a means of knowledge generation.

The converse to this is the constructivist (anti-positivist) paradigm. The constructivist approach emphasizes that social reality is viewed and interpreted by the individual according to the ideological positions they possess. Thus, knowledge is personally experienced rather than acquired from or imposed from outside. The constructivist approach suggests that reality is multi-layered and complex (Cohen et al., 2000) and a single phenomenon that has multiple interpretations. This approach emphasises that the verification of a phenomenon is adopted when the level of understanding of a phenomenon is such that the concern is to probe into the various unexplored dimensions of a phenomenon rather than establishing specific relationship among the components, as it happens in the case of positivism.

Particular paradigms with their assumptions about knowledge and reality identify their preferred methods of inquiry. The positivist paradigm with methods allowing for quantifiable results dominates the field of safety culture research. Qualitative methods are rarely used in safety culture research, often this is due to the large amount of time it takes to analyse the results and sometimes access to the participants can prove to be difficult. Many within the safety culture area advocate using both the positivist paradigm (quantitative approach) and constructivist paradigm (the qualitative approach) as these offer valuable insights into different elements of measuring and constructing safety culture (Cox and Cheyne, 2000; Cooper, 2000). Gilner and Morgan (2000) suggest the choice of methods should be based on the purpose of the research. Lack of methodological triangulation probably stems from the general fact that most organisational researchers have been trained in either quantitative or qualitative methods (Martin, 2002) The following section will discuss a triangulated methodology and how it will be applied in this thesis.

### **4.2.3. Triangulation Methodologies**

Using the general principles of Bandura's model of Reciprocal Determinism (Bandura, 1977) Cooper (2002) argued that the relationships between internal and external factors of safety climate should be considered dynamic and responding to changes in the three core elements; situation, behaviour and the individual. Cooper (2000) suggested these relationships should allow for *triangulation* and thus a *multi-faceted* view of safety culture. Cooper (2000) presented a number of ways in which the reciprocal model could be investigated; for behavioural elements - peer observations, self-report and outcome safety measures - for the situational elements - an investigation of the safety management system or

other management investigation techniques such as ergonomic investigation and workflow systems - and for the psychological elements - safety questionnaires, surveys and analysis.

Triangulation is a research approach that recommends using two or three different methodologies and study designs in order to double or triple check results and avoids the methodological limitations of using a single approach (Jick, 1979). Triangulation usually mixes qualitative and quantitative methodologies. Within the safety culture literature there is a consensus that using a multi-method/triangulated approach should be adopted to establish and measure safety culture (Cooper, 2000), despite this few studies use this approach. A triangulated method allows for a multi-level analysis of safety culture by using both qualitative (focus groups, interviews, document analysis and observations) and quantitative methodologies (questionnaires, audits, accident, injury and near miss data) (Cox and Cheyne, 2000).

In response to the gaps in the literature Cox and Cheyne (2000) used a triangulated methodology to develop the *Safety Climate Toolkit* at Loughborough University. Part of a joint industry and Health and Safety Executive research project to assess safety culture in offshore environments. The *Safety Climate Questionnaire* included in the *Safety Climate Toolkit* was developed using a multi-method triangulated approach. The stages were:

1. A series of focus group discussions ( $n=40$ ) were conducted with both offshore and onshore personnel exploring employees' understanding and perception of 'safety culture'. These 40 discussion groups involved 375 employees in groups ranging between 3 and 12 individuals. The shared understandings underpinning constructs together with a review of the literature on safety culture assessment informed the development of safety climate questionnaire.
2. Cox and Cheyne (2000) also reviewed the safety attitude questionnaire surveys that had been carried out in the organisations participating in the research project (e.g. Alexander et al., 1994; Fitzpatrick, 1996) and the common items and themes from the three survey instruments were identified.

3: Other safety attitude measures were reviewed; in the offshore industry (Lee, 1995; Donald, 1995), other industries (e.g. Zohar, 1980; Brown and Holmes, 1986; Cox, 1988; Dedobbeleer and Beland, 1991; Cox and Cox, 1991; Cooper and Philips, 1994; Cheyne and Cox, 1994; Cox et al., 1998; Mearns et al., 1998) and the HSE attitudinal indicator of safety climate (Byrom and Corbridge, 1997).

A pilot questionnaire was developed with 47 items covering *Management Commitment, Communication, Priority of Safety, Safety Rules and Procedures, Supportive Environment, Involvement, Personal Priorities and Need for Safety, Personal Appreciation of Risk and Work Environment*. The Questionnaire was piloted in two offshore locations. Sixty completed questionnaires were returned, comments and feedback was addressed. This resulted in a 43-item questionnaire which was tested on a larger pilot population. The questionnaire was distributed to 350 employees on three offshore installations. Two hundred and twenty one questionnaires were returned giving a 63% response rate.

The data was subjected to confirmatory factor analysis. A nine factor model was tested but indicated a relatively poor fit for the data (CFI=0.78) so then the six constraints identified in the model modification statistics were released. This involved six of the items being associated with different factors. This improved the model fit (CFI=0.85). Each item was significant at the 0.05 level. The authors note that items with relatively low factor loadings may not be entirely indicative of the factor, but such items could be usefully consulted individually and in any summing up of factor scores these loading could be used to weight individual items.

The authors examined two forms of reliability these were internal-scale reliability and alternate-forms reliability. Internal reliability for each of the factors reported was in the range of  $\alpha = 0.53$  through to  $\alpha = 0.84$ , the lower ones being consistent with the low loading factors. Alternate-forms of reliability involved comparing two different versions of the same measure, (Dane, 1990) where 30 subjects completed the questionnaire and after a gap of at least 18 hours were asked 17 randomly chosen of questions in an interview format. All items were significant apart from three, this indicated good overall reliability.

Given that a multi-method approach is advocated in the safety literature (Cooper, 2000) and the choice of methodology should suit the purpose of the research (Gliner and Morgan, 2002), it can be argued

that a triangulated/multi-method methodology is likely to generate rich insights into the factors or variables affecting safety culture and safety performance and as such would be the preferred approach as opposed to a purely qualitative or quantitative approach. For that reason it was decided to develop a triangulated approach in this thesis and combine different methods, including a safety climate questionnaire, interviews and focus groups.

#### **4.2.4. The Uniqueness of the Ph.D. Research**

In contrast to the preferred psychometric approaches that dominate safety culture research this thesis uses an embedded approach. The researcher had access to all employees and spent a large proportion of the time in the sponsor organisation, working from the training department. The researcher took part in safety meetings, all site based employee training programmes and undertook site visits. The following chapter (Chapter 5) discusses this in more detail. This degree of embeddedness offered a unique level of exposure to the organisational complexities that characterise the overall organisational culture and safety culture of the sponsor organisation.

The researcher was able to access all the employees in the different locations across the business and this allowed for the application of the mixed methods. The researcher spent much time on site with the frontline employees and taking part in their annual training both classroom and site based (Walker, 2010). This provided an opportunity for informal conversations, individual interviews and focus groups with front line employees and management, followed by the administration of a safety climate questionnaire (Cox and Cheyne, 2000). This embedded perspective is based on the premise that safety culture and climate assessments benefit from being bespoke and rooted in contextualised insights.

#### **4.3. Stages of Methodological Approach**

This section will provide an overview of the methodological approach undertaken in order to achieve the research objectives. This was carried out in four main stages: *Literature Review, Familiarisation and Focus Groups, Interviews and Safety Climate Questionnaire*.

**Phase 1: Literature Review (Chapter 3):** A review of previous systematic reviews and meta-analysis to identify the main dimensions of safety climate, safety climate antecedents and outcomes.

**Phase 2: Familiarisation and Focus Groups (Chapter 5):** Familiarisation was twofold, first to familiarise the researcher with the sponsor organisation and its employees, second for the organisation and its employees to familiarise themselves with the researcher and the research project. This was achieved by firstly the researcher attending; safety meetings, job related training and site visits to gain an in-depth understanding of the job roles, and the safety challenges faced by the organisation and its employees and secondly through devising and implementing an ongoing communication and marketing campaign to raise awareness and understanding of the research project and to encourage participation. Then a number of focus groups ( $n=7$ ) were conducted with a cross section of front line workers ( $n=49$ ) to:

- *Identify individuals perceptions and attitudes towards safety*
- *Identify factors that shape safety in the organisation*
- *Identify areas to be explored further in the 1:1 interviews*

**Phase 3: Interview (Chapter 6):** Semi structured interviews were conducted with a cross section of employees ( $n=27$ ). Participants were selected using a purposeful sampling strategy, to select those who have a direct involvement in safety. The sample included front line operational site based staff, line managers, middle managers and senior managers. Interview questions were developed from the results of the focus groups in consultation with safety regulatory and academic experts in the field ( $n=3$ ). The questions were divided into six main sections:-

1. *Safety Leadership*
2. *Prioritisation of Health and Safety over Production*
3. *Engagement & Involvement*
4. *Two-way Communication*
5. *Organisational Learning*
6. *Attitude to Blame*

**Phase 4: Safety Climate Questionnaire (Chapter 7):** The constructs identified in the initial focus groups and interviews informed the development of a tailored safety climate questionnaire specific to



the sponsor organisation. The resulting questionnaire was an assemblage of existing validated measures of the constructs identified as influencing safety performance, these measures included:

- *Safety Climate Toolkit (Cox and Cheyne, 2000)*
- *Upward Communication (Hofmann and Morgeson, 1999)*
- *Employee Engagement (Harter et al., 2002)*
- *Leader Member Exchange (Graen and Uhl-Bien, 1995)*
- *Perceived Organisational Support (Eisenberger et al., 1986)*
- *Organisational Commitment (Allen and Meyer, 1990)*

#### **4.5. Questionnaire Administration**

There has been a considerable amount of research into the potential advantages or disadvantages of internet based versus paper based questionnaires (Cook et al., 2000; Solomon et al., Sax et al., 2003). The advantage of internet questionnaires includes quicker turn-a-round time, reduced expense, and easier data management than traditional paper-and-pencil questionnaires (Jones and Pitt, 1999). Research suggests that internet based data collection response rates may differ from traditional methods. Pealer et al. (2001) found no significant difference in response rates of internet based questionnaires when compared to paper based questionnaires. The Internet version generated a response rate of 62% compared to 58% for the paper-and-pencil version. Knogsved et al. (2007) in a randomised control trial of online versus paper based survey administration found the paper based version generated a response rate of 17% before a reminder. After a reminder this rose to 73% response rate. When an e-mail reminder was sent to the online group response rate rose from 64% to 76%. Knogsved et al. (2007) conclude that to maximize response rates internet versions can be combined with traditional paper based versions and followed up with reminder e-mails to encourage completion.

In order to maximise the response rates in line with Knogsved et al. (2007) findings and recommendations, two forms of the questionnaire were developed, a paper-based version and an online version. Half the employees in the sponsor organisation ( $n=201$ ) were based on site. Often there was only one computer in the site office which only the site foreman or site engineer had access to. Any

information sent around by e-mail had to be printed and circulated to the front line workers by the site foreman or site engineer. Historically this method had generated very low responses to organisational questionnaires. As previously mentioned in Chapter 5 those employees based on site took part in their annual training over the winter months as the weather conditions were too hazardous for them to work on site. In order to maximise the response and completion rate, the researcher administered the paper based questionnaire to the site based employees at the start of the winter training sessions over a four week period. The researcher was present during administration to brief and debrief participants and to answer any questions regarding completing the questionnaire.

The online version of the questionnaire was an exact replica of the paper based questionnaire. This version was e-mailed to all office based employees ( $n=207$ ) with details of the purpose of the study and a link to the online questionnaire. This was open for a four week period. During this time the office based employees were sent two follow up reminder e-mails encouraging them respond.

Overall the breakdown of the results suggests there are no significant differences in response rates between the paper based and online version. One hundred and twenty employees completed the paper based questionnaire, a 58% response rate. One hundred and thirty five completed the online version, a 65% response rate with no overlap.

## **4.6. Ethical Considerations**

The qualitative (focus groups and interviews) and quantitative (questionnaire) studies were conducted, designed and administered in line with the British Psychological Society's (BPS, 2004) guidelines. All interviewees gave their written consent to taking part in the interviews and focus groups. The voluntary participation, confidentiality of the data and the right to withdraw was highlighted through a standardised informed consent document that all participants were asked to read and sign prior to commencing the interview. The researcher also read through standardised informed consent instructions at the beginning of the interview (see Appendix 3).

The questionnaire was approved by the Institute of Work Health and Organisations Ethics Committee of the University of Nottingham and approved by the sponsor organisation's senior management. Both versions of the questionnaire included a brief outlining the purpose of the study, anonymity of the information, and the right to withdraw. Informed consent was gained by participants completing following questions at the beginning of the questionnaire.

*1. In order to participate you will need to give your informed consent. By ticking the boxes you are indicating that you understand the nature of the survey and that you agree to participate in the research. Please tick the following points if you agree to take part.*

☐ I understand that all information I provide will remain anonymous and kept in accordance with the Data Protection act (1998)

☐ I understand that I have been provided with an explanation of the survey in which I am participating in and have been given the name and telephone number of an individual to contact if I have questions about the research

☐ I understand that participation in the survey is voluntary and that I can withdraw at any time

On the online version participants could not move onto the next section of the questionnaire if all boxes were not checked.

## **4.7. Summary**

Safety climate research typically uses quantitative approaches such as questionnaires and surveys to measure safety climate. The first safety climate scale was developed by Zohar in 1980 since then a number of different safety climate measures have been developed (see Flin et al., 2000; Guldenmund, 2000). Qualitative approaches include observations, interviews group discussions and document analysis (Cooper, 2000). There are advantages and limitations to both these approaches. An alternative to either a quantitative or qualitative approach is to adopt a triangulated approach using both qualitative and quantitative methods (Cooper, 2000). This approach was adopted in this thesis. Using this combined approach should circumvent the methodological limitations of using a single methodology. The results of qualitative (Chapters 5 and 6) and quantitative studies (Chapter 7) are discussed in the following chapters.

# Chapter 5: Familiarisation and Focus Groups

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## 5.1. Introduction

Chapter 4 outlined the overall methodology of the thesis and described the benefits and limitations of the different approaches to measure safety culture and climate and the rational for adopting a triangulated approach. The sponsor organisation operates in the high hazard construction sector. The primary aim of the thesis was to understand the organisational factors that shape safety culture and safety performance in the sponsor organisation. Given that the construction industry is complex and dynamic and there was a desire to understand the contextual factors influencing safety culture and safety performance, thus a qualitative methodology was adopted for the first study. The first study corresponds to the second phase of the research and is detailed in this chapter. This chapter starts by outlining the initial period of familiarisation undertaken by the researcher and then details exploratory focus groups conducted with frontline workers. This chapter goes on to present the thematic analysis of the focus groups and concludes by linking this to the previous research on safety climate and culture identified in the previous chapters (Chapter 2 and 3).

### 5.1.1. Study Aim

To understand in depth the contextual and organisational factors that shape safety culture, and safety performance in the sponsor organisation.

### 5.1.2. Study Objectives

- Familiarisation with the sponsor organisation, its employees, their job roles and the safety challenges.

- Use a grounded qualitative methodology to understand the central factors that shape safety performance in the sponsor organisation.
- Identify the main themes which influence safety culture and safety performance.

## **5.2. Familiarisation Process**

It was important for the researcher to familiarise herself with the range of activities undertaken by the sponsor organisation relevant to the research. This was done by familiarisation with the different types of documentation, including safety policies and procedures and reviewing incident reports and safety statistics. The researcher, given their limited knowledge of the industry which the sponsor organisation operates in, felt it was important to understand the organisation, its practices and employee roles as much as possible before carrying out the research. This is in line with the view of Dawson (1997) who advocates researchers 'get their hands dirty' by experiencing and engaging in the practices of the organisation and drawing close to the subject of their research. This active approach (Patton, 1990) included participating in safety meetings, observations of the roles being carried out on site and attending the winter training with site based staff. The following section will describe these in more detail. These stages were conducted simultaneously and were complementary to each other.

### **5.2.1. Familiarisation with the Safety Documentation**

The written documentation of the sponsor organisation contained a wide range of information that guided safety management and employees in their daily tasks and set a framework for decision making when dealing with safety issues. The organisation had over the previous two years dedicated a considerable amount of time updating and revising their safety policies and procedures. Legally the organisation had an obligation to keep and maintain certain documents. These included:

**A Health and Safety Policy:** This is essentially a plan detailing how the sponsor organisation will manage health and safety issues. The content is beyond the scope of this thesis but in general it contains the following three sections.

1. The 'statement of intent', the organisation's commitment to managing Health and Safety effectively.
2. The 'organisation', who in the organisation is responsible for what aspects of safety management
3. The 'arrangements' section containing details of what will be done in practice to achieve the aims set out in the statement of intent.

This policy is a requirement of UK legislation (Health and Safety at Work Act, 1974).

### **5.2.2. Accident Database**

A computer based accident reporting system had recently been installed in the sponsor organisation. This included reporting of all accidents, injuries, incidents and near misses as well as recording data on RIDDOR's (Reporting of Injuries, Diseases and Dangerous Occurrences Regulations). The organisation also had a small call centre which was responsible for, amongst other things, taking calls from employees on site who raised or reported safety concerns; these were put on the system to be actioned.

There were a number of ways the accident reporting database could be updated; usually by the Health and Safety team, inputting the details of accident investigations, site inspections and safety audits or by those onsite with access to a computer (usually the site foreman), or by the staff in the call centre. Data was not recorded anonymously. Those who filled out the online system also record their name and the names of those involved in the safety incident. These accidents, incidents and near misses were then assigned to someone within the organisation to be resolved or escalated, the severity of the case determined who in the organisation was made accountable from the foreman to the Health and Safety Director.

A report was then compiled of all the accidents/incidents and near misses, their locations and reported back to the Board of Directors once a month. The overall accidents statistics show that on the whole the rate of accidents was declining year on year. The researcher also familiarised herself with a number of accident reports. These were compiled by a member of the health and safety team in response to an accident or incident. Those involved were interviewed by the Health and Safety team and a report was created attempting to identify the root cause and any possible solutions.

### **5.2.3. Attending Safety Meetings**

The accident, incident and near misses reports generated by the computer based accident database and were discussed at the monthly safety meetings. These were attended by both representatives from management and site. The researcher attended several of these with the purpose of understanding the nature of the accidents, incidents and near misses in more depth. The meetings also served as an opportunity to promote the research project to key stakeholders within the sponsor organisation. This allowed the researcher to become a familiar figure and through this alleviate any concerns people in the organisation may have had about the research project. It was important for the researcher to be seen as independent from the management of the organisation in order to gain 'buy in' to the research project.

Additional to the safety meetings there were biweekly TOFFS (Timeout for Safety) meetings. These were less formal than the safety meetings. Topics discussed were generated from the frontline staff. During these sessions information about the accidents and incidents that occurred in the sponsor organisation and in the wider industry were disseminated. The researcher attended a number of these TOFFS meetings with the aim of familiarising herself with the employees of the wider organisation and to additionally gain common acceptance of the research project.

#### **5.2.4. Site Visits**

Over half the employees in the organisation were based on sites across the UK. It was important for the research to understand the nature and work tasks of each of the different roles onsite. This was achieved by visiting a number of sites throughout the UK. Due to the high hazard nature of most of the site based roles that included working at height and working with high voltage electricity it was not possible for the researcher to directly observe these roles but through observation on the ground and informal conversations with the site based employees the researcher gained a good understanding of their roles and the challenges they faced.

#### **5.2.5. Attending the Winter Training**

During the winter months all frontline site based employees were put on standby. This was due to the adverse weather during the winter months, creating conditions that were too hazardous to work in. This allowed the organisation to get all site based employees in over two week periods to conduct the annual training. Annual training ensured each linesman was signed off as competent to do the job and understood the relevant legal safety requirements they had to adhere to. In order to understand the site based employees' roles in more detail and to meet and build a rapport with as many of the site based frontline employees as possible the researcher undertook part of the winter training with each gang/team. This included both classroom based and site based activities. The majority of classroom based training included updates on the legal safety requirements for the role, this included working at height, working with high voltage electricity and first aid training. The majority of site based training included using the equipment for the role this included; tractor training, winch and pull lift training, pylon training and tower rescue. Being with the frontline site based employees over three months undertaking this training allowed the researcher to gain an in-depth understanding of their roles and build up a good rapport with them gaining their trust and commitment to the project.



### **5.2.6. Publicity and Regular updates**

The researcher worked closely with the marketing manager in the sponsor organisation to ensure that employees were informed of the scope of the project and frequently updated on its progress. This was done through regularly putting articles in the quarterly in-house magazine, which was emailed to all employees with computer access and posted to the home of those site based employees who did not have computer access. This ensured the research project and its progress was clearly visible and the researcher was seen as a 'familiar face' in the organisation.

### **5.2.7. Summary**

Access to organisations typically takes time, relationships are fragile and are built on mutual trust and researchers are reliant on the good will of the 'gatekeepers' or key 'stakeholders'. The familiarisation stage was fundamental to enhancing the researchers' knowledge of the sponsor organisation and its employees and to build up the trust with the participants and key stakeholders to increased participation rates in the safety culture assessment studies.

## **5.3. Methodological Issues**

There is a debate over the relevant merits of the individual or group interviews (focus groups) and their capacity for eliciting data from participants. Advocates of individual interviews (Fischhoff, Bostrom, Jacobs and Quadrel, 1997; Lynn, 1999) argue that group dynamics may suppress the expression of opinions from those individuals who do not feel confident or feel inhibited to express their views in a social setting. While supporters of group interviews suggest that these can actually facilitate and stimulate disclosures which may otherwise remain unarticulated (Frith, 2002).

The fact that participants may feel inhibited to discuss personal and intimate details in group interviews can be seen as a disadvantage of the method (Fischhoff et al., 1997). However there are also a number of advantages to the approach these can include; a rapid way of gathering data from a large

number of participants (Wilkinson et al., 2004), the dynamic discussion which takes place in group interviews is more akin to a naturalistic conversation such as storytelling, joking, arguing, teasing and disagreement (Jarret, 1993) this may also evoke vernacular responses (Bers, 1987) and the group interactions allows respondents to react and build upon the responses of the other group members creating a 'synergistic effect' (Stewart and Shamdasani, 1990). This may lead to more elaborate insights about the phenomenon under study. This effect is supported with the emotional involvement of participants which is less common than in one to one interviews (Gillham, 2005).

While there are many benefits of group interviews, it is important to try and mitigate the potential disadvantage of participants feeling inhibited to disclose personal or intimate details. In order to try and minimise this the focus groups were homogenous (Morgan, 1997). This was thought to be particularly important for conducting focus groups with the frontline site based staff. It is well documented in the safety culture literature that leadership and management practices have an effect on safety culture and safety performance (Flin et al., 2000; Guldenmund, 2000; Cheyne et al., 2002; Zohar, 2003; Flin and Yule, 2004). Including management in these groups could have discouraged open and honest discussions around the factors that affect safety in the organisation. In this particular organisation these groups were used to working and living on site in groups. These individuals felt comfortable in each other's presence and in order to encourage participation and facilitate an open and honest discussion it was felt that keeping the groups in their gangs/teams where they felt comfortable was important.

In summary there is good evidence that in the right context group elicitation techniques offer a number of advantages to the individual interview (Gillham, 2005). Focus groups are widely regarded as an effective tool for exploratory purposes that can relatively quickly and easily provide a good understanding of the range of views, attitudes and experiences of participants on a given subject. Hence focus groups were chosen as the most suitable method for exploring factors that affect safety performance with this particular group, site based frontline employees.

### 5.3.1. Sample

Focus group participants were purposefully not randomly sampled. Purposive sampling techniques (Patton, 1990) are primarily used in qualitative studies and can be defined as selecting units (e.g. individuals, groups of individuals or institutions) based on specific purposes associated with answering the research questions. Sampling in which, *'particular settings, persons, or events are deliberately selected for the important information they can provide that cannot be gotten as well from other choices'* (Maxwell, 1997 p.44). As the focus group discussions aimed to explore contextual aspects of safety performance and safety culture in the sponsor organisation frontline site based workers, ( $n=35$ ), Charge hands ( $n=10$ ) and Foremen ( $n=8$ ) were selected to take part as safety was directly inherent in their daily working lives and directly relevant to them and their co-workers. A total of seven focus groups were conducted with 49 participants in total, all of which were male.

### 5.3.2. Procedure

Focus group interviews were carried out in line with recommendations for good interview practice (BPS, 2004). All participants were verbally briefed on the purpose of the research project, the anonymity of the data gathered and their right to withdraw. A copy of the brief can be found in Appendix 1. Focus groups were conducted whilst frontline employees were on standby during the winter training sessions.

### 5.3.3. Pilot focus groups

In the first instance a pilot focus group was conducted to understand the following areas, which informed subsequent focus group sessions:

1. How to invite people to maximise participation rates
2. Assess the appropriateness of the question
3. To provide an opportunity for the researcher to familiarise themselves with the focus group procedure and protocol

Focus groups were unstructured in order to develop an uninhibited free flow conversation and to elicit open and honest responses from the participants. The aim of the discussion was to explore the aspects important to employees, the only question asked was:

- What do you think affects safety performance in this organisation?

Responses were then explored in more depth by the researcher. While consideration was given to the use of audio recording the focus groups however the methodological advantages that this might offer were outweighed by the need to enhance rapport and trust between the researcher and employees at this early stage in the research in order to:

- Increase participation in the focus groups
- Encourage a natural flow of conversation
- Encourage the use of terms and terminology naturally used by the employees
- Allow participants to lead the conversation and let them talk about the matters which were most important to them

The focus groups lasted between 30 minutes to an hour. A research diary was used to keep records of each focus group. Diary entries were made immediately after each focus group in order to minimise the risk of losing data. The diary was also used to record non-verbal behaviours and inferences.

While not audio recording the focus groups verbatim but using reflective field notes in this initial study may be open to criticism, this approach reflects the following considerations; given that site based employees had already expressed a mistrust of management it was important for the researcher to be seen as independent and objective. This approach increased participation in the focus groups and developed trust between the researcher and employees which lead to open and honest conversations.

### 5.3.4. Data Analysis

Thematic analysis was considered the most appropriate method of analysis for this exploratory study. The rationale for this was based fundamentally on the constructivist paradigm (discussed in more detail in Chapter 4), that this process would generate an appropriate level of detail to meet the primary purpose of the study, to develop insights and understanding in regard to the context of safety climate and safety performance in the sponsor organisation. Additionally to inform the next stages of the research the qualitative interviews (Chapter 6) and the quantitative safety climate questionnaire (Chapter 7).

#### 5.3.4.1. Thematic Process

The analysis of the research diary followed 5 steps as recommended by (Braun and Clarke, 2006).

1. *Familiarisation with the data* - Familiarisation with the data started when the research diary was completed, where conversations, reflections and insights were noted. In addition diary notes were re-read several times.
2. *Generating initial codes* - Descriptors/labels (codes) were attached to short, meaningful chunks of data (pieces of text, sentences and paragraphs).
3. *Searching for themes* - The set of initial codes were reviewed to identify any similarities and overlaps. Where an overlap was identified, significant consideration was given to merging these as constituent facets of higher order codes or themes.
4. *Reviewing themes* - All quotations that shared the same codes were collated. The themes were then reviewed for any inconsistencies.
5. *Naming the themes* - Groups of similar quotations were defined, named given a short description.

#### **5.3.4.2. Reliability, Validity and Generalisability**

The codes themes generated were checked by other academics in the field ( $n=2$ ) to gain consensus on inter rater reliability. Additionally the results of the analysis, the themes identified by the researcher were presented to a sample of the focus group participants ( $n=8$ ) to check they agreed with these themes identified. Both the academic experts and the sample of employees who took part in the focus groups agreed with the main themes identified through the thematic analysis.

### **5.4. Results**

The focus groups provided a rich insight into site based employees' commentaries on workplace safety and the broader perspectives of working for the sponsor organisation and its safety culture. In many instances safety issues were embedded within the broader organisational culture and context. A substantial number referred to communication and the actions of management and these themes are reflected in the safety culture literature (Hofmann and Morgeson, 1999; Flin et al., 2000; Mearns et al., 2001; Cheyne et al., 2002; Mohamed, 2003; Beus et al., 2009; Kath et al., 2010) (see Chapter 2 and 3). The results of the analysis are described below:

#### **1. Communication**

Poor communication was cited as having an effect on safety, consultation in decision making, planning and work life balance. They often felt they were given very little information with a lack of feedback opportunities.

##### **1.2. Opportunities to feedback**

Communication was seen as top down, with lack of opportunities to feed back. While sites had regular meetings there was no representative from 'management' there, and they often cited there was little if no visibility on site from management, this led to a lack of understanding of site when making decisions that affected their working practices and safety. Some participants made reference to a safety stand down day, where all members of the organisation from site based employees to senior managers took

a day off work to meet up and discuss safety issues. This was well received by all site based employees as it allowed them an annual opportunity to speak to the directors in person and air their concerns but this hadn't happened for a number of years. It also gave all an opportunity to see what the organisation's plans and objectives were for the year, what contracts they had won and what they would be working on so allowed them to roughly plan their workload for the year.

### *1.3. Lack of Face to Face Communication*

A Lack of visibility of management on site was described as an issue. The organisation has grown substantially over the last five years and previously the managers and directors were often out on site to have a 'chat' with the gangs. There used to be informal get-togethers such as beers after work with site managers/engineers and those working in the gangs. These were seen as friends as well as colleagues. These opportunities for face to face communication didn't happen anymore and contributed a feeling of an 'us and them' culture between site and office based staff. Many felt they are seen as '*rough lines men out on site*' leading to a general feeling of being unappreciated by the organisation and low morale. Additionally this was felt to have implications for working practices and safety, with decision makers having a poor understanding of site and the associated roles leading to difficult to follow safety policies and practices.

## *2. Leadership*

Leadership and communication are not exclusively separate factors but interlinked. There was perceived to be a lack of consultation in decision making leading to poor planning of projects, which had an effect on safety and their workload, work-hours, work-life balance and travel times. Additionally many felt that managers were not approachable and responsive to issues that they had raised and that many felt that they weren't treated as equals.

### *2.1. Accountability and Responsiveness of Managers*

Those who participated in the focus groups were able recounted times when they had raised safety issues and concerns or made recommendations to managers for better ways of working and then they '*fell on deaf ears*' and nothing was done about it. This lead to under reporting of safety concerns as

many felt there was no point as nothing would be done about it. Some cited times when they had raised safety concerns to managers and they were told management were aware of it but to get on with the job anyway. They felt that managers didn't honour their promises and commitments made to those on site.

## *2.2. Fair Treatment*

Another perception was that other parts of the business which were treated better than them for example had better PPE and equipment. One focus group recounted an example of when the Managing Director had come to site, no one knew who he was and when he asked '*how's it going*' they saw it as an opportunity to raise their grievances and issues. Following on from this one of the Operations Managers came to site and reprimanded the gang branding them as trouble makers. They had subsequently been on standby longer than the other gangs and had been sent to the projects furthest away adding to their travel time to site. There was also a reported a low level of trust for management.

## *2.3. Skills Knowledge and Abilities*

Those who participated in the focus groups felt there was a general lack of skills and understanding of those that managed the sites, the site project managers and engineers. Historically as it used to be a family ran company people were recruited into positions in the company not through formal procedures but rather through who you knew in the organisation. This left a large number of employees with a general lack of understanding of site and the associated job roles. This had implications in the planning process when tendering for jobs and as a consequence the workload and working hours of the linesmen doing the job. Additionally there was a feeling that managers were not on site as often as they should be and were not approachable or able to offer good support and advice to those carrying out the day to day work on site.



### *3. Job Demands*

The demands of the job were cited by the focus group participants as having an effect on safety performance. Often having to work long hours with high workloads, working away from home for a number of weeks at a time leaving them fatigued and having poor work life balance.

#### *3.1. Working Hours/Workload*

The long working hours and working week were cited as a source of frustration and having a negative effect on safety. The nature of the job meant that the gangs have to work and live on site. To keep the accommodation costs down most live in caravans on site. A lot of them had to work long days from 6am to 7pm and even though they were meant to go home every other weekend, quite often due to time pressures they only got to go home one weekend in three. These long working hours and high workloads are often linked to poor planning at the procurement stage of the projects. The clients, large utilities suppliers, want more for less and this impacts on the costing and time allocation of projects. For most the deciding factors for selecting a contracting organisation are cost and time. In order to work on the electricity pylon the live voltage on the overhead lines is turned off, these are known as outages. If the utilities company or their contractor goes over this allocated time for an outage then there are high financial penalties. Poor planning and the clients wanting more for less have big implications for the time pressures and workload for the frontline workers. This in turn has a big implication on their home life and work life balance.

Additionally some of the members of the focus group mentioned that they felt they were working 24/7 as they couldn't go out and have a drink in the evening or visit other places and do what office workers do after work due to random drink and drugs testing and trackers in their work vans. Some said if the job was behind schedule they were not even allowed a dinner break.

#### *3.2. Travel Time to Site*

Travel time to and from sites was cited as an issue with work starting at 6am on a Monday morning. A large proportion of the linesmen came from the north of the UK and often had to travel hundreds of miles down south to sites and were still expected to be there for 6am. This led to a large number driving through the night. The high workload, increased time pressures, long working hours/working week and

travel distance to site was perceived as having an impact on safety. These factors negatively impacted on employees stress levels leaving many feeling very fatigued.

#### *4. Employee Engagement & Involvement*

Focus group participants felt they were not consulted on decisions that affected their working lives and they had a lack of autonomy to carry out their job as they would like. There was a perceived lack of recognition for the work they did leading to poor motivation, job satisfaction and organisational commitment.

##### *4.1. Consultation in Decision Making*

Participants mentioned the lack of consultation in decision making, whilst planning and costing up projects. Those who were responsible for carrying out the projects, the site foremen were not involved in the tendering process. Several were able to cite instances when this had caused problems when carrying out the project as the number of men and times allocated to carry out the project were underestimated leading to 'firefighting' approach. With many working overtime and long hours to get the project finished on time. There were a number of examples given where the organisation had lost money on a project through bad planning at the procurement stage when the management had not factored things in which would take additional time and resources such as poor site access, or miscounting the number of electricity pylons to complete the project. This also had implications for site based employees work life balance with large numbers working away from home, living and working on site for up to three weeks at a time unable to travel home at the weekend due to work commitments.

Poor planning was often cited as a concern, this left people unable to organise their lives which impacted on their home life as their work schedules and whereabouts was frequently only communicated to them the day before. Sometimes this information was wrong with teams then having to travel long distances to the correct sites.

#### *4.2. Autonomy in Decision Making*

The foremen who were in charge of the linesmen felt they had a lack of autonomy in decision making about how to carry out the job, when to promote workers to the next grade or at the end of a job to let the workers go home when they had finished a project early.

#### *4.3. Reward and Recognition*

In general there was a perceived lack of appreciation, reward and recognition for the work they did on site by management. Participants felt that management had a poor attitude towards them and they were talked down to. Often not being thanked for the work done, with little or no positive feedback, only to be criticized and reprimanded when something went wrong, with one participant stating '*we just want to be loved*'. Pay and length of time on standby was cited as a concern. No-one on site had a pay-rise for two years at the time of conducting the focus groups, whilst the organisation's increasing profits were widely publicised across the business and to the shareholders.

#### *5. Safety Prioritisation*

All felt safety was important to them individually and as a team on site due to the high risk nature of their job, working at height and working with high voltage electricity. Often there were mixed messages in regard to safety versus productivity, the corporate message was safety first but the underlying message was getting the job done on time. One focus group gave an example of where finishing the project a month and half early was widely publicised and recognised throughout the organisation. The perception was that that getting the project finished early was encouraged, when this occurred the foreman and his gang were looked upon favourably. Several were able to recount examples of where they were encouraged to climb the pylon to complete the job as they were behind schedule in poor weather, such as rain and wind, which would make the working conditions less safe.

#### *6. Culture*

Participants referred to the culture of the organisation as a policing one where there was under reporting of accidents, near misses and risks due to a fear of reprisal and blame often able to recount

examples of where they had been indirectly punished for raising general concerns. This was amplified by an 'us and them culture' where there was a lack of understanding of site by office based personnel.

### *6.1. Us and Them*

Participants referred to 'us and them' culture between office based and site based staff, where the office based staff had little understanding for the jobs they did on site and this had implications for the decisions made about how to carry out their roles and the PPE and equipment implemented on site. This in turn made some of the PPE and equipment not suitable for the job, made the job more difficult and some of the safety procedures difficult to understand and follow.

### *6.2. Blame/Fear or Reprisals*

There was a fear of being blamed for raising safety concerns. This led to accidents, incidents, near misses and safety concerns being under reported. Examples were given where concerns were raised and those who raised the concerns were threatened with standby or given the jobs furthest away from home as a result. Some felt there should be a better grievance procedure so they could report concerns without fear of being blamed.

## **5.5. Summary of Main Findings**

This study aimed to identify areas perceived as related to safety culture and safety performance by frontline site based employees in the sponsor organisation. In addition the results were used to inform development of a more standardised set of interview questions to investigate these factors in-depth (See Chapter 6).

Six themes were identified as affecting safety from the point of view from the frontline employees on site. These were; *Communication, Leadership, Employee Engagement & Involvement, Safety Prioritisation, Job Demands* and *Culture*. The study allowed a preliminary understanding of the complex nature of the close relationships between these factors.

Over the last two years the sponsor organisation had appointed a new Health and Safety team. They had spent a considerable amount of time implementing new health and safety policies, procedures and a new on-line accident reporting system (as detailed in the previous section). This had a positive influence on the safety performance of the organisation with a reduction in RIDDOR's year on year. The results of the focus groups suggest the approach to ensure compliance with the health and safety procedures could be characterised as top down with little open dialogue and consultation with site based frontline workers. This approach was seen by frontline site based employees as being controlled with a policing approach to safety compliance. This had wider consequences for the employees and the organisation. It had implications for consultation and involvement in decision making, autonomy on how to carry out jobs and reduced organisational learning due to accidents, incidents and near misses being under reported due to a fear of blame. Some of the safety processes, equipment and PPE were seen as inappropriate and difficult to follow, through a lack of understanding of site by management who implemented these initiatives, which in turn had a negative effect on safety.

The attitudes of management was seen as an issue which affected site based employees ability to feed back safety concerns and general issues. A feeling of being treated unfairly and limited reward and recognition by the organisation for their efforts resulted in low engagement and moral amongst site based employees. Mixed messages with regard to safety versus production were seen to influence safety; many felt the underlying message was production first. The lack of visibility of managers on site, and a lack of understanding of site in general led to poor planning of projects, which in turn negatively affected employee's work pressures, workloads and work life balance and overall organisational efficiency. The lack of managers' onsite also contributed to a feeling of an 'us and them' culture.

### **5.5.1. Limitations**

The most obvious limitation of the study was not audio recording and transcribing the focus groups verbatim, the benefits associated with not audio recording the group interview out weighted the possible limitations, this included being able to build a relationship with the participants to illicit open and honest responses, particularly as more formal and rigorous approaches were planned for later stages of the research. There were advantages to assuming a very informal approach, particularly in the early stages

of a project where salient features are unknown to the researcher (Lynn, 1999). Interview schedules can work like a filter and limit responses to the subjects identified by the researcher (most likely from the subject literature) to be included in the interview schedule which may limit the opportunity to freely to explore the topics important to those working in this organisation. Not structuring the interviews gave the researcher the advantage of asking probing questions that could not have been predicted and that originated from topics under discussion.

### **5.5.2. Links to previous research**

The themes identified through the focus groups in the sponsor organisation are similar to previous research with regard to the main variables that have the potential to affect safety culture and safety performance. The themes generated from the focus groups reflect previous research, in particular related to upward communication (Hofmann and Morgeson, 1999; Kath et al., 2010) and a lack of communication of safety issues due to a fear of blame and retribution (Edmondson, 1996). O'Connor et al. (2011) in a review of safety climate dimensions in the aviation industry, found communication was a key safety climate dimension. The authors conclude that as the aviation industry consists of a number of different occupational groups that are not co-located, this creates particular challenges to communication as these groups are not able to engage in informal and spontaneous interaction. The results of the focus groups suggest a similar scenario where the physical distance of the work sites from the office functions creates particular issues for communication, perpetuating an 'us and them culture'.

Management and leadership was also identified as a key influence of safety performance and safety culture, this has also been identified by a number of quantitative studies on safety culture (Flin et al., 2000; Mearns et al., 2003; Zohar, 2003; Flin and Yule, 2004). Other elements identified through the focus groups reflect social exchange theory (Blau, 1964) as discussed in Chapter 3. Site based employees felt a lack of support from the organisation as a whole, leading to low morale, engagement and organisational commitment. Previous research has found that perceived organisational support has an influence on safety culture (Mearns et al., 2010) and safety outcomes (Hofmann and Morgeson, 1999) and that employee engagement and organisational commitment is also related to safety

performance (Harter, 2002; Nahrgang et al., 2010). The relationship between safety climate and safety outcomes is mediated by work related attitudes such as organisational commitment (Clarke, 2010).

The strength of this grounded qualitative approach adopted in this study, is that it was possible to derive key insights not just of what's important to safety performance, but also how they impact on other outcomes such as organisational efficiency, engagement and organisational commitment. These types of in-depth insights are unavailable through quantitative methods (Cooper, 2000) and can provide organisations with practical information on the safety culture of their organisations which can in turn inform the development of safety policies, practices and safety interventions. The next chapter describes the second qualitative study exploring employees' perceptions of the factors that shape safety culture and safety performance in the sponsor organisation. The study uses semi structured interviews and the questions were informed by the results of this study.

# Chapter 6: Qualitative Assessment of Safety Culture

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## 6.1. Introduction

The results of the focus groups with site based front line staff (Chapter 5) suggest that *Communication, Leadership, Employee Engagement, Job Demands, Safety Prioritisation* and *Culture* are contextual and situational factors which appear to have an effect on safety performance. These contextual factors could be described as aspects of the overall psychosocial organisational climate which in turn influences the safety climate and safety outcomes (Clarke 2010; Nahrgang et al., 2010). The generalisability of these findings could be questioned given that, the focus groups were not recorded verbatim and were conducted with site based front line employees only. A more structured approach was required to provide further insights to inform the development of the quantitative safety climate questionnaire (Chapter 7) that tests the generalisability of these findings.

### 6.1.1. Study Aim

- The purpose of the study was to explore in more depth the perceived factors that affect safety performance in the sponsor organisation identified in the focus groups.

### 6.1.2. Study Objectives

- To develop rich insights of the factors that shape safety culture and safety outcomes in the sponsor organisation.
- To identify the main themes to inform the development of a safety climate questionnaire.



## **6.2. Methodological Issues**

As discussed in Chapter 5 there are arguments for and against the individual interview and its capacity for eliciting data from participants. Advocates of the individual interview (Fischhoff, Bostrom, Jacobs and Quadrel, 1997; Lynn, 1999) argue that group dynamics may suppress the expression of opinions of those individuals who do not feel confident or may be inhibited from expressing their views in a social setting.

The in-depth interviews were conducted with differing levels of personnel across the organisation, including senior directors, operational managers and site based employees. The results from the focus groups suggested that there was an underlying culture of blame and due to the potentially sensitive nature of the topics for discussion, it was decided that one to one individual interviews were the best methodological approach to explore the themes highlighted in the focus groups further, as opposed to group interviews. By conducting both focus groups with front line site based operational employees (Chapter 5) and using more in-depth individual interviews this approach aimed to address most of the criticisms of both qualitative methodologies.

### **6.2.1. Sample**

#### ***6.2.1.1. Negotiating Access***

The Board of Directors agreed that the researcher could have un-restricted access to approach anyone within the organisation to take part in the interviews. The researcher worked with the marketing manager to put together an article for the internal magazine to inform employees in the organisation about the research project and to encourage participation in the interviews (see Chapter 5).

#### 6.2.1.2. Sample Frame

It was important to select employees in the organisation who had an influence on, or were involved in, safety or operational practices so a purposeful sampling strategy was employed (Patton, 1990). The strength of this sampling strategy lies in selecting information-rich cases. Information-rich cases were chosen so the researcher could learn a great deal about issues of central importance to the factors that affect safety in the organisation (Maxwell, 1997). Table 6 shows the number of participants from each department or working group.

The type of purposeful sampling used was chain sampling. This is a sampling technique used for locating information-rich key informants or critical cases (Patton, 1990). The process involved asking members of the site based focus groups as well as the Health and Safety department 'Who knows a lot about safety practices on site?' and 'Who should I talk to?' By asking a number other employees involved in the study who else to talk to, the chain gets bigger and the researcher is able to accumulate new information-rich cases. In most cases a few names were mentioned repeatedly to the researcher as key people to talk to. The interviews were conducted to the point of redundancy, as the purpose was to maximise the information on the factors that affect safety performance in the organisation, so when no new information was generated from the interviews sampling was terminated (Lincoln and Guba, 1985).

*Table 6: Interview Sample*

Department/Group	Number of Participants	Based
Frontline operational	4	Site
Charge hands	2	Site
Foremen	2	Site
Site Engineers	2	Site
Construction Project Managers	3	Site
Operations Managers	3	Office
Transport	1	Office
Project Directors	4	Office
Accounts/Procurement	2	Office
HR & Training	2	Office
Board of Directors	2	Office
<b>Total</b>	<b>27</b>	

### **6.2.2. Interview Schedule**

The semi structured interview was used to understand the factors that shape and influence safety performance and safety culture identified in the focus group in more depth. The interview schedule was semi structured and used mostly open ended questions. The advantage of this is there is more flexibility in the order the questions are asked and the answers can be explored by the researcher in more detail than in a structured interview (King, 1994). This qualitative method was chosen to build an in-depth descriptive account of the factors that influence safety performance in the sponsor organisation by those who have a direct or indirect involvement in operational safety.

In order to conduct the interviews it was necessary to develop a set of questions that would further explore the topics identified in the previous study (Chapter 5). To do this a range of information sources were drawn upon:

1. Research findings based on the focus groups conducted with front line operational site based employees (See Chapter 5).
2. Mainstream literature on safety culture (See Chapter 2 and 3).
3. Consultation with expert advisors including; the Principle Psychologist at the Health and Safety Executive, an academic who has conducted numerous research studies on safety culture and climate predominantly in the oil and gas industry and the researchers academic supervisors.

These sources were supplemented by the researcher's insights derived from informal discussions with employees across the organisation through the familiarisation process (see Chapter 5). Interviews were conducted with employees at differing levels across the organisation the questions were appropriately phrased. For example when investigating perceptions of leadership front line site based employees were asked about their immediate supervisors (foremen) but foremen were asked about their

immediate managers (project managers/site engineers). The protocol is provided in Appendix 2. Structured questions were asked around the following topics:-

- Safety Leadership
- Prioritisation of Safety over Production
- Engagement & Involvement
- Two-way Communication
- Organisational Learning
- Attitude to Blame

#### **6.2.4. Data Analysis**

Twenty seven interviews were conducted in total; these were between 45 minutes and an hour long. All interviews were transcribed verbatim. This resulted in large volumes of textual material. All of this material needed to be analysed and interpreted. It was necessary to develop an analytical strategy within the interpretive process so that the results are representative and robust.

A relatively recent development in organisational research has been the application of *Template Analysis* to rich unstructured qualitative data following the primary data collection phase (Crabtree and Miller, 1999; King, 2004). Template analysis has emerged from more structured approaches such as Grounded Theory and Interpretative Phenomenological Analysis (IPA). King (2004) argues that although template analysis makes use of codes and coding of data it is not as prescriptive as Grounded Theory and is not wedded to its realist methodology. It can be used across a range of epistemological positions and as such can be useful for many research disciplines. When template analysis is used within a broadly phenomenological approach it is very similar to IPA. The main difference between the two approaches is the use of a '*priori*' code in template analysis and the balance between within and across case analysis.

Thematic analysis provides a framework to capture the richness of the data and helps organise the data collected into a structure. As the resulting interview transcripts were long with much textual

information to analyse, template analysis allowed the researcher to organise the data into *priori* codes and themes, which helped manage and organise the large volumes of data. The template analysis was conducted using the following steps recommended by King (2004):-

**1) Defining *priori* themes** - The main *priori* themes were taken from the results of the exploratory focus groups, field notes, literature review and expert advisor feedback. As the focus groups had generated some areas to be explored at interview there was an assumption that these areas should be included. Additionally the importance of leadership, communication, job demands and culture in relation to safety culture is well-established (see Chapter 2 and 3) thus these were included in the *priori* themes as these were expected to arise in the data. Using *priori* themes accelerates the initial coding phase of analysis; which can be very time-consuming especially with large amounts of textual information. In order to ensure that material that does not relate to the initial *priori* themes was overlooked and to ensure the *priori* themes developed were actually the most effective way of characterising the data, the *priori* themes were treated as tentative and redefined, added to or removed as the process of analysis was conducted.

**2) Transcription** - All audio recorded interviews were transcribed verbatim. These were then read through thoroughly a number of times by the researcher in order to familiarise herself with the text.

**3) Initial coding of the data** - The researcher identified the parts of the transcripts that were relevant to the research question, 'what are the factors that affect safety culture and safety performance in the sponsor organisation'. Those 'chunks' that recurred several times in the data set within and across transcripts were defined as a theme, then those that were identified as one of the *priori* themes were coded and attached to the identified section. For those parts of the transcript where there were no relevant themes the existing themes were modified and new ones were devised.

**4) Production of initial template** - The initial template was developed after a sub-set of five transcripts had been coded. The themes identified in the selected transcripts were grouped into a smaller number of higher-order codes which described broader themes in the data. This was done by hand.

**5) Template development** - The template was then developed by applying it to the full data set, coding all relevant segments on it, and modifying it, if there was relevant material which the template did not

adequately cover. Whenever the researcher found a relevant piece of text which did not fit well into an existing theme the template was changed and added too.

**6) Quality check** - The template, codes and analysis were checked by other academics in the field of Occupational Safety (n=2) to check quality and ensure that the analysis was not being systematically distorted by the researchers own preconceptions and assumptions. The final template can be found in Appendix 4. The themes identified can be found in Table 7.

*Table 7: Themes identified through template analysis*

Priori Themes		Sub Themes			
1	Communication	1.1.	Top Down	1.1.1.	Lack of Opportunities to feedback
		1.2.	Poor Communication to site	1.2.1	Lack of Face to Face
2	Leadership	2.1.	Visibility on site	2.1.1.	Support and Advice
		2.2.	Accountability, Approachability and Responsiveness		
		2.3.	Understanding of site	2.3.1.	Informed of outcomes of accidents and near misses
				2.3.2.	Identification of Root Causes/Organisational Learning
3	Job Demands	3.1.	Poor Planning		
		3.2.	Working hours/Working Week		
		3.3.	Client Demands/Commercial Pressure		
4	Health and Safety Prioritisation	4.1.	Importance of Safety vs. Production		
		4.2.	Corner cut to get the job done		
		4.3.	Health and Safety Procedures	4.3.1.	Correct PPE/Equipment
5	Employee Engagement	5.1.	Consultation in decision making		
		5.2.	Reduced Moral		
		4.3.	Lack of Reward and Recognition		
6	Culture	6.1.	Blame/Fear of Reprisals	6.1.2.	Under reporting
		6.2	Us and Them		
		6.3.	Un-fair treatment		

## 6.3. Results

A number of *priori* themes and sub themes were identified through template analysis. These are detailed below.

### 1. Communication

Poor communication was cited by site based, office based and management, as a factor affecting safety performance and something the organisation was particularly bad at, it was characterised by being top down, with a lack of face to face communication. The participants cited an over reliance on emails and a lack of opportunity for site based employees to feedback concerns. The issues relating to communication are widely cited in the safety culture literature (DeJoy, 1985; Edmondson, 1996; Hofmann and Morgeson, 1999). Edmondson (1996) found that positive safety climates from management showing a committed and non-punitive approach to safety, promotes more open, free-flowing communication about safety-related issues. The freedom employees feel in discussing safety issues with their direct supervisors or *upward safety communication* has been linked to improved safety commitment as well as decreased injuries (Hofmann and Stetzer, 1996; Hofmann and Morgeson, 1999).

#### 1.1. Top Down

Interviewees described communication in the organisation as top down, embedded in a telling rather than consulting way of informing employees in the organisation. This perception was particularly strong for site based employees who described how they were told about changes, new ways of working and the implementation of new processes rather than being consulted with. The office based employees and management interviewed felt more involved with the decisions made by the organisation that affected their day to day working than site based employees.

*'Recent example we have just had a whole department restructure, they have sent it out and I don't understand what it's on about, it just doesn't make sense at all...they have not communicated to*

*anybody that is inside this restructure, they have not sat down and told them what it is all about or anything which I think is pretty poor.'* [Construction Project Manager]

#### **1.1.1. Lack of Opportunities to Feedback**

An aspect of the perceived top down communication culture was the lack of opportunities to feedback on decisions made about their role, working practices, safety policies and process. Or a lack of opportunities to raise any concerns and issues. Senior managers interviewed felt they had more opportunities to feedback than site based employees.

*'It's just again they have this attitude where you know I'm going to tell you, you need to wear this PPE, you need to do this, and you need to do that, and it's as if they're being dictated what to do and people don't listen to their opinion, you know, if there is a difference of opinion which clearly there is on a lot of procedures on PPE at least if its discussed and you understand why they are in place, regardless of what the reason is, I think you get a better understanding, you get a lot more out of the guys who are having to use it.'* [Foreman]

#### **1.2. Poor Communication to Site**

Those interviewed acknowledged communication to site could be improved significantly. These views were more strongly expressed by the site based staff but to some extent by management. The organisation had grown in recent years and gone from being a family run organisation to being bought out by a global PLC. This added a number of layers of personnel between the board of directors and the front line site based employees. Coupled with this were the locations of site which acted as a physical barrier to effective communication. As the previous organisation was smaller and had fewer employees and layers of management there was much more face to face communication with those employees working on site, and other parts of the organisation were more aware of what site based employees did. A number of site based employees felt that due to all the additional policies, processes and procedures communication was actually getting worse not better.



*'I think there could be better communication, between the Health and Safety department and us, the communication the understanding from their point of view to our site is not there, do you know what I mean the everyday running of it.'* [Foreman]

#### **1.2.1. Lack of Face to Face Communication**

As previously mentioned the organisation had grown significantly over recent years creating more departments and organisational layers. Previously there had been much more face to face communication through managers visiting site and informal get together, whereas communication was now characterised by a lack of face to face communication and an over reliance on e-mails. This was particularly problematic for site based staff as only the site engineers and foremen had access to a computer. Often due to the remote locations they worked at there were problems with internet coverage which meant e-mails were often difficult to access. Site engineers and site foremen were expected to read, digest and disseminate the information sent out in e-mails and print out any associate documents and pin to the notice boards.

E-mail was the preferred method of communication in the organisation, with hundreds of e-mails being sent to the site engineers and site foremen every day. Some of these were safety related i.e. safety alerts (information on incidents that happened in other organisations) but often these were not filtered for relevance and sent to everybody on site whether relevant to their role or not. Important information regarding safety policy and process updates were e-mailed to the site foremen or site engineers or these e-mails told them where to access them on the intranet. This method of communication was perceived to be the least effective way to communicate. Due to the over reliance on e-mails key information in regards to safety could easily be missed as due to the time pressures of their workload many only scanned their e-mails. Face to face communication was seen as the best way to communicate safety information, to ensure that information was digested and understood by site and office based employees and more senior management, yet managers said they struggled with having time to get out on site.

*'I think a lot of policies are written to cover, and I don't think these policies are rolled out to these guys on the site as they should be. There's one thing saying, there is an e-mail saying, oh uploaded onto the*

*intranet is a revamped version a revision of this particular policy, but I mean to be honest with you I don't have the time to even look at them, I really don't because there's an e-mail coming in, there's problems on site, and if I do that I know other people will do it, but these linesmen, I mean no disrespect to them but half of them I mean they don't want to read policies like that, they'd rather it be explained in layman's terms so they understand the gist of it, you know but we don't seem to make time to do it enough and I'm not sure it should come from me, I think it should come from the department above me, and they should probably come and give everybody the same talk together, and then there's a basic understanding and everybody know what everybody has been told, what's been discussed and it's probably on a level playing field, if there is any questions or problems we can raise them there and hopefully sort them out. That's the way I'd prefer to see it.'* [Site Engineer]

*I'm not unique but I must get over 100 e-mails every day, 150, purely because of the e-mail traffic, there is just so much we're an e-mail culture, we'll e-mail the person next to us rather than speak. I mean I understand that actually e-mail is there for that kind of thing, so it was probably never not going to be on e-mail but I would hazard a guess that a large percentage of people, unless it is something that screams out at you that going to be relevant, they won't read it. It's a terrible admission, but I won't if it's not relevant to what I'm doing.'* [Operations Manager]

Edmondson (1996) has commented that when employees perceive that their concerns are not valid or addressed this tends to foster a negative climate that inhibits the willingness of both managers and employees to communicate freely and discuss issues and mistakes. The central role of communication is related to a more positive safety climate. Poor communication, a lack of opportunities to feedback, a lack of face to face can have a range of negative implications for safety on site: it can create dissatisfaction and passivity amongst those on site and may be a source of indifference of employees to formal communications, and this can hinder their motivation to participate in future safety practices.

## **2. Leadership**

Poor leadership was perceived as a key influence on safety performance by those interviewed particularly the site based employees. There was reference to a lack of visibility of senior managers on site and a perceived lack of support from them. Managers were seen as unapproachable, lacking in

accountability and an understanding of site. The perception of those in more hands on operational roles in particular was that this actually challenged safe working as there was a lack of learning from accidents and incidents at a more senior management level.

Reference to the central role of the manager's influence on safety climate and safety performance can be found in a number of studies of safety culture and climate (Flin et al., 2000; Seo et al., 2004; O'Connor et al., 2011). Leadership acts as an antecedent to safety climate, safety behaviours and outcomes (Christian et al., 2009; Nahrgang et al., 2010; Clarke, 2010). Of all the safety climate dimensions management commitment to safety is the strongest predictor of work related injuries (Beus et al., 2010). Empirical studies have found that positive relationships between a leader and their subordinates results in lower levels of accident involvement, fewer safety-related incidents (Hofmann and Morgeson, 1999; Michael et al., 2006), increased safety citizenship behaviours (Hofmann, Morgeson and Gerras, 2003), and higher levels of upward safety communication (Kath et al., 2010).

## *2.1. Visibility on site*

Visibility of senior manager/directors was frequently cited as an issue affecting safety. This was seen as more of an issue for site based employees but even the senior managers interviewed acknowledged that they needed to get out to site more.

*'When I talk about management I am talking about the senior management, who I never see, I have seen them once on the job; in fact I have seen them once out of, I don't know, five years maybe longer.'*  
[Front line operational]

*'Well certainly in terms of out on site in the field not enough that's absolutely definite, from myself and my management team and people to the side of me as well, it's absolutely recognised and it's something that I'm determined to increase, now I don't have to be out there every day, you know I was out there in the past in various operational roles where you need to be but it is important and this is about leadership and ....walking the talk. It's really about um you know being seen to, undertake that leadership, I think the other side of it in terms of promoting the safety message is I think that's and*

*easier to do from this building this office location much easier but nothing replaces actually being there in the field talking to the guys it is done insufficiently at the moment.'* [Board Director]

### **2.1.1. Support and Advice**

The site based employees interviewed felt that there was a policing approach to Health and Safety, coupled with the low visibility on site of the senior managers; they felt that the Health and Safety team only came on site when there was an audit or accident investigation. As many of the Health and Safety team and senior managers had not got their relevant training certificates, work permits and had not done the job previously they were unable to climb the electricity pylons to really investigate safety accidents, incidents and near misses thoroughly. Often the perception on site was that they were only there to point the finger and find something wrong rather than offer support and advice on how to resolve the issues. Site based managers felt there was no-one above them to turn to for support and advice, when it was needed.

*'They are almost like a bloody police force, but the whole company seems to be full of these bloody people who are out to get you, that is the impression that we get on this particular site anyway that every time we have an audit that they don't come and advise you, they just tell you what you can't do but not how you can get around it, which is bloody stupid you know, I think somebody told \* that the diesel valve was in the wrong place because it was on top of a hill, he was told to move it, so he moved it, but he was never told where to move it you know, you know if a safety officer can't advise you, they can only tell you how not to do something but not how to do it, then there is something wrong.'* [Front line operational]

*'I can't just pinpoint it to support in one area, we have, I think we have problems in support throughout the business, our IT department, our HR department, you know, they probably have reasons for it and they're maybe stretched and other reasons I'm not aware of, so I mean it's very easy for me to sit and point fingers, but sometimes I don't get that backup and support I need from things like that, it's a strange thing, it's like after 5 o'clock there's never a person to ring, I know who I can ring, and I know who'll answer it, or I can leave a message and they will ring me back, but sometimes I mean I carry my phone with me 24/7 even when I go on holiday, and I always tell engineers or foreman, I say look I*

*really don't mind if there's a problem ring me, I'll probably have a yes or a no, where it might take you three hours to find a yes or a no, and I said I really don't mind that, I'd rather you did that than struggle. But I don't get that kind of support up from me.'* [Construction Project Manager]

## **2.2. Accountability, Approachability and Responsiveness**

Site based employees cited that the managers were not approachable and they felt that their attitude towards the site based front line employees could be improved. Those on site felt that when they raised safety concerns and general issues, managers were not responsive to these concerns and did not take accountability for them. Site based interviewees gave examples where they had raised concerns and these had not been addressed and responded too, or if they were responded to it was not done in an appropriate time. There was little or no feedback on the issues raised and what was being done to address them. Whilst the organisation had some vehicles for raising safety concerns such as the safety meetings, as issues raised were not responded to in a sufficient timeframe, this had issues for safety working practices with some working against the recommendations set out in the work instructions. Site based employees also felt that senior managers did not honour their promises and commitment and could cite examples of where managers had agreed to do something for example go home early if a job was finished on time and then this was not allowed. This lead to a feeling on site that there was no point in raising concerns as they wouldn't be responded to, which lead to under reporting and a lack of organisational learning. This perception was reflected in part by middle managers but less so by senior managers.

*'I have mixed feelings, I think ultimately they obviously don't want to hurt people and have accidents, and they want to keep everything tickety boo, but sometimes I think we need a bit more support and information to do our job safer, more efficiently, but sometimes it's a bit slow to come through and usually it results after several discussions, arguments and the rest of it, which I don't particularly like doing, but that's the way we have to get it done at the moment.'* [Operations Manager]

*"The top guys, they came down and they asked us you know if there was anything we were unhappy with so I complained about the safety harnesses, that they were there solely for stopping people for falling off structures and not for working with, it is a work belt, you know to hang your tools on it and you*

*have to work out of them comfortably and you can't do it because everything is round your back side, you know you can't do it because it is solely designed really for stopping you falling off the structure and I told this to these guys and they said well we will see what we can do, but nothing was done about it and I knew it wouldn't be done."* [Charge hand]

### **2.3. Understanding of site**

Site based employees felt that there was poor understanding of site by those who complied and implemented the safety policies and procedures. This had implications for working practices and site based employees felt that the Health and Safety team and senior managers who made these decisions had very little experience of working on site and doing the job which meant that some of the procedures were not appropriate and difficult to follow.

*'I think that they need to spend time out on site to understand things, they put things in place that you can clearly see that they have no idea about what they are doing which is quite scary sometimes, like the slogans that they put out, the current one is go home safe every day or something, everyone knows you have to go home safe every day, things like that is just patronising to site people I think.'* [Front line operational]

*'I do think that they need to get more involved in what we do on site, then you can work together better then instead of them just saying no you're going to do it like this, when in reality sometimes that just doesn't work.'* [Site Engineer]

#### **2.3.1. Informed of Accidents and Near Misses**

Those on site felt that they were not well informed of the outcomes of the accidents and near misses they reported. They felt that often the information in the accident reports was incorrect and looking for somebody to blame rather than understanding the underlying issues and finding solutions. Managers felt they were better informed of the outcomes of accident investigations as these were circulated electronically.

*'I said if anything happens on site if you need to come and do an investigation on site I will come with you and I did that, and I give them all the answers and the linesman was sat there and I knew because I was stood there next to him they gave him the right answers as to what had happened, and there's no report come out for it. So then you think well I've made my commitment because people said there's not enough support of you know guidance when the SHEQ's come to site to help them, and made a point of doing that, and the reports not even issued, and that is what \* was talking about, the conductor stripping, that's one that's not closed out because there's not even been a report, so I don't even know what the outcome is.'* [Construction Project Manager]

### **2.3.2. Identification of Root Causes/Organisational Learning**

Interviewees felt that the site audits, accident and incident investigations did not fully identify the root causes and as a result the organisation did not learn from them and as a consequence did not generate appropriate solutions to the safety issues highlighted. This was in part due to a lack of understanding of site by those carrying out the investigations. For example as already highlighted many of the Health and Safety team and senior managers did not have the right training to climb the electricity pylons, as a result could not properly investigate what had happened when a near miss, accident or incident occurred. Up on the electricity pylons are where most of the work was completed and where the biggest hazards and risks were, including working with high voltage electricity, working at height and adverse weather conditions. This perception was more strongly felt by site based operational staff than senior management.

*'We did a report and the first report that was done you know it wasn't what it should have been...I was just given a copy of the report that had been prepared...But yeah you know there were elements of that thing that sort of from an operational perspective it kind of upset me a bit because in the first place people weren't fully cognisant of what they were looking at, and in the second place, for example, you know the afternoon, it happened about lunch time on say a Wednesday afternoon or something, we pulled one of the SHEQ's team off a job in Dundee, he drove, 5, 6, 7 hours down the road to site, and I went to see it the next morning and met him on site, you know, site was tidied up by this stage, the feeder was still there and all the physical damage and stuff, so I got my harness on, all my stuff on, and I said come on then we'll go up there and have a look to see what we think what happened. And this*

*guy said to me, I can't climb because I'm not on the \* approved list, because our client \* have got an approved list of things. There was two things to say about that, and the circumstances of what had happened it shouldn't have mattered who was on what list, and in the second place you know you should have been climbing anyway, why drive 5 or 6 hours from Dundee to tell me you can't climb to look.'* [Operations Manager]

*'Maybe not on this incidence no, because they didn't fully understand what we were doing so when they wrote their investigation report it didn't really reflect any measures you could put in place to stop it, we kind of come up with them ourselves on site and pushed it through that way, through my manager.'*  
[Site Engineer]

Based on the above examples it can be suggested that site based employees don't feel supported by the senior managers in the organisation and there is a lack of accountability and action from managers when issues are highlighted. When there is organisational support and concern, employees are more likely to feel that safety issues are important and that action will be taken, this will help employees feel free to raise safety concerns with their managers (Hofmann and Morgeson, 1999).

In line with social exchange theory (Blau, 1964) 'genuine concern of management about their workforce' rather than 'tinkering' with policies and procedures are the most effective Health and Safety management practices for improved safety performance (Shannon et al., 1997). A climate (or culture) of care and concern, will through the norms of reciprocity make the workforce feel obliged to reciprocate with safe behaviours. Those site based employees interviewed suggested better visibility and understanding of site would help them feel more supported and develop a more positive leader subordinate relationship, this has been linked to a more positive safety climate, for example Thomas et al. (2011) found that executive walk arounds in a healthcare setting improved front line staff's perceptions of safety climate.

### **3. Job Demands**

Those employees involved in operational delivery cited poor planning as an issue affecting safety performance, with poor costing and scheduling of jobs leading to a fire fighting approach. This was amplified by the commercial pressures and clients wanting more for less. Site based employees cited



long working hours and working weeks as an issue, with many feeling fatigued and having poor work life balance.

Job demands can include high work pressures, an unfavourable physical working environment and emotionally demanding interactions (Demerouti et al., 2001; Bakker and Demerouti, 2007). Job demands can be inherently negative, or they may turn into job stressors when effort is required on the part of the employee to meet these demands (Meijman and Mulder, 1998; Bakker and Demerouti, 2007). Nahrgang, Morgeson and Hofmann (2010) found that in their recent meta-analysis job demands contributed to safety outcomes. Other researchers have found that pressure specifically has a negative effect of safety culture and safety behaviour (Brown et al., 2000, Mearns and Flin et al., 2001).

### ***3.1. Poor Planning***

Poor planning was cited by both senior management and site based employees as having an effect on safety, more so by the site based employees, where this had an impact on their workload, time pressures and work life balance. Poor planning when bidding for projects and a lack of consultation with those who do the job, quite often led to a fire fighting approach, this had consequences for organisational learning where a lack of a review process at the end of the project meant that the same mistakes and issues were repeated on the next project. Managers were aware that there needed to be better planning as this was having a negative effect on operational performance and profitability.

*'Unfortunately what tends to happen is we move quite quickly through, so we'll complete one project and you move onto the next one, without really sort of going into the detail of what happened, lessons learnt, unfortunately.'* [Project Director]

*'We've got a tendering department, and they'll get a job come up for example, and then what will happen is, they'll say right okay, they'll put a programme together and resource allocate to it, they've got all the rates, the agreed rates with the client, they'll pull that together and then they'll ask a bit of advice from everybody, say um, not the right people, not the people who are running the job it will be another project manager, and he might say right that is going to take 5 days, that's going to take 10*

*days, 3 days and we should finish around about there, alright no problem, and they base that tender around that, then what will happen is it will go back and forth and there is a bit of negotiating, there will be 10% knocked off, 20% knocked off, you know the usual and then it'll be yeah we agree to that, there terms and conditions get sent in which we don't see we don't know what were signing up for, well I don't know what we are signing up for, and then all of a sudden it will be like right who shall we give this job too? Um here you are you've got nothing to do now run this job, and you'll be given a job and it's like and the programme is wrong, the prices wrong the resource is wrong and you're stuck with it and your trying to make it work, you're trying to fire fight all the way through the job you see, and then in this example now when we come to my contract reviews why aren't you making 23 percent? Well because we are probably doing it the right way you tendered wrong and all.'* [Construction Project Manager]

### **3.2. Working hours/working week**

The site based employees and management suggested there was a long working culture throughout the organisation. Those working on site felt that poor planning had an impact on this as not quoting and planning for new projects correctly meant that front line operational employees had to work longer hours and more overtime at weekends to get the job done. This also had an impact on their work life balance.

*'Because of the pressures of delivery we work long hours there is definitely a long hours culture within the organisation, with a number of us never working under 60 hours a week, so there is definitely that and that kind of puts pressure on you for the day job.'* [Project Director]

*'There is a lot of people that work a lot of hours but without any recognition of it, which I is...personally find it quite tough.'* [Operations Manager]

### **3.3. Client Demands/Commercial Pressure**

Senior managers in particular were aware of the increasing commercial pressure and client demands and clients wanting more for less. This impacted on the times pressures and workload of those on site doing the job. This also had the potential to negatively impact safety performance.

*'I think in a commercial contracting organisation you will always have that balance, cause you know we are not talking about balancing safety and efficiency, all we are saying is do it safely but we need you to be efficient, and that pressure to be efficient will only increase, as the commercial pressure we face will only increase, so we need to do things smarter and quicker you know work harder and smarter.'* [Board Director]

*'We tend to shut our eyes to it a little bit and just try and plod on and making profit is harder than it's ever been, you know, market is the market, the clients want more for less, our suppliers are squealing, we have a lot of small suppliers so we have to be quite ethically minded dealing with people and managing cash flow and all the rest of it.'* [Project Director]

From the interviews it appears that poor planning, commercial pressures and high workloads have an influence on the safety culture and safety performance of the organisation, where there is pressure to meet tight deadlines. This is not uncommon in high hazard industries operating in competitive environments (Mearns and Flin et al., 2001). The consequences of high pressure and increased job demands are negative and can be seen as a source of risk to good safety performance.

#### *4. Health and Safety Prioritisation*

Interviewees reported high individual priority of safety but many site based operational employees reported mixed messages when it came to safety versus production. This was amplified by Health and Safety procedures which were difficult to follow leading to corners sometimes being cut to get the job done.

Managers' behaviours and actions can, in turn, drive those of others (Cheyne et al., 2002) and can have direct and indirect effects on employees safety behaviour; directly by modelling unsafe behaviours and reinforcing them through monitoring and control or indirectly by establishing the norms of safety behaviour, through policies and practice. These actions influence the expectations and motivations of employees and as a consequence the likelihood that particular safety behaviour will be repeated or suppressed (Flin and Yule, 2004). Unsafe practices for example can be reinforced, when there are

mixed messages around safety prioritisation over production and when there is pressure on managers to meet tight deadlines (Zohar, 2002). Pressure for production has been seen to negatively affect safety climate (Mearns et al., 2001) and increase unsafe behaviour (Clarke, 2006).

#### *4.1. Importance of Safety Versus production*

All of those interviewed felt that safety was of high importance to the organisation and at an individual and team level to those on site. However the perception of the site based employees and some of the office based managers interviewed was there were mixed messages in regard to safety versus production. Whilst the official line was safety first many working on site felt that the underlying message was production and finishing the job on time.

*'Safety is the message that goes out, but from my perspective I find it very difficult that people can fully take that on board when followed quite quickly afterwards we have expectations from, not just from our division, but from the group headquarters, their expectations are what they call double digit growth on turnover and profit, year on year, so that's the kind of things they're feeding to the shareholders as one of our sort of corporate objectives and strategy, and unfortunately I think that to sort of achieve that kind of level of growth you've got to do that through productivity and efficiency you know one of the biggest costs is your labour force, now whether that's cutting labour back, whether it be in the office or in the field, that obviously you know gets to a point where if you do that too much you could compromise safety. So the official line is without doubt safety is first, but I think in practice that's very difficult that people can actually take that as being the driver when people are held accountable on how their project's performed, it's human nature, you want your project to perform as well as it can, if people's bonuses are based more heavily weighted towards the financial orientation rather than Health and Safety, albeit safety's in there, and like I say also that just the Group expectation of profit and turnover growth.'* [Board Director]

*'Don't let these people fool you that Health and Safety is their prime concern because it isn't, it is profit believe you me, its safety first, until your job is running behind'* [Charge hand]

#### 4.2. Corner cut to get the job done

Those interviewed acknowledged that corners were probably cut to get the job done. Site based employees in particular felt that these corners were cut to get the job done quicker and more efficiently not unsafely.

*'I think it's probably they want to get the job finished so they can go home early, that's got to be one. Or I think sometimes people look for shortcuts or easy ways out when really I don't think they appreciate they're probably only going to save a couple of minutes anyway and in the grand scheme of things it makes no difference whatsoever.'* [HR & Training]

*'I think so. But never to the point where it's unsafe, we might for example do something as I just said, marginally on the wrong side of what you'd feel absolutely comfortable with, but you know if the expression cutting corners is kind of perhaps indicative of some sort of do it and damn it sort of attitude, then that doesn't happen, no, it doesn't happen because it can't happen, not working the stuff that we're at.'* [Foreman]

#### 4.3. Health and Safety Procedures

Onsite employees stated that some of the Health and Safety procedures were difficult to follow and use. The organisation's over reliance on e-mails and lack of face to face communication to explain these safety policies and procedures had as a consequence created a poor understanding of them on site.

*'If they produce a big document then they should get the people in that need to process and work to this document, have a sit down and say this is a new implementation, this is the key that you need to look at. Because I have had experience on site, a site engineer working for me and I was going through the Health and Safety file with all our processes in and he got up and walked out because it was too much for him, you know I said look you need to know this but not all of it, you need to pick out the bits that you are going to have to do, the relevant ones, but you have to have an overview and it's like me sitting down and doing a EBOSH course again for two weeks, there was that much information and I*

*can understand why he went out. So just sending a document out and saying this has been updated on the intranet, I don't think is good enough because how can you guarantee that that document and that information has been taken in and implemented by the people on site, you know it is all sent in an e-mail.'* [Operations Manager]

#### **4.3.1. Correct PPE/Equipment**

Some of those site based employees interviewed felt they did not have the right equipment or PPE to do the job safely, or that the PPE and equipment could be improved to help them do the job more safely and more efficiently.

*'None of us have worked on 132 before, we'd always worked on the national \*, which is a lot bigger, a lot slower, now we're working on 132 we've gone from maybe working on one site for one week, now we're working on nine sites in one day, with the same amount of people, so it's a lot faster, but they're still needing the same equipment to access, or different equipment and it's never really been on this project, you know like 4 by 4 vehicles, things like that, the clients turn up in their Land Rovers with their ladders, never been used for years because it's obviously subcontracted work now, and they've got their welfare facilities and their vans, and they've got a little teapot and all that, and our guys have got the old vans what we used to have...basically if they're moving on nine sites a day then they need to be self-sufficient really, even our subcontractors they're all equipped'* [Foreman]

Managers and client expectations clearly play a role in how safety is prioritised. Whilst the 'corporate' message is safety first in reality this is influenced by a number of commercial pressures. The prioritisation of production is indirectly reinforced by organisational practices and financial incentives for rewarding and recognising production, increasing the likelihood that this practice and behaviour will be repeated and normalised (Flin and Yule, 2004).

#### **5. Employee Engagement/Involvement**

Operational employees felt there was a lack of consultation in decisions which had implications for their job and ways of working and this led to reduced morale and job satisfaction. A number also stated that

there was a lack of reward and recognition for the hard work and long hours they put in to get the job finished on time and in budget. Managers acknowledged there could have been more done to reward and recognise employees. Employee engagement can be described as the positive state of satisfaction and commitment an employee has to an organisation (Khan, 1990). When this translates to safety it is the extent of involvement, participation and communication in safety related activities (Hofmann and Morgeson, 1999, Neal and Griffin, 2006). Nahrgang, Morgeson and Hofmann (2010) classified compliance as engagement and found that in their meta-analysis that compliance explained the largest variance in safety outcomes.

### *5.1. Consultation and Involvement in Decision Making*

Site based employees felt there was a lack of consultation in decision making. This was exacerbated by the poor commutation to site. Decisions were made about procedures and processes without speaking to the people that were carrying out the job and this had an effect on the appropriateness of the solutions developed and implemented. The lack of consultation when planning projects had an effect on front line employee's workload and work life balance.

*'I think they need a lot more, I don't know, a lot more discussions and reasoning behind why it's changed, not just to say that's changing from that to that. I mean currently we've got issues on site now where really we shouldn't work in a danger zone which is directly the way we're working, and yet the only way we can connect our winches is to the pylon line, so basically we're contradicting us own rules. And people don't seem to listen, we have guys who are looking into alternatives and solutions to sort it out, but people just don't seem to listen and it results in frictions to the e-mail trials and all the rest of it, it's totally unnecessary, and it deters people from trying and they get frustrated and you know I think that's half of the problem, if people would listen to what these guys tell them from site I don't think there's be half as many issues as what there is.'* [Foreman]

### *5.2. Reduced Morale*

Morale was reported by those working on site as low. This was due to the lack of feedback and responsiveness of managers and a lack of reward and recognition.

*'Everybody needs to lift their heads up because, and I don't know how you do that, I don't know how you get it back on track because everybody's heads are down, everybody's heads are you know dragging on the floor, the foremen, the charge hands, the linesmen, even the likes of me, you know, that's just a waste of time'* [Construction Project Manager]

### **5.3. Lack of Reward and Recognition**

Those interviewed stated that there was a lack of reward and recognition across the business in particular for those working on the front line carrying out the job. Additionally most site based employees stated that pay and reduced benefits was an issue.

*'We're very good at pointing out when somebody's got it wrong, but really very poor at pointing out when somebody's... and not just about achievement, effort, because there is a lot of hard work goes into our business and it kind of goes unnoticed a little bit, which is really disappointing, because people won't do it forever.'* [Project Director]

*'If you asked the guys, out there guys and girls out there I think you would find that morale is quite low, um and that's because there have been no pay rises for two years, no bonuses, people have had certain benefits taken away from them, things like even silly little things like tagging your personal calls on your mobile phone, that's gone down really badly here'* [Construction Project Engineer]

*'The culture here is just probably the hardest thing, we tend to kick quite hard, but we don't tend to thank at all.'* [Operations Manager]

From the interviews it seems site based employees were disengaged from the wider organisation. Site based employees felt they could have been more involved in decision making. Autonomy and freedom to carry out work allows employees to achieve their work goals in terms of both productivity and safety outcomes (Nahrgang, Morgeson and Hofmann, 2010). Perceived organisational support which has a



relationship with engagement and organisational commitment has been linked to safety climate (Mearns et al., 2010) and safety climate has significant associations with organisational commitment and job satisfaction (Clarke, 2010).

## 6. Culture

The operational employees interviewed felt there was a blame culture with many able to recall experiences of reprisals for reporting their concerns, this lead to under reporting of accidents, incidents and near misses. This was exacerbated by an 'us and them' culture where there was a lack of understanding of site and the challenges they faced by the office based staff and management, which links into the safety culture research of Reason (1998) which suggests in order to encourage the reporting of accidents, incidents and near misses a just culture must be engineered. An effective reporting system depends on how an organisation handles blame and punishment. And this lies at the heart of any safety culture. Punitive cultures will suppress reporting and organisational learning. A negative safety culture has also been linked to poor communication of safety issues (Hofmann and Morgeson, 1999).

### 6.1. Blame/Fear of Reprisals

Those interviewed, apart from the senior managers, felt there was a blame culture. This was perceived to be more of an issue affecting the safety of site based employees. Fear of reprisals and blame lead to under reporting of accidents, incidents and near misses. This was felt by site based employees to be exacerbated by a policing approach to safety management.

*'I do still think culturally we struggle with blame, we encourage everybody to report on Rivo, but there are lots of people that will tell you they've had a really bad experience from reporting on Rivo, so actually don't want to do it anymore because they've either got in trouble, or somebody else has got in trouble, and it's ended up being a fairly negative experience. So culturally we're a long way off what we're trying to achieve around reporting being a positive experience.'* [Operations Manager]

*'Because if you question anything you're shot... well not shot down as such, but I feel like you're seen as a bit of a troublemaker if you question anything that they... we have a site audit as you probably know, once a month, if I don't agree with something that they pick up on, or if I want to question it, they don't like it, they don't like it.'* [Front Line Operational]

## 6.2. Under reporting

Those interviewed felt that there was some level of under reporting of incidents and near misses particularly on site. The perception was that this was due to the negative experiences they had from reporting safety issues in the past.

*'It used to be a company where anyone could phone anyone and ask a favour, ask for help, and whatever an issue, but now I know we do promote a no blame culture but underlying I think that's exactly what it does, you know, and that's why some people are a bit hesitant to come forward and probably report things and discuss things because they think there's going to be some kind of repercussions.'* [Construction Project Manager]

## 6.3. Us and Them

Those interviewed felt there was an 'us and them' culture between site and the office based employees. This contributed to a lack of understanding by senior management and the Health and Safety team off site and the front line employee's roles.

*'You know there's a them and us scenario out on site and in here because the lads on site are delivering stuff and working all sorts of hours, seven days a week, mostly, just to deliver stuff. And you know they see things back here as some people sitting around pushing pens and having coffee breaks two or three hours long and stuff. So you know there's a danger for them and us thing, you know'*  
[Operations Manager]

*'The office managers think that they are the company and we are nothing out here you know we are nothing out here just rough blokes who work on site.'* [Frontline Operational]

## 6.4. Unfair Treatment

Site based employees felt they were not treated fairly, as equals or when compared to other parts of the business.

*'You have the lads onto you, why haven't we got this, why do we not get the same as them, you know, and then of course the managers above me where they're saying, oh well the lads can't go at this time, they need to stay till this time, and you're thinking you know if they do the work, in my eyes if you get a good day's work out of them fine by me.'* [Foreman]

It is clear from the in-depth insights generated from these interviews that the sometimes sensitive information would have been difficult to obtain quantitatively. Limited understanding of the risks and hazards out on site means that safety initiatives developed are not always appropriate. It also means that the organisation's accident and near miss statistics were under reported, thus questionable. Under reporting of accidents has been well documented in the safety literature (Glazner et al., 1998; Pransky et al., 1999; Leigh et al., 2004; Rosenman et al., 2006, Probst and Estrada, 2010). Probst and Estrada found that 71% of experienced accidents went unreported. Individual-level under reporting of accidents has been linked to a fear of reprisals or a loss of benefits (Webb et al., 1989; Pransky et al., 1999; Sinclair and Tetrick, 2004; Van der Post et al., 2004);

## **6.4. Summary of Main Findings**

The aim of the interviews was to gather in-depth insights into staff perceptions with regard to safety culture and safety performance that could be quantified in the next stage of research through the quantitative safety culture questionnaire. The process of gaining an in-depth understanding about the sponsor organisation's safety culture involved one to one interviews ( $n=27$ ) with representatives from site based employees ( $n=13$ ) and office based middle and senior managers ( $n=14$ ).

There were differences in the nature of work of site based managers and senior managers. The results of the interviews in part reflected these differences. The main challenges for the managers related to balancing corporate and client expectations and dealing with increasing demands for delivering the same services at a lower cost and time scale than their competitors in order to win contracts. The site managers were more concerned with the challenges of delivering the project on time and within budget. Whilst the different groups viewed the challenges to safety slightly differently, however there were some commonalities in the results.

Template analysis resulted in the description of six *priori* themes; *Communication, Leadership, Job Demands, Health and Safety Prioritisation, Employee Engagement & Involvement* and *Culture* and 24 sub themes considered relevant to the characteristics of safety culture. Communication was the most frequently cited area for improvement and the biggest influences on safety culture and safety performance, by all levels of employees, from front line operational employees to the board of Directors, closely followed by leadership and priority of safety over production, although this was more strongly felt by site based employees. The lack of employee engagement and involvement and blame culture was most strongly perceived by site based employees, however there was less awareness of this at a senior level.

The results of the interviews closely mirror the results of the focus group. The themes identified from the analysis of the focus groups discussions formed the basis for the initial template (King, 2004) used to analyse the one to one interviews. For that reason the *priori* themes are the same, however due to the interviews being more in-depth and transcribed verbatim more sub themes were identified.

#### **6.4.1. Strengths and Limitations**

The primary advantage of in-depth interviews is that they provide much more detailed information than quantitative methodologies (Cooper, 2000). Given that the researcher had been through a comprehensive familiarisation process, many of the individuals interviewed were already aware of the research project and some had met the researcher, thus due to the relationship developed with the employees open and honest discussions ensued. It was particularly important that employees felt they could trust the researcher and information given was anonymous as the focus groups identified a culture of blame and fear of reprisals. Whilst individual interviews have been criticised (Lynn, 1999), by employing both group interviews (Chapter 5) and more in-depth individual interviews this combined qualitative approach aimed to address most of the criticisms of both qualitative methodologies.

# Chapter 7: Quantitative Assessment of Safety Culture

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## 7.1. Introduction

The quantitative study of the triangulated approach, the development of the safety climate questionnaire, is outlined in this chapter. The questionnaire development, the methods and administration process are described. The chapter further details the hypothesis testing and the statistical analysis of the results. Finally the chapter concludes with a brief summary of the overall findings. The overall results will be discussed in more detailed in the next chapter (Chapter 8).

### 7.1.1. Aim

To identify and measure the constructs that shape safety culture, and safety performance outcomes in the sponsor organisation.

### 7.1.2 Objectives

- To develop a questionnaire to address the above aim, to be completed by the sponsor organisation's employees.
- To explore the psychometric properties of the influences on safety culture and safety outcomes.
- To provide the sponsor organisation with results with which to benchmark the success of any future safety interventions against.

## 7.2. Method

The following section outlines the method of the quantitative study reported in this chapter.

### 7.2.1. Questionnaire Development

The themes identified in the qualitative studies (Chapter 5 and 6) along with the theoretical insights from the review of the literature (Chapter 3) were used to inform the questionnaire development. The most dominant themes included *Communication* (upward communication), *Leadership* (the relationship with the immediate supervisor and perceived support from the organisation), *Job Demand* (safety climate), *Employee Engagement & Involvement* (employee engagement and organisational commitment), *Safety Priority* (safety climate) and *Culture* (safety climate). The main themes identified were well researched areas with existing validated measures. There are a number of existing scales to measure these phenomena particularly safety culture/climate and these have been established across many different industries. It was deemed prudent to make use of these existing questionnaires in the current study. These include;

- Safety Climate Toolkit (Cox and Cheyne, 2000)
- Safety Communication (Hofmann and Morgeson 1999)
- Perceived Organisational Support (Eisenberger et al. 1986)
- Leader Member Exchange (Graen and Uhl-Bien, 1995)
- Employee Engagement (Harter, 2002); and
- Organisational Commitment (Allen and Meyer, 1990).

The questions most relevant to the themes identified in the qualitative studies were selected from each measure. This created a composite questionnaire with 78 questions in total. Questions relating to self-reported accident near misses were also included. A full list of the questions selected from each measure are included in Table 8.

Table 8: Questions included in the safety climate questionnaire

Measure	Questions
<b>Upward Safety Communication</b> (Hofmann and Morgeson, 1999)	I feel comfortable discussing safety issues with my immediate Manager/Supervisor
	The organisation encourages open communication about safety
	The organisation openly accepts ideas for improving safety
	There is good quality communication here about safety issues which affect me
	I receive praise for working safely
<b>Employee Engagement &amp; Involvement</b> (Harter et al., 2002)	I know what is expected of me at work
	While at work, I receive regular recognition or praise for doing a good job
	I have the materials and equipment I need to do my work right
	At work, my opinions count
	My fellow employees are committed to doing quality work
	In the last year, I have had the opportunities at work to learn and grow
	I am involved in the decisions made about how to carry out my job
	I am involved with the decisions made about safety issues at work
<b>Leader-Member Exchange</b> (Graen and Uhl-Bien, 1995)	My immediate Manager/Supervisor understands my job-related problems and needs
	My immediate Manager/Supervisor recognises my potential
	My immediate Manager/Supervisor would use his/her power to help me solve work related problems
	My immediate Manager/Supervisor would 'bail me out' at his/her expense
	I defend and justify my immediate Manager/Supervisor's decisions when he/she is not there to do so
<b>Perceived Organisational Support</b> (Eisenberger et al., 1986)	The organisation values my contribution to its success
	The organisation fails to appreciate any extra effort from me
	The organisation would ignore any complaint from me
	The organisation really cares about my well-being
	Even if I did the best job possible, the organisation would fail to notice
	The organisation cares about my general satisfaction at work
	The organisation shows very little concern for me
	The organisation takes pride in my accomplishments at work
<b>Organisational Commitment</b> (Allen and Meyer, 1990)	I do not feel like part of a family in this organisation as a whole
	I feel a strong sense of belonging to this organisation as a whole
	This organisation as a whole does not deserve my loyalty
	I am proud to tell others where I work
	I would be happy to work here until I retire
<b>Safety Climate</b> (Cox and Cheyne, 2000)	
<b>Management Commitment</b>	Senior Management only acts to improve safety after accidents have occurred
	Corrective action is always taken when Senior Management is told about unsafe practices
	In my workplace Senior Management turn a blind eye to safety issues
	In my workplace my immediate Manager/Supervisor show interest in my safety

	My immediate Managers/Supervisor express concern if safety procedures are not followed
<b>Priority of Safety</b>	Senior Management clearly consider the safety of employees of high priority
	Safety rules and procedures are carefully followed in this organisation
	Senior Management considers safety to be equally as important as production
<b>Safety Rules</b>	Sometimes it is necessary to depart from safety requirements for productivity's sake
	Some health and safety rules and procedures are not really practical
	Some safety rules and procedures do not need to be followed to get the job done safely
<b>Supportive Environment</b>	We often give tips to each other on how to work safely
	I am strongly encouraged to report unsafe conditions
	A no-blame approach is used to persuade those acting unsafely that their behaviour is inappropriate
	I can influence health and safety performance in this organisation
<b>Personal Priority of Safety</b>	Safety is the number one priority in my mind when completing a job
	Personally I feel that safety issues are not the most important aspect of my job
	I understand the safety rules for my job
<b>Work Environment</b>	Operational targets often conflict with safety measures
	Sometimes conditions here hinder my ability to work safely
	Sometimes I am not given enough time to get the job done safely
	There are always enough people available to get the job done safely
	This is a safer place to work than other companies I have worked for
<b>Self-Reported Accident</b>	How many accident have you had while working for this organisation? (An accident can be defined as any event which results in injury, and/or damage and/or loss.)
<b>Self-Reported Near Misses</b>	How many near misses have you had while working for this organisation? (A near miss can be defined as any event which had the potential to cause injury and/or damage and/or loss but which was avoided by circumstance.)

### 7.2.2. Pilot

The draft questionnaire was piloted in three phases. First it was circulated to two directors and the safety director of the sponsor organisation ( $n=3$ ) for review. Second it was circulated to a cross section of the site foremen and project engineers ( $n=5$ ) for comment. Finally paper copies were given to a team of frontline workers to complete ( $n=10$ ) during their winter training. The researcher was present during the final phase to receive any verbal feedback and comments were noted.



These processes suggested a number of revisions to the draft questionnaire, these were:

- Changes to the language of the questionnaire to make clear if it was asking about senior management or immediate supervisor. In the sponsor organisation there was a clear distinction in the organisation between supervisors and managers. Supervisors were responsible for the immediate management of front line staff, whereas managers/ment were perceived as anything above this level.
- Additional categories added to the demographic questions in terms of 'what area of the business do you work in?'
- Minor changes to the language used for the questions, to make it more appropriate to the sponsor organisation.

### **7.2.3. Item Scaling**

A 5-point Likert scale was used with anchor points of 'Strongly Agree'; 'Agree'; 'Neither Agree nor Disagree'; 'Disagree'; 'Strongly Disagree'. The five points weights from 5, to 1 respectively. Research has shown that Likert scale have a strong potential to produce distributions that can be treated as interval data (Carifio, 1978). Five and 7-point scales are the most commonly used in psychometric measures of safety culture and climate. Colman et al. (1997) and Dawes (2008) have demonstrated that empirically, 5 and 7 point scales produce ostensibly equivalent results thus in keeping with other safety culture measures and for simplicity and 5 point scales was used.

## 7.2.4. Measures

The final questionnaire consisted of statements that measured six separate constructs, *Safety Climate*, *Upward Communication*, *Employee Engagement & Involvement*, *Leader Member Exchange* and *Perceived Organisational Support*. Additionally a question relating to self-reported accidents and near misses was included to measure safety outcomes. The participants used a 5-point Likert scale to report whether or not they agreed with each statement (1 = *strongly agree* to 5 = *strongly disagree*). A copy of the questionnaire is shown in Appendix 5. The questions included in the questionnaire are displayed in Table 8. The constructs and measures are as follows:

### 7.2.4.1. Upward Safety Communication

Upward safety communication was measured using a 5-item scale of 'communication' which was adapted from Hofmann and Morgeson's (1999) study. Upward communication refers to degree to which employees feel free to raise safety concerns with their immediate supervisor. Reliability analysis using cronbach alpha, showed that the 5-item scale demonstrated good internal consistency ( $\alpha = .83$ ).

### 7.2.4.2. Employee Engagement and Involvement

Employee Engagement and Involvement was measured using a 7-item 'Employee Engagement' scale. Five items were adapted from Harter et al. (2002). Employee engagement refers to the extent employees are intrinsically motivated to attain excellence in their work. Two additional items on worker involvement, which were identified through the qualitative focus groups and interviews, were added to scale. These were.

- *I am involved in the decisions made about how to carry out my job*
- *I am involved with the decisions made about safety issues at work*

Reliability analysis showed that the 7-item scale demonstrated good internal consistency ( $\alpha = .80$ ).

#### *7.2.4.3. Leader–Member Exchange*

Leader–member exchange (LMX) was measured using a 7-item measure of 'supervisor support' taken from Graen and Uhl-Bien (1995) study on leadership and employee relationships. LMX is acted out through a process of social exchange with subordinates. Subordinates develop a mutual preference and trust in exchange for leaders' concern for their safety and well-being. Reliability analysis indicated good internal consistency ( $\alpha = .88$ ).

#### *7.2.4.4. Perceived Organisational Support*

Perceived organisational support (POS) was measured using an 8-item measure of 'organisational support,' which was adapted from the Survey of Perceived Organisational Support (SPOS; Eisenberger et al., 1986). POS refers to individual employees beliefs concerning the extent to which an organisation values them, contributions and cares about their well-being. Four of the items were worded negatively and as such were reverse scored. The reliability analysis showed excellent internal consistency ( $\alpha = .91$ ).

#### *7.2.4.5. Organisational Commitment*

Organisational Commitment was measured using a 5-item measure of 'organisational commitment' which was adapted from Allen and Meyer's (1990) study. Organisational Commitment refers to employees' involvement and identification with their employing organisation. Two of the items were worded negatively and were reverse scored. Reliability analysis showed good internal consistency ( $\alpha = .86$ ).

#### *7.2.4.6. Safety Climate*

Safety climate was measured using a total of 24 items adapted from Cox and Cheyne (2000) *Safety Climate Toolkit* (see Chapter 4). The specific dimensions of safety climate measured were 'Management commitment', 'Priority of safety', 'Safety rules' (Safety rules and procedures), 'Supportive

*environment*', *'Personal priority and need for safety' (Personal priority for safety)* and *'Work environment'*. Reliability analysis indicated good internal consistency for all the dimensions included in the safety climate measure ( $\alpha = .88$ ).

*Management commitment* was measured using a 6-item measure and defined managers as 'immediate supervisors' or 'senior managers/ment'. Two of the items were worded negatively and were reverse scored. Reliability analysis showed good internal consistency ( $\alpha = .75$ ).

*Priority of safety* was measured using a 3-item measure. Reliability analysis indicated good internal consistency ( $\alpha = .83$ ).

*Safety rules and procedures* were measured using a 3-item scale. All three items were worded negatively and were reverse scored. Reliability analysis indicated good internal consistency ( $\alpha = .73$ ).

*Supportive environment* was measured using a 5-item measure. One of the items was worded negatively and was reverse scored. Reliability analysis indicated moderate internal consistency ( $\alpha = .59$ ). This is consistent with the original safety climate toolkit development where Cox and Cheyne (2000) report that internal consistency as  $\alpha = .61$  (see Table 9).

*Personal priority of safety* was measured using a 3-item scale. One item was worded negatively and was reverse scored. Reliability analysis indicated poor internal consistency ( $\alpha = .59$ ). This is consistent with the Safety Climate Toolkit (Cox and Cheyne, 2000) where the internal consistency is reported as  $\alpha = .61$  (see Table 9).

*Work Environment* was measured using a 5-item scale. Four of those items were negatively worded and reverse scored. Reliability analysis indicated good internal consistency ( $\alpha = .74$ ).

Table 9: Comparison of Reliability Coefficients

Measure	Current Safety Climate Questionnaire $\alpha =$	Safety Climate Toolkit (Cox & Cheyne, 2000) $\alpha =$
Management Commitment	0.75	0.84
Priority of Safety	0.83	0.72
Safety Rules	0.73	0.72
Supportive Environment	0.59	0.61
Personal Priority of Safety	0.50	0.61
Work Environment	0.74	.78

Comparisons of the reliability coefficients demonstrates consistent reliability across the safety climate dimensions included in this questionnaire in this study, and the original safety climate measure developed as part of the *Safety Climate Toolkit* (Cox and Cheyne, 2000).

7.2.4.7. Self-Reported Accidents and Near Misses

Self-reported accidents were measured using the HSE definition of accidents (HSE, 1995). The questions used were:

- How many accidents have you had while working for this organisation? (An accident can be defined as any event which results in injury, and/or damage and/or loss.)

Self-reported near misses were measured using the HSE definition of near misses. The question was as follows:

- How many near misses have you had while working for this organisation? (A near miss can be defined as any event which had the potential to cause injury and/or damage and/or loss but which was avoided by circumstance.)

7.2.5. Participants

The sample frame was all the employees in the sponsor organisation ( $n=408$ ). Two hundred and fifty five completed the questionnaire: a 63% response rate. However a total of 50 left some sections unanswered reducing the completion rate to 51%. Further analysis of those that failed to complete the questionnaire is detailed in Table 10. Analysis showed 10 failed to complete the demographic data section. Questions included; 'How many years have you worked for the company?', 'Where are you based?', and 'Which area of the business do you work in?' The question 'What is your current role within the business' was clearly stated as optional. The purposed of this was to make sure that if respondents felt they were identifiable from their response to this question they could leave it blank. Over a third skipped this question ( $n=82$ ) meaning it was not a usable category for analysis. One possible explanation for participants failing to complete this section was that through answering these questions they may have felt they would have been identifiable.

Table 10: Response rate of questionnaire measures

	Demo-graphic Data	Safety Climate	Upward Comm	POS	Employee Engagement	LMX	OC
Completed	245	236	224	207	207	205	205
Not completed	10	19	31	48	48	50	50

The organisation had historically generated low response rates from site based employees, Table 11 shows that 44% of the respondents were on site and 66% were from Head Office, Newton (supply chain and distribution) and design. What the response rates demonstrate is that non completion rates are relatively similar across the four locations. Of the 205 employees that completed the questionnaire 76% were male, 24% female (this was representative of the employee population) with a mean length of service of 5.8 years.

Table 11: Frequency of non-completed questionnaires by location

	Start	Demo-graphic Data	Safety Climate	Upward Comm	POS	Employee Engage-ment	LM X	OC	Total non-complete
Onsite	113	110	108	103	97	97	95	95	18
Head Office	57	55	52	49	46	46	46	46	11
Newton	17	15	14	14	14	14	14	14	3
Design	68	65	62	58	50	50	50	50	18

7.2.6. Safety Climate Dimension Consistency

The safety climate questionnaire (Cox and Cheyne, 2000) part of the *Safety Climate Toolkit* (for more information see Chapter 4) was amended to suit the purposes of this study. As some minor changes had been made to the safety climate dimensions, with some questions being omitted or reorganised it was important to see if the psychometric properties of the dimensions were still comparable. This was done in two ways; firstly by comparing the reliability coefficients of the safety climate questionnaire dimensions in the current study compared with Cox and Cheyne (2000) safety questionnaire dimensions (see Table 9). Comparisons of the reliability coefficients demonstrate consistent reliability across the safety climate dimensions for both questionnaires.

Second principal components analysis (PCA) of the mean scores of each safety climate dimension was conducted with a Varimax Rotation. The Varimax rotation identified 6 clear factors with factor weights of .88 to .99 with some relatively minor cross loadings. The Kaiser-Meyer-Olkin (KMO) measure verified the sampling adequacy for the analysis to .79, which meets the recognised expectations (Field 2009). From the results it can be assumed (Cox and Cheyne, 2000) the model developed in the offshore industry extends across other high hazard industries, such as the sponsor organisation and factor structure and scale reliability (see Table 9) suggest that the dimensions, per se describe the same model (see Table 12).

Table 12: Principle component analysis of safety climate dimensions with varimax rotation

	Component					
	1	2	3	4	5	6
Safety Rules	.95					
Work Environment		.96				
Supportive Environment			.94			
Personal Priorities				.99		
Safety Priority					.90	
Senior Management Commitment						.88

7.3. Analysis of Results

The first section outlines the results of the analysis to identify the antecedents of safety climate in the sponsor organisation. The second section outlines the results of the analysis to identify the safety outcomes in the sponsor organisation. The sections will where appropriate outline the relevant statistical tests used and the rationale for doing so.

7.3.1. Analysis of Possible Psychosocial Antecedents of Safety Climate

Statistical analysis of the safety climate antecedents employed an appropriate variety of techniques including bivariate correlations between predictor and outcome, as well as examination of standardised coefficients of a regression equation with all five predictors, *Upward Communication*, *Employee Engagement*, *Perceived Organisational Support*, *Leader Member Exchange* and *Organisational Commitment*. The analysis of these antecedents and their relationship to safety climate are detailed in the next section.

7.3.2. Hypothesis and Analysis

A number of hypotheses in relation to were tested using bivariate correlations. Results of these are displayed in Table 13.



*Hypothesis 1: Upward Communication is positively related to safety climate.*

A Pearson product-moment correlation was conducted to assess the relationship between upward communication and safety climate. Preliminary analyses showed the relationship to be linear and the variables were normally distributed as assessed by Shapiro-Wilk test ( $p > .05$ ). There were no outliers. There was a strong positive correlation between upward communication and safety climate  $r(210) = .77, p < .001$ , with upward communication explaining 59% of the variation in safety climate. There was a statistically significant relationship between upward communication and safety climate supporting Hypothesis 1.

*Hypothesis 2: Perceived Organisational Support is positively related to safety climate.*

A Pearson product-moment correlation was run to assess the relationship between Perceived Organisational Support (POS) and safety climate. Preliminary analyses showed the relationship to be linear with one variable safety climate normally distributed, as assessed by Shapiro-Wilk test ( $p > 0.05$ ), and there were no outliers. There was a strong positive correlation between Perceived Organisational Support (POS) and safety climate  $r(206) = 0.69, p < .001$ , with perceived organisational support explaining 47% of the variation in safety climate. There was a statistically significant relationship between POS and safety climate supporting Hypothesis 2.

*Hypothesis 3: Employee Engagement is positively related to safety climate.*

A Pearson product-moment correlation was run to assess the relationship between employee engagement and safety climate. Preliminary analyses showed the relationship to be linear, one variable, safety climate to be normally distributed, as assessed by Shapiro-Wilk test ( $p > .05$ ), and there were no outliers. There was a strong positive correlation between engagement and safety climate  $r(206) = 0.63, p < .001$ , with employee engagement explaining 59% of the variation in safety climate. There was a statistically significant relationship between Employee Engagement and safety climate supporting Hypothesis 3.

*Hypothesis 4: Leader Member Exchange is positively related to safety climate.*

A Pearson product-moment correlation was run to assess the relationship between LMX and safety climate. Preliminary analyses showed the relationship to be linear one variable, safety climate to be normally distributed, as assessed by Shapiro-Wilk test ( $p > .05$ ), and there were no outliers. There was a strong positive correlation between LMX and safety climate  $r(203) = .57, p < .001$ , with LMX explaining 32% of the variation in safety climate. There was a statistically significant relationship between LMX and safety climate supporting Hypothesis 4.

*Hypothesis 5: Organisational Commitment will be positively correlated to safety climate.*

A Pearson product-moment correlation was run to assess the relationship between organisational commitment and safety climate. Preliminary analyses showed the relationship to be linear one variable, safety climate to be normally distributed, as assessed by Shapiro-Wilk test ( $p > .05$ ), and there were no outliers. There was a strong positive correlation between organisational commitment and safety climate  $r(203) = 0.61, p < .001$ , with organisational commitment explaining 37% of the variation in safety climate. There was a statistically significant relationship between Organisational Commitment supporting Hypothesis 5.

*Table 13: Correlations between Psychosocial Climate Dimensions and Safety Climate*

	Safety Climate	Upward Communication	POS	Engagement	LMX
Safety Climate	-				
Upward Communication	.77**	-			
POS	.69**	.67**	-		
Engagement	.63**	.62**	.68**	-	
LMX	.57**	.55**	.54**	.62**	-
Organisational Commitment	.61**	.59**	.75**	.60**	.49**

\* $p < .05$ ; \*\* $p < .001$

7.3.3. Multiple Linear Regression

Multiple linear regression analysis was run to examine the predictive relationship of safety climate from upward communication, POS, LMX, Employee Engagement and Organisational Commitment.

*Hypothesis 6: Upward Communication, POS, Employee Engagement, LMX and Organisational Commitment will be significant predictors of safety climate.*

The assumptions of linearity, independence of errors, homoscedasticity, unusual points and normality of residuals were met. These variables significantly predicted Safety Climate  $F(5, 199) = 79.81, p < .05, \text{adj. } R^2 = .65$ . Three of the variables, upward communication, POS, Engagement and LMX added significantly to the prediction,  $p < .05$ . Organisational Commitment was not statistically significant. Regression coefficients and standard errors can be found in Table 14. Results partially support Hypothesis 6.

Table 14: Regression Coefficients Psychosocial Climate Antecedents of Safety Climate

Variable	B	SEB	Standardised Coefficient
Intercept	.84	.09	
Upward Communication	.35	.04	.33*
POS	.12	.05	.11*
Employee Engagement	.08	.05	.06*
LMX	.08	.04	.07*
Organisational Commitment	.01	.01	.04

\* $p < .05$ ; B = unstandardised regression co-efficient, SEB = Standard Error of the coefficient

### 7.3.4. Estimating the Relative Importance of Predictors of Safety Climate

Hypothesis 6 was also investigated using relative weight analysis. Multiple linear regression is one of the most commonly used statistical tools for addressing issues related to prediction, such as identifying a set of predictors that will maximise the amount of variance explained in the outcome variable.

However research has documented how indices commonly produced by multiple regression analyses fail to correctly partition variance to the various predictors when they are correlated (Darlington, 1968). A supplementary approach is relative weight analysis (Fabbris, 1980; Johnson, 2000) which allows for more accurate variance partitioning among correlated predictors.

Standardised regression weights can be seen as flawed measures of importance because of the inter-correlations amongst the predictors. Relative weight analysis (Fabbris, 1980; Johnson 2000) resolves this by using a variable transformation approach to create a new set of predictors that are orthogonal to one another. This is achieved by regressing the dependent variable of these new transformed predictors, producing a series of standardised regression coefficients. These regression coefficients are then rescaled back to the original variables by combining them with the standardised regression coefficients obtained by regressing the original predictors on their orthogonal counterparts. This produces an estimate of relative importance for each predictor variable (Johnson, 2000). As the weights are generated by an orthogonal transformation of the original predictors, they no longer suffer from the problems associated with multicollinearity. The individual weights also sum to the overall model  $R^2$  and can be expressed as a percentage of predictable variance associated with each predictor.

Information regarding a variable's contribution to predictable variance is useful when considering the practical utility of a variable (Cortina and Landis 2009). Relative weight analysis can be seen as a useful supplement to multiple regression because it provides information not readily available from the indices typically produced from the analysis. Relative weight analysis allows a more comprehensive understanding of how various predictors combine in a multiple regression equation as it explains how much of the variance in safety climate can be attributed to each predictor variable.

The relative weights for all variables (Upward Communication, POS, Employee Engagement, LMX and Organisational Commitment) were calculated (see Table 15). In addition confidence intervals were

computed. Tests of significance were conducted in line with the procedure described in Tonidandel et al. (2009). This procedure involves comparing the weight produced by a predictor known not to be important in the population that is a randomly generated variable. Then bootstrapping these confidence intervals around the difference between the two weights is used to evaluate statistical significance across the entire population (see Table 15), the relative weight associated with upward communication was significantly larger than the weights for, POS, Employee Engagement, LMX, and Organisational Commitment. Similarly, POS was significantly more important than Employee Engagement, LMX and Organisational Commitment.

Table 15: Relative Weight Results for Psychosocial Antecedents of Safety Climate

	Raw weight	% of R <sup>2</sup>	95% Confidence Interval	
			Lower	Upper
Upward Communication	.25*	36.7	.20	.30
POS	.14*	20.3	.09	.17
Employee Engagement	.10*	15.5	.07	.14
LMX	.09*	13.2	.05	.13
Organisational Commitment	.10*	14.3	.06	.13

\*Significantly different from 0 ( $p < 0.05$ )

In line with the initial regression results upward communication, POS, Employee Engagement, LMX were all significantly important predictors of safety climate accounting for 37 percent, 20 percent, 16 percent, 13 percent and 14 percent (respectively) of the predictable variance in safety climate. However contrary to the initial regression results Organisational Commitment was also a significantly important predictor accounting for 14 percent of the predicable variance in safety climate. Thus using these analyses all variables (upward communication, POS, Employee Engagement, LMX and Organisational Commitment predicted safety climate and for that reason Hypothesis 6 was supported (see Figure 10).

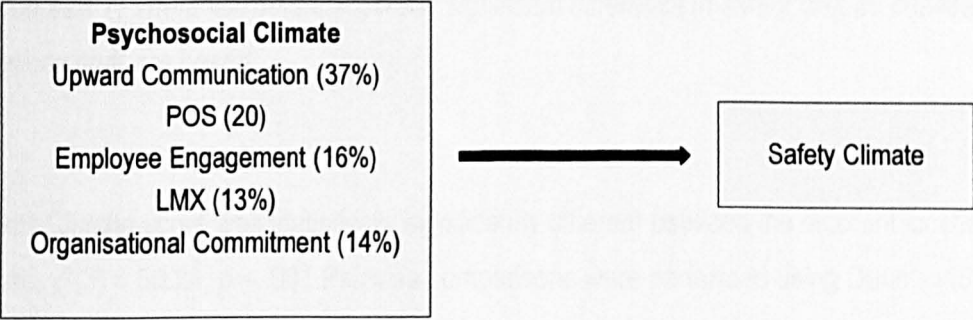


Figure 10: Illustrative diagram of Psychosocial Climate Predictors of Safety Climate

7.3.5. Summary of Findings

As can be seen from the hypothesis testing, with regard to the psychosocial antecedents of safety climate, all variables show a significant relationship with safety climate. Regression results show Upward communication, POS, Employee Engagement and LMX significantly predict safety climate but not Organisational Commitment. Further analysis using relative weight analysis, shows that Organisational Commitment is also an important predictor of safety climate. Upward communication accounts for the largest percentage of predictable variance in safety climate (37%) followed by POS (20%), Employee Engagement (16%), Organisational Commitment (14%) and lastly LMX (13%).

7.4. Analysis of Possible Subcultures

A Kruskal-Wallis test was ran to examine if there were any statistically significant differences in safety climate, upward communication, POS, LMX, Engagement and OC between where staff are based; on site, head office, Newton (supply chain and distribution) or Design. Results are summarised in Table 16.

*Hypothesis 7: There will be a statistically significant difference in safety climate between the different locations staff are based.*

Safety Climate score was statistically significantly different between the different locations staff were based,  $\chi^2(3) = 50.24, p < .001$ . Pairwise comparisons were performed using Dunn's (1964) procedure with a Bonferroni correction for multiple comparisons. Safety Climate score was statistically significantly different between the Head Office and on site ( $p < .001$ ) and Head Office and other ( $p < .001$ ) locations. There was a statistically significant difference between safety climate at the different sites. Results partially support Hypothesis 7.

*Hypothesis 8: There will be a statistically significant difference in upward communication between where staff are based*

Upward communication score was statistically significantly different between the different locations staff were based,  $\chi^2(3) = 11.48, p < .05$ . Pairwise comparisons were performed using Dunn's (1964) procedure with a Bonferroni correction for multiple comparisons. The Upward Communication score was statistically significantly different between the on site and design ( $p < .05$ ) and there was not a significant between on site and head office at ( $p < .05$ ) locations. Results partially support Hypothesis 8.

*Hypothesis 9: There will be a statistically significant difference in POS between where staff are based*

POS score was statistically significantly different between the different locations staff were based,  $\chi^2(3) = 33.90, p < .001$ . Pairwise comparisons were performed using Dunn's (1964) procedure with a Bonferroni correction for multiple comparisons. POS score was statistically significantly different between the on-site and design ( $p < .001$ ) and head office and on site ( $p < .001$ ) locations. Results partially support Hypothesis 9.

*Hypothesis 10: There will be a statistically significant difference in Engagement between where staff are based*

Engagement score was statistically significantly different between the different locations staff were based,  $\chi^2(3) = 19.92, p < .001$ . Pairwise comparisons were performed using Dunn's (1964) procedure with a Bonferroni correction for multiple comparisons. Engagement score was statistically significantly different between the on-site and head office ( $p < .001$ ) and design and on site ( $p < .05$ ) locations. Results partially support Hypothesis 10.

*Hypothesis 11: There will be a statistically significant difference in LMX between where staff are based*

LMX score was statistically significantly different between the different locations staff were based,  $\chi^2(3) = 19.92, p < .001$ . Pairwise comparisons were performed using Dunn's (1964) procedure with a Bonferroni correction for multiple comparisons. LMX score was statistically significantly different between the on site and head office ( $p < .001$ ) and design and on site ( $p < .05$ ) locations. Results partially supported Hypothesis 11.

*Hypothesis 12: There will be a statistically significant difference in OC between where staff are based*

Organisational Commitment score was statistically significantly different between the different locations staff were based,  $\chi^2(3) = 20.23, p < .001$ . Pairwise comparisons were performed using Dunn's (1964) procedure with a Bonferroni correction for multiple comparisons. OC score was statistically significantly different between the on-site and head office ( $p < .001$ ). Results partially support Hypothesis 12.



*Table 16: Pairwise comparisons of work locations*

	Safety Climate	Upward Communication	POS	Employee Engagement	LMX	Organisational Commitment
Head Office – Design	1.00	1.00	1.00	1.00	1.00	.59
Head Office - Newton	.86	1.00	1.00	.37	.18	1.00
Head Office - Onsite	.00*	.03*	.00**	.00**	.00**	.00**
Design -Newton	1.00	1.00	1.00	1.00	1.00	1.00
Design – Onsite	.00**	.05	.00**	.02*	.01*	.08
Newton – Onsite	.16	.69	.14	1.00	1.00	.86

\* $p < .05$ ; \*\* $p < .001$

### 7.4.1. Summary of Findings

Each variable, Safety Climate, Upward Communication, POS, Employee Engagement, LMX and Organisational Commitment demonstrates a significant difference between head office and on site. There is also a significant difference between Design and on site for Safety Climate, POS, Employee Engagement but not Upward Communication or Organisational Commitment. There was no significant difference between any of the variables and Head office and Design, or Head Office and Newton, or Newton and on site.

Office based functions (Head office and Design) demonstrate different safety climates and psychosocial climates (POS, Employee Engagement, LMX) when compared to site functions. Head office and the design services was mostly made up of professional and semi-professional white collar workers. On site was mostly made up of blue collar manual workers and Newton, the supply chain and distribution function was made up of a mixture of both. These findings can be interpreted as evidence of the existence of different subcultures between white collar and blue collar functions in the sponsor organisation. Caution should be drawn when interpreting these results, as whilst the numbers for those based at head office is almost equal for male ( $n=27$ ) and females ( $n=28$ ) on site had also had the largest proportion of male employees ( $n=103$ ) when compared to females ( $n=7$ ) so these gender difference may have influenced the results and were not controlled for in the analysis. Never the less

the gender differences in this organisation could be seen as representative of the gender differences in the blue and white collar workforce on the whole, with the construction industry being a male dominated industry (Barrios and DiDona, 2013).

## 7.5. Safety Outcomes

The following section will present the results of the analysis related to the second research questions 'What are the factors that shape safety performance in the sponsor organisation?' Safety performance was measured by two safety outcomes, self-reported accidents and near misses. The appropriate statistical tests and the rationale for their use are detailed in this section. The results for the analysis of the five factors, *Safety Climate*, *Upward Communication*, *POS*, *LMX* and *Organisational Commitment* and safety outcomes are presented. The section goes on to present the results of further analysis of each safety Climate Dimension in relation to safety outcomes. The section concludes with brief summary of these results.

### 7.5.1. Statistical Analysis of Count Data

The occurrences of accidents and near misses are typically infrequent and sporadically experienced by employees in an organisation. This means that there are usually large numbers of zeroes in the data. Many of the employee population will have never had an accident or near miss whilst working for an organisation. In other words, the underlying distribution of the occurrences of accidents and near misses for most of the employee population during their length of service is positively or rightly skewed. Conventional multiple linear regression models, which rely on normal assumption, lack the distributional properties necessary to describe adequately count variables such as accidents and near misses during length of service (e.g. Abdel-Aty and Radwan, 2000).

The majority of studies exploring the organisational factors related to occupational accidents usually employ linear regressions between the explanatory factors and the dependent variable (e.g. accident rate or near miss rates). However, the application of classic linear regression models generates

inconsistent estimates because the number of occupational accidents or near misses is not a continuous variable and consequently cannot be assumed to be normally distributed. Rather it is a discrete count variable. As a result, these linear regression models are not appropriate to make probabilistic statements about accidents and near misses and the statistics derived from these models are questionable (Breslow, 1984).

Nelder and Wedderburn (1972) developed their Generalised Linear Models (GLM) specifically to overcome these limitations. There are two key differences between classic linear models and GLM. Firstly, GLM allows scope for the dependent variable to follow any exponential distribution including the normal distribution. Second, there is a more flexible relationship between the dependent and the explanatory variable through the introduction of a *link function* and *variance function* (Fahrmeir and Tutz, 1994). The variance function is the relationship between the mean and the variance of the dependent variable that calculates the variance under non-normal conditions. The link function describes the (usually) non-linear relationship between the mean of the dependent variable and the linear right hand side (of the equation). The link function links the response to the linear predictor.

### **7.5.2. Safety Outcomes**

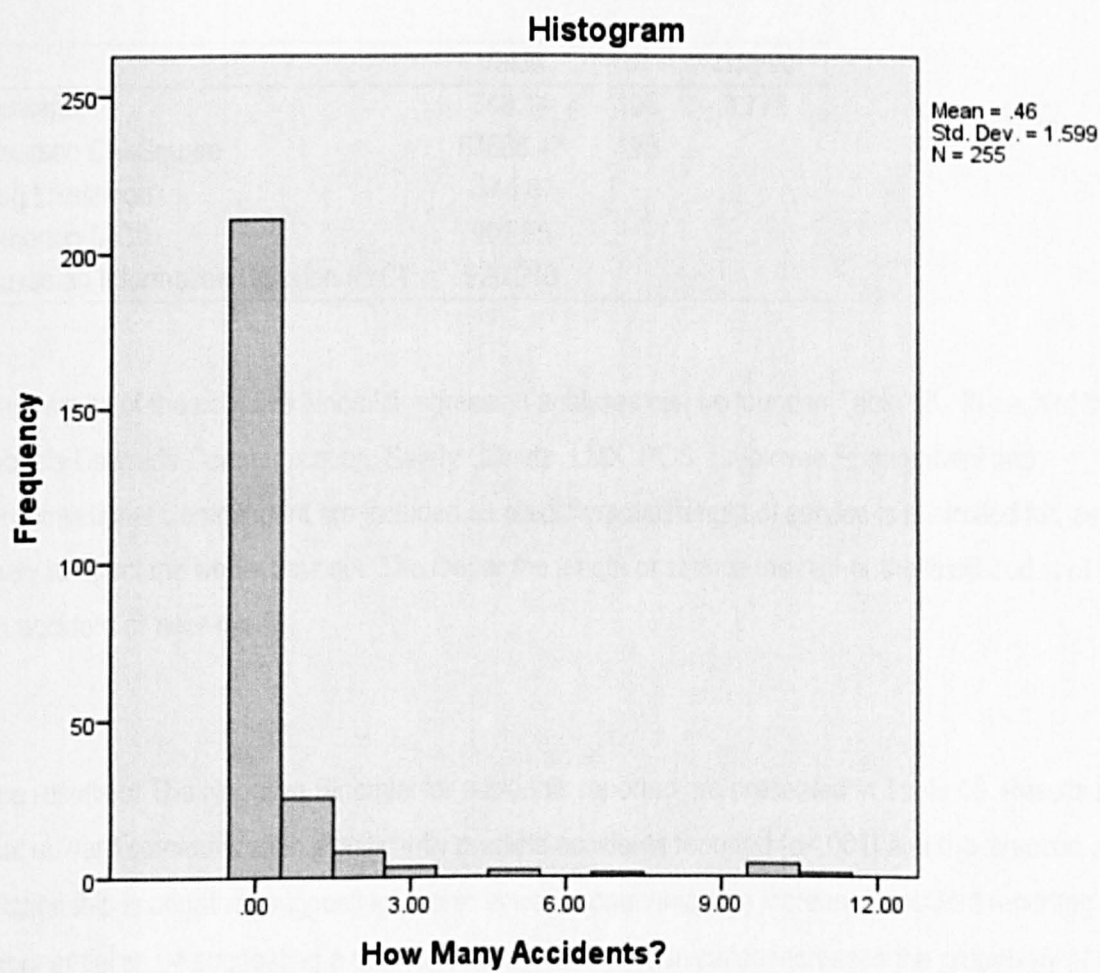
Traditionally, count variables such as accidents and near misses have been estimated using the Poisson regression, a method that belongs to GLM. The Poisson regression needs the variance of the sample to be equal i.e. an absence of over dispersion and this is not actually the case with the most event variables, such as accidents and near misses (Breslow, 1984).

To deal with the over dispersion problem in count data, one commonly used distribution is the Negative Binomial distribution. In this model, the parameter that defines a Poisson process depends on a random variable. The Negative Binomial model allows the data to follow a Poisson distribution, but assumes that a degree of non-observable heterogeneity exists. Thus, if the mean and the variance are not equal, the negative binomial regression introduces a dispersion parameter that follows a gamma (alternative) distribution to accommodate the over dispersion.

7.5.2.1. Accidents Reported

As can be seen in Graph 1, the dependent variable, accidents reported distribution is skewed. The incidence of zero counts are over dispersed  $n=59$ . The unconditional mean of the DV (reported accidents) variable is 0.46 which is much lower than its variance 1.60. As the data is over-dispersed and the conditional variance exceeded the conditional mean the Negative Binomial model is used.

Graph 1: Histogram of Reported Accidents



Hypothesis 13: Safety Climate, Upward Communication, LMX, POS, Employee Engagement and Organisational Commitment are significantly related to number of accidents reported.

Table 17. The table provides several indices of the goodness-of-fit of the model. These measures can be used to compare models. The deviance (748.14) is evaluated as Chi-Square distributed with the model degrees of freedom (198). Goodness-of-fit measures and the deviance, show this model is significantly worse from a full model (or a saturated model) and is non-significant. If the tests had been statistically significant, it would indicate that the data does not fit the model well. The omnibus test (likelihood ratio chi-square) provides a test of the overall model comparing this model to a model without any predictors (a "null" model). The current model is a significant improvement over such a model ( $p=.000$ ).

Table 17: Goodness-of-Fit for Model – Accidents Reported

	Value	df	Value/df
Deviance	748.14	198	3.778
Pearson Chi-Square	57688.47	198	
Log Likelihood	-444.47		
Criterion (ACI)	902.95		
Bayesian Information Criterion (BIC)	926.210		

The results of the negative binomial regression analyses can be found in Table 18. In each of the models Upwards Communication, Safety Climate, LMX, POS, Employee Engagement and Organisational Commitment are included as predictors and length of service is controlled for, as this is likely to affect the whole data set. The longer the length of service the higher the likelihood is of having an accident or near miss.

The results of The Negative Binomial for accidents reported are presented in Table 18. Results reveal that upward communication significantly predicts accidents reported ( $p<.001$ ) and the direction of the relationship is negative, suggesting poorer upward communication increases accident reporting. The exponential is .04 suggesting a decrease in upward communication increases the probability of an accident being reported by 28.57.

Safety climate significantly predicts accidents reported ( $p<.001$ ). The direction of the relationship is positive suggesting the more positive the safety climate the more accidents reported. The exponential is 4225.50 suggesting for every unit increase in safety climate the probability of an accident reported increases by 4225.49.

POS significantly predicts accidents reported ( $p<.001$ ). The direction of the relationship is positive, suggesting the higher the POS the more accidents reported. The exponential is 15.27 suggesting a unit increase in POS increases the probability of an accident being reported increases by 15.27.

LMX significantly predicts accidents reported ( $p<.001$ ). The direction of the relationship is negative suggesting the less positive the supervisor relationship the more accidents reported. The exponential is 0.74 suggesting for every unit decrease in LMX the probability of an accident reported increase by 1.36.

Organisational Commitment significantly predicts accidents reported ( $p<.001$ ). The direction of the relationship is negative suggesting poorer organisational commitment the more accident reported. The exponential is .71 suggesting the probability of an accident being reported increases by.29. Employee Engagement does not significantly predict accident reported. Results partially support Hypothesis 13 (see Figure 11).

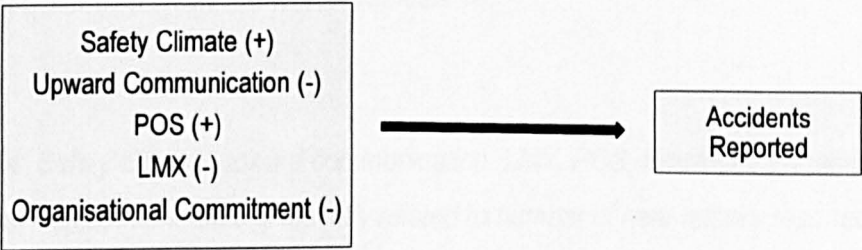


Figure 11: Illustrative Diagram of the Predictors of Accidents Reported

*Table 18: Negative Binomials for Accidents and Near Miss Reported*

Model	Accidents		Near Misses	
	B	Exb(B)	B	Exp(B)
Upward Communication	-3.36**	.035	-2.67**	.07
Safety Climate	8.36**	4225.50	4.28**	72.23
POS	2.73**	15.27	1.63**	.63
Employee Engagement	.11	1.11	-.46	5.12
LMX	-2.61**	0.07	-.22	.80
Organisational Commitment	-.35**	.71	-.07	.94

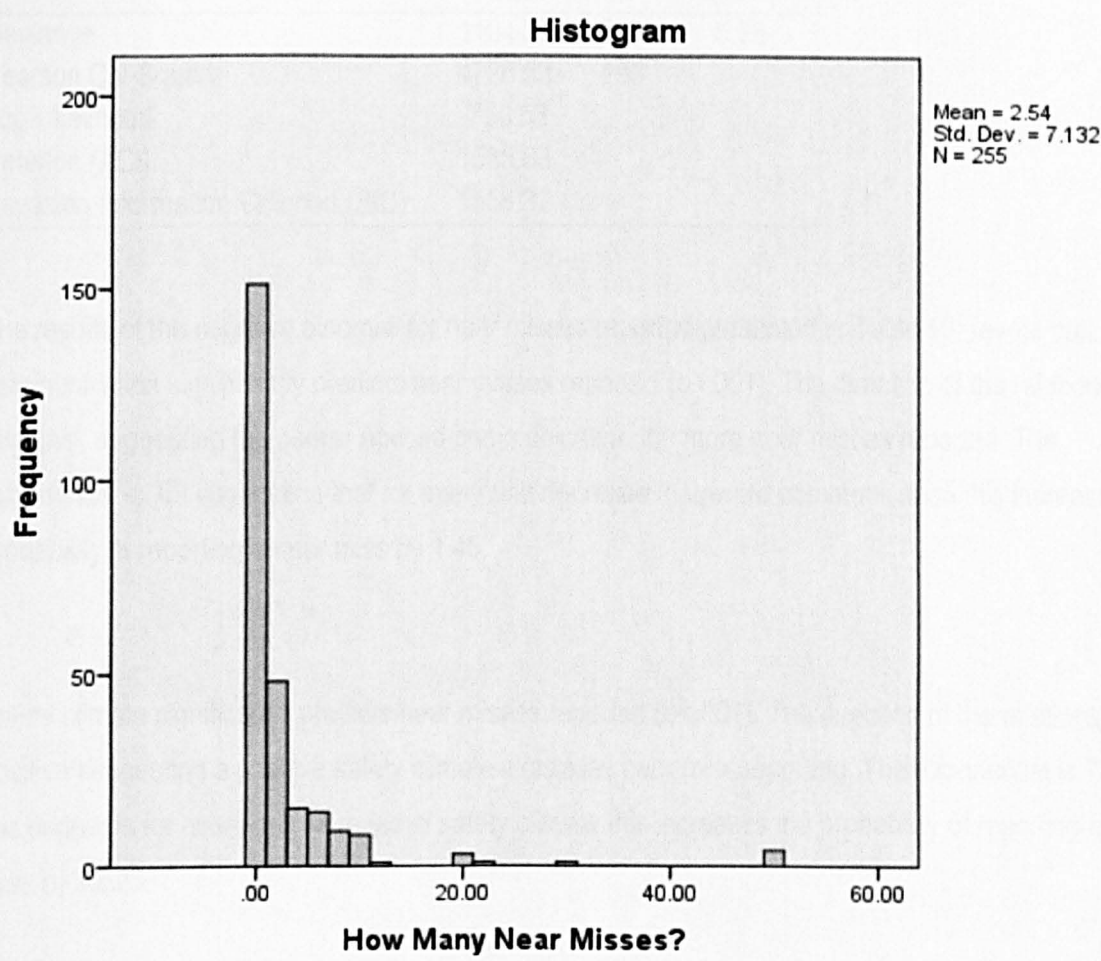
*\*p<.05; \*\*p<.001*

*7.5.2.2. Near Misses Reported*

The dependent variable, near misses reported distribution is skewed. The incidence of zero counts are over dispersed  $n=211$ . See Graph 2. The unconditional mean of the near misses reported variable 2.54 is much lower than its variance 7.13. As the data is over-dispersed and the conditional variance exceeded the conditional mean the Negative binomial is used to analyse the data, for that reason a Negative binomial model was used test Hypothesis 14.

*Hypothesis 14: Safety climate, upward communication, LMX, POS, Employee Engagement and Organisational Commitment are significantly related to number of near misses reported.*

Graph 2: Histogram of Near Misses Reported.



The table 19 provides several indices of the goodness-of-fit of the model. These measures can be used to compare models. The deviance (4768.53) is evaluated as chi-square distributed with the model degrees of freedom (198). Goodness-of-fit measures and the deviance results show this model is significantly worse from a full model (or a saturated model) and is non-significant. If the tests had been statistically significant, it would indicate that the data does not fit the model well. The omnibus test (likelihood ratio chi-square) provides a test of the overall model comparing this model to a model without any predictors (a "null" model). The current model is a significant improvement over such a model ( $p = .000$ ).



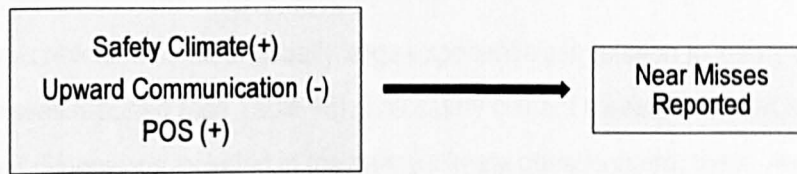
*Table 19: Goodness-of-Fit for the Model – Reported Near Misses*

	Value	df	Value/df
Deviance	1104.37	198	5.58
Pearson Chi-Square	4768.53	198	
Log Likelihood	-760.53		
Criterion (ACI)	1535.63		
Bayesian Information Criterion (BIC)	1558.32		

The results of the negative binomial for near misses reported presented in Table 18, reveal that upward communication significantly predicts near misses reported ( $p<.001$ ). The direction of the relationship is negative, suggesting the poorer upward communication the more near misses reported. The exponential is .69 suggesting that for every unit decrease in upward communication this increases the probability of reporting a near miss by 1.45.

Safety climate significantly predicts near misses reported ( $p<.001$ ). The direction of the relationship is positive suggesting a positive safety climate increases near miss reporting. The exponential is 72.23, this suggests for every unit increase in safety climate this increases the probability of reporting a near miss by 72.23.

POS also significantly predicts near miss reporting ( $p<.001$ ). The direction of the relationship is positive, suggesting a perceived supportive environment increases near misses reported. The exponential is .63 this suggests the for every unit increase in POS the probability of a near miss being reported is increased by .63. Employee Engagement, LMX or Organisational Commitment does not significantly predict near misses reported. Hence Hypothesis 14 is partially supported (see Figure 12).



*Figure 12: Illustrative Diagram of the Predictors of Near Misses Reported*

### 7.5.3. Summary of Findings

The results show that upward communication, Safety Climate, POS show a significant relationship with both accidents and near misses reported (while controlling for length of service). LMX and Organisational Commitment show a significant relationship with accidents reported only. Upward communication reported demonstrates a negative relationship with accidents and near misses reported, this suggests that poor upward communication leads to more accidents and near misses reported. POS demonstrated a positive relationship suggesting the more supported employees feel by the organisation the more accidents and near misses are reported. LMX and Organisational Commitment demonstrate a negative relationship with accidents reported suggesting the less positive the supervisor employee relationship and the lower the employee's commitment to the organisation the more accidents reported. Safety climate is the strongest predictor of both of reported accidents and near misses and this relationship is positive suggesting that the more positive the safety climate the more accidents and near misses reported. However the exponentials (probabilities) for safety climate and accidents and near misses reported are very large, these next section aims to explain these results further by analysing the relationship of each safety climate dimension to safety outcomes (reported accidents and near misses).

## 7.6. Safety Climate Dimensions and Safety Outcomes

As the previous analysis revealed some unusually large exponentials in relation to safety climate and accidents and near misses reported (see Table 18). The safety climate measure was broken down further into the different dimensions included in the safety climate questionnaire; these were *Senior Management Commitment* (perceptions of senior manager's commitment to safety), *Safety Priority* (perceptions of the priority safety over production in the organisation), *Safety Rules* (individual compliance to safety rules), *Supportive Environment* (Perceptions of support to report safety issues without fear of blame), *Personal Priority* (Individual priority of safety), *Work Environment* (perceived job demands).

*Hypothesis 15: The different safety climate dimensions (Senior Management Commitment, Safety Rules, Supportive Environment, Personal Priority and Work Environment) will be significantly related to reported accidents.*

The goodness-of-fit of the model is shown in Table 20. The table provides several indices of the goodness-of-fit of the model. These measures can be used to compare models. The deviance (2121.901) is evaluated as chi-square distributed with the model degrees of freedom (201). Goodness-of-fit measures and the deviance show this model is significantly worse from a full model (or a saturated model) and is non-significant. If the tests had been statistically significant, it would indicate that the data does not fit the model well. The omnibus test (likelihood ratio chi-square) provides a test of the overall model comparing this model to a model without any predictors (a "null" model). The current model is a significant improvement over such a model ( $p=.000$ ).

*Table 20: Goodness-of-Fit for Model – Safety Climate Dimensions and Accidents*

	Value	df	Value/df
Deviance	2121.901	201	10.557
Pearson Chi-Square	26710667147.811	201	
Log Likelihood	-1112.104		
Criterion (ACI)	2245.307		
Bayesian Information Criterion (BIC)	2277.726		

The results of the negative binomial for the breakdown of safety climate and reported accidents presented in Table 21, reveals that Senior Management commitment is a significant predictor of accidents reported ( $p < .001$ ). The direction of this relationship is negative, suggesting poorer management commitment leads to more reported accidents. The exponential is 2.615, suggesting that for every decrease in management commitment the probability of reporting an accident increases by 0.38.

Safety Priority is also significantly related to the number of accidents reported ( $p < .001$ ). The direction of this relationship is positive suggesting that the higher the priority of production over safety the more accidents reported. The exponential is 116.06, suggesting that for every increase in safety in the priority production over safety the probability of a reported accident is increased by 116.06.

Personal Priority significantly predicted accidents reported ( $p < .001$ ). The direction of the relationship is positive suggesting that the more an individual prioritises safety the more accidents are reported. The exponential is 60.81, suggesting that for every unit increase in an individual's personal priority of safety the probability of accident reported is increased by 4.1.

Work Environment is a significant predictor of accidents reported ( $p < .001$ ). The relationship is positive suggesting the higher the job demands the more accidents reported. The exponential is 182.38 suggesting that for every increase in job demands and work pressure the probability of accidents reported increases by 182.38.

Safety Rules and Supportive Environment did not show a significant relationship with accidents reported. Only the safety climate dimensions, Senior Management Commitment, Personal Priority and Work Environment demonstrated a significant relationship to accidents reported, but not Safety Rules and Supportive Environment thus the Hypothesis 15 is partially supported (see Figure 13).

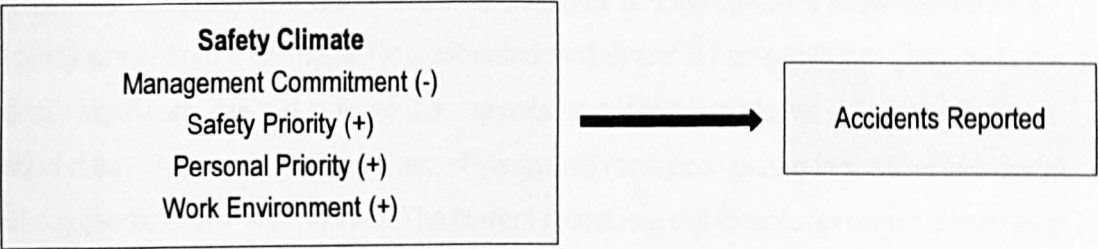


Figure 13: Illustrative Diagram of Safety Climate Dimensions that Predict Accidents Reported

Table 21: Negative binomials for safety climate dimensions and reported accidents and near misses

Model	Reported Accidents		Reported Near Misses	
	B	Exb(B)	B	Exp(B)
Senior Management Commitment	-10.55**	2.62	-8.90**	.000
Safety Priority	4.75**	116.07	6.10**	446.82
Safety Rules	.47	1.60	1.60**	4.974
Supportive Environment	.902	2.46	-2.64**	.071
Personal Priority	4.11**	60.80	-1.41**	.25
Work Environment	5.21**	182.38	-.31*	.74

\* $p<0.05$ ; \*\* $p<.0.001$

*Hypothesis 14: The different safety climate dimensions (Senior Management Commitment, Safety Rules, Supportive Environment, Personal Priority and Work Environment) will be significantly related to reported near misses.*

Table 22 provides several indices of the goodness-of-fit of the model. These measures can be used to compare models. The deviance (1349.109) is evaluated as chi-square distributed with the model degrees of freedom (204). The Goodness-of-fit measures and the deviance show this model is significantly worse from a full model (or a saturated model) and is non-significant. If the tests had been statistically significant, it would indicate that the data do not fit the model well. The omnibus test (likelihood ratio chi-square) provides a test of the overall model comparing this model to a model without any predictors (a "null" model). The current model is a significant improvement over such a model ( $p=.000$ ).

*Table 22: Goodness-of-Fit for Model – Safety Climate Dimensions and Near Misses Reported*

	Value	df	Value/df
Deviance	1349.11	204	66.162
Pearson Chi-Square	8209817175923.51	204	
Log Likelihood	-6888.175		
Criterion (ACI)	13790.349		
Bayesian Information Criterion (BIC)	13813.812		

The results of negative binomial for the breakdown of safety climate dimensions and near misses reported, controlling for length of service is presented in Table 21. The results reveal that Senior Management Commitment significantly predicts the number of accidents reported ( $p<.001$ ). This relationship is negative suggesting that the poorer management commitment to safety the more near misses reported. The exponential is .000 suggesting that for every decrease in management commitment the probability of a near miss being reported increases by 1.

Safety Priority significantly predicts near misses reported ( $p<.001$ ). The direction of this relationship is positive, suggesting that the higher the prioritisation of safety the more near misses reported. The

exponential is 446.817 suggesting that for every unit increase in safety prioritisation over safety the probability of a near miss being reported increases by 0.002.

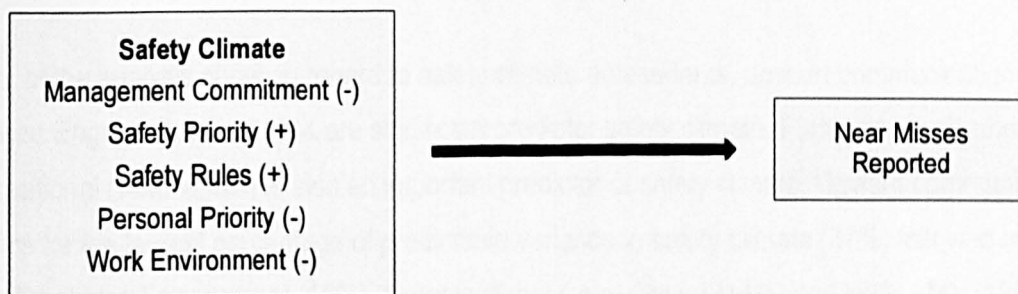
Safety Rules significantly predicts the number of near misses reported ( $p < .001$ ). The direction of this relationship is positive suggesting the higher regard for individual safety compliance the more near misses reported. The exponential is 4.974 suggesting that for every increase regard for individual compliance increases the probability of a near miss being reported increases by 4.97.

Supportive Environment significantly predicts ( $p < .001$ ) the number misses reported. The direction of this relationship is negative suggesting the less supported employees feel to report safety issues without fear of blame the more near misses are reported. The exponential is .07, suggesting that for every decrease in supportive environment the probability of a near miss being reported is increased by 1.40.

Personal Priorities significantly predicts near misses reported ( $p < .001$ ). The direction of this relationship is negative suggesting that the more individual employees prioritise safety the less near misses are reported. The exponential is .25 suggesting that for every decrease in individual priority of safety the probability of a near miss being reported increases by 4.08.

Work environment significantly predicts near misses reported ( $p < .05$ ). The direction of this relationship is negative suggesting the lower the job demands the more near misses are reported. The exponential is .737, suggesting that for every decrease in job demands the probability of a near miss being reported increases by 1.35.

All safety climate dimensions, Senior Management Commitment, Safety Rules, Supportive Environment, Personal Priority and Work Environment demonstrated a significant relationship to near misses reported so the results support Hypothesis 14 (see Figure. 14).



*Figure 14: Illustrative Diagram of Safety Climate Dimensions that Predict Near Misses Reported*

### 7.6.1. Summary of Findings

When the results of the safety climate measure are broken down into the different dimensions of safety climate, Senior Management Commitment, Safety Priority, Personal Priority and Work Environment all significantly predict both accidents and near misses reported. Safety rules and Supportive Environment significantly predict near misses reported only.

Management Commitment shows a negative relationship with accidents and near misses reported, suggesting that poor Management Commitment leads to more accidents and near misses reported. Safety priority demonstrates a negative relationship suggesting that the higher safety is prioritised the more accidents and near misses are reported. For Personal Priority and Work Environment the relationships are the opposite direction for accidents and near misses reported. Suggesting that more individuals prioritise safety the more accidents are reported, but the less near misses reported. The higher the job demands and work pressures the more accidents reported but the less near misses reported. Personal Priorities and Supportive Environment showed a significant relationship with near misses reported and the direction of these relationships were negative suggesting the less individuals prioritised safety more near misses were reported and the less supported employees felt to raise safety concerns without blame the more near misses reported.



## 7.7. Summary

Results of the analysis show, in regard to safety climate antecedents, upward communication, POS, Employee Engagement and LMX are significant predictor safety climate. Further analysis shows that Organisational Commitment is also an important predictor of safety climate. Upward communication accounts for the largest percentage of predictable variance in safety climate (37%) followed by POS (20%), Employee Engagement (16%), Organisational Commitment (14%) and lastly LMX (13%). Between group analysis showed a significant difference for all the variables (Upward Communication, Safety Climate, POS, Employee Engagement, LMX and Organisational Commitment) between the office based (white collar) and site based (blue collar) locations. This can be taken as evidence of different subcultures between office and site based functions.

With regard to safety outcomes (accidents and near misses), upward communication, Safety Climate, POS show a significant relationship with both accidents and near misses reported (while controlling for length of service). LMX and Organisational Commitment show a significant relationship with only accidents reported. When the results are broken down into the different safety climate dimensions, Senior Management Commitment, Safety Priority, Personal Priority and Work Environment show a significant relationship with both accidents and near misses reported. Safety Rules and Supportive Environment show a significant relationship with near misses reported only. An interesting picture emerges when the directions of these relationships are examined with many the opposite direction of the way, one would anticipate and previous research would support.

The next chapter discusses these findings in more detail, how these findings support or refute the conclusions of previous research on safety climate antecedents and outcomes. The chapter then outlines the theoretical contributions of the thesis, its strengths and limitations. The chapter concludes by outlining the practical implications and directions for further research.

# Chapter 8: Discussion

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## 8.1. Overview

The purpose of this Chapter is to consider in depth the results detailed in Chapter 5, 6 and 7. This chapter will commence with a summary of the main study findings of the qualitative studies (Chapter 5 and 6) and the quantitative study (Chapter 7). A key focus will be on those findings demonstrating the particular theoretical contribution to knowledge in the area of safety culture and safety performance research. The chapter concludes by considering the strengths, limitations of the studies, directions for future research and the implications for practical applications.

### 8.1.1. Summary of Qualitative Findings

The qualitative evidence collectively offered an insight into not only the key influences on safety climate and safety outcomes in the sponsor organisation, but also how the variables identified were related to the organisational context they were embedded in. Results of the focus groups and interviews (Chapter 5 and 6) identified *Communication, Leadership, Job Demands, Health and Safety Prioritisation, Employee Engagement/Involvement and Culture*, were identified as the main themes. Unsurprisingly the focus group and interview resulting themes mirror each other. However the interviews allowed the themes identified through the focus groups to be explored in more depth with participants from front line site based employees, middle and senior management. The analysis identified an additional 24 subthemes. The main themes are described below.

1. *Communication* - Poor communication was cited by site based and office based employees including management as a factor influencing safety performance and something that the sponsor organisation was poor at. This was characterised by being top down, with a lack of face to face communication and an over reliance on e-mails, with particularly poor communication to site, the fact that sites were based a significant distance from the head office functions, only exacerbated this and acted as a barrier to communication.

**2. Leadership** - Poor leadership was also cited influence on safety performance particularly by the site based employees. With regard to senior managers there was reference to a lack of visibility on site and a perceived lack of support. Managers were seen as unapproachable, lacking in accountability and having a poor an understanding of site. The perception of those in more hands on operational roles in particular was that this negatively affected safe working practices. Site based employees felt they were not well informed of the outcomes of accidents and incidents reported. Managers felt more informed of the outcomes of accident investigations. A number also felt that accident investigations did not adequately identify root causes leading to reduced organisational learning.

**3. Job Demands** - Employees involved in operational delivery cited poor planning as an issue affecting safety performance, poor costing and scheduling of projects when bidding for contracts, leaving them under resourced leading to a 'fire fighting' approach. This was amplified by commercial pressures. Managers were more aware of the client demands i.e. wanting more for less. Site based employees cited long working hours and working weeks impacted negatively impacted on tiredness levels and work life balance.

**4. Health and Safety Prioritisation** - Interviewees reported high individual priority of safety. However site based operational employees reported mixed messages when it came to safety versus production. The corporate message was safety first, but the underlying message was production first. These messages were seen as less ambiguous by senior managers who reinforced the safety first message. This was indirectly reinforced by financial incentives being attached to production for managers. Health and safety policies and procedures were seen as difficult to follow and understand leading to corners sometimes being cut to get the job done and operational staff suggested they did not have the best PPE for the job.

**5. Employee Engagement & Involvement** - The operational employees felt there was a lack of consultation in decisions which had implications for their job and ways of working. This led to reduced morale job satisfaction. Operational employees stated there was a lack of reward and recognition and the long working hours negatively affected safety, this lack of recognition was acknowledged by senior management but to a lesser extent.

6. *Culture* - The front line operational staff interviewed felt there was a blame culture with several able to recall experiences of reprisals and negative consequences for reporting their concerns this led to under reporting of accidents, incidents and near misses. This was exacerbated by an 'us and them' culture where there was a lack of understanding of site by the office based functions. Both managers and operational employees made reference to an 'us and them' culture do to the substantial growth of the organisation over recent years.

*Communication* was one of the main themes identified in the qualitative studies. O'Connor et al. (2011) recognised communication as a key dimension included in safety climate measures in the aviation industry. The authors suggest that this is of particular importance as different occupational groups work together but are not co-located. This creates particular challenges for communication, as these groups are not able to engage in informal and spontaneous interaction. Parallels can be drawn with the industry the sponsor organisation operates in where operational workers are based on sites remote from office functions, certainly the results of the qualitative studies purport to this. Other researchers have found a link between upward communication (the degree to which employees are able to raise safety concerns and safety climate (Kath et al., 2010) and accidents (Hofmann and Morgeson, 1999).

*Leadership* another key theme identified in the qualitative studies has received attention in the safety climate literature, where leadership and management attitudes have been identified as a key dimension of safety climate (Flin et al., 2000; Seo et al., 2004; O Connor et al., 2010) and have been found to be a robust predictor of safety outcomes (Christian et al., 2009; Beus et al., 2010).

The other two themes *Safety priority* and *Job demands*, are closely linked and the relationship between work pressures, job demands and safety climate has been well established (Mearns and Flin et al., 2001; Zohar, 2003; Nahrgang et al., 2010). Pressure for production has a negative effect on employee safety (Landsbergis et al., 1999) and the more an organisation places a greater emphasis on production the more employees perceive that safety is secondary to the demands of production (Janssen et al., 1995).

*Employee engagement & involvement* was another identified theme. There is some evidence to link employee engagement to safety outcomes (Harter et al., 2002; Nahrgang et al., 2010). If engagement is broadly conceptualised as work related attitudes then organisational commitment and job satisfaction have also shown a relationship with safety outcomes (Clarke, 2010).

The final theme was *Culture*; negative safety climates characterised by punitive approaches to safety management and blame, reduce communication about safety concerns and in turn negatively affect safety behaviours, safety compliance and accident rates (Edmondson, 1996; Reason, 1998; Cheyne et al., 1998; Zohar, 2003).

The results suggest the main themes, *Communication, Leadership, Safety Priority, Job Demands, Employee Engagement & Involvement and Culture* are not dissimilar to other research in the field in regard to the main variables that have been identified as having the potential to influence safety culture and safety outcomes.

The results of both of the qualitative studies allowed in-depth exploration of the organisational culture, the policies, practices, values and beliefs the sponsor organisation and its employees held about safety. This information and the key themes identified were able to inform the development of the quantitative study a safety climate questionnaire. Despite the ambiguity and confusion around the definitions of safety climate and culture (Flin, 2000) it could be argued that using both a qualitative and quantitative approach enabled the researcher to explore both safety culture and safety climate in the sponsor organisation.

## **8.2. Summary of Quantitative Findings**

This section provides an overview of the findings of the quantitative study (Chapter 7). The key findings will be presented in relation to the research question for the thesis, '*what are the factors shaping safety culture and safety performance in the sponsor organisation?*'

### **8.2.1. Psychosocial Antecedents of Safety Climate**

There is a significant relationship between all psychosocial organisational variables LMX, POS, Employee Engagement, Organisational Commitment and Safety Climate. All variables, Upward Communication, LMX, POS Employee Engagement, except Organisational Commitment, significantly predict safety climate. Further analysis (Relative weight analysis) shows that Organisational Commitment is also an important predictor of safety climate. Upward Communication accounts for the largest percentage of predictable variance in safety climate (37%) followed by POS (20%), Employee Engagement (16%), Organisational Commitment (14%) and lastly LMX (13%). These findings support previous research which has shown a relationship between safety climate and upward communication (Hofmann et al., 2003), POS (Hofmann and Morgeson, 1999,; Gvekye and Salminen, 2007; Mearns et al., 2009) Employee Engagement (Nahrgang et al., 2010) and Organisational Commitment (Clarke, 2010).

### **8.2.2. Safety Climate Sub Cultures**

When this is broken down by location; on site, head office, supply chain and logistics and design, and these locations are compared there are significant differences between; head office and on site, design and onsite for safety climate, POS, Employee Engagement and LMX. There was a significant difference between head office and on site for Upward Communication and Organisational Commitment only. The design and head office personnel can be typically described as white collar workers whereas the site based staff can be described as blue collar workers, as their role predominantly involved manual labour. This supports the results of the qualitative study where employees referred to an 'us and them culture' between office based and site based staff. The results also reflect that of previous research which refers to different sub cultures in the sponsor organisations (Clarke, 2000).

### 8.2.3. Safety Climate and Safety Outcomes

This section will describe the results of the analysis of safety climate and safety outcomes (accidents and near misses reported). The safety climate dimensions and their relationship to safety climate outcomes will be discussed, linking these findings to previous research.

Interestingly when looking which variables predict self-reported accidents and near misses, whilst controlling for length of service there are some apparent unexpected differences. As expected safety climate is the strongest predictor of self-reported accidents and near misses but unlike other findings this relationship is positive suggesting that a positive safety climate increases the probability of accidents and near misses reported. A large number of studies have demonstrated that perceptions of safety climate are negatively correlated with accidents (Griffin and Neal, 2000; Hofmann and Stetzer, 1996; Clarke, 2006; Christian et al., 2009; Beus et al., 2010). These findings demonstrate the opposite relationship i.e. the more positive the safety climate the more accidents and near misses reported.

When the safety climate dimensions are analysed separately in their relation to safety outcomes (accidents and near misses reported) the results appears to reflect some of the findings of the safety climate literature. Management Commitment (how committed management are to safety), Safety Priority (the priory the organisation gives to safety over production), Personal Priority (individual priory of safety), Work Environment (job demands and pressure) show a significant relationship with both accidents and near misses reported. Safety Rules (safety compliance) and Supportive Environment (how supported employees feel to report safety concerns) demonstrate a significant relationship with near misses reported only.

Management Commitment shows a negative relationship with accidents and near misses reported, suggesting that poor Management Commitment increases the probability of accidents and near misses being reported. This result links to previous research which shows that management commitment is a robust predictor of safety outcomes (Beus et al., 2010; Michael et al., 2005). Bridges (2000) found that when employees perceive low levels of management commitment to safety near misses are under-reported.

Safety priority appears to be the safety climate dimension with the largest influence on the probability of accidents and near misses being reported. Safety priority demonstrates a positive relationship suggesting that the more safety is prioritised over production the less chance accidents and near misses are reported. Pressure for production has been identified as a key safety climate dimension (Flin et al., 2000; Seo et al., 2004; O'Connor, 2011), this links into previous research examining under reporting of accidents and production pressure. Probst and Graso (2013) found high levels of production pressure lead to more accidents but fewer are reported to the organisation.

Interestingly for Personal Priority and Work Environment the relationships are the opposite direction for accidents and near misses reported. The higher the job demands and work pressures the more accidents reported but the less near misses reported. These results suggest that more individuals prioritise safety the more accidents are reported, but the less near misses reported. Personal Priority for safety can be described as how much an individual prioritises safety. The results are explained in the context of previous research linking risk taking to safety outcomes (Brown et al., 2000).

Work Environment shows a significant relationship with accidents reported and the direction of the relationship is positive demonstrating that high job demands are related to an increased probability of accidents reported. This result supports previous research which has demonstrated that high job demands are related to increased injuries and accidents (Mearns and Flin et al., 2001; Zohar, 2003; Nahrgang et al., 2010). Work environment demonstrated a significant relationship with near misses reported, however the direction of this relationship is negative, the opposite of accidents, suggesting the poorer the work environment the greater the probability of near misses being reported. This finding supports previous research. Goldenhar et al., (2003) found a significant relationship between job demands and near misses reported, when examining the relationship between job stressors, injury and near misses in construction workers. Morrow and Crum (2004) also found support for increased job demands, namely fatigue inducing factors and increased reporting of close calls in their study of truck drivers. Kath et al., (2010) also found job demands had a positive association with safety communication suggesting that workers are more likely to discuss safety concerns with their supervisors when job demands interfere with safety.



The results show safety rules significantly predicts near misses reporting and the direction of this relationship is positive, i.e. the more an individual complies with safety rules the higher the probability of a near miss being reported. Safety compliance refers to the core activities that individuals need to carry out to maintain workplace safety. These behaviours include adhering to standard work procedures and wearing personal protective equipment (Neil and Griffin, 2006). Safety compliance as a safety outcome has received some attention in the safety literature (Rumundo, 2000, Hofmann and Stetzer, 1996; Brown et al., 2000; Probst, 2004; Clarke, 2006; Neil and Griffin, 2006). Conversely previous research has shown that safety compliance is negatively correlated with accidents and near miss rates (Neil and Griffin, 2006; Probst, 2004). The results do support previous findings that demonstrate a relationship with compliance and near misses although the direction of this relationship is the opposite of previous findings. This can be explained in the context of safety citizenship behaviours (Hofmann and Morgeson, 1999) that is, reporting near misses and safety concerns in a positive safety behaviour aimed at helping the organisation learn from hazards, hence those who comply with safety rules are also more likely to report safety concerns.

#### **8.2.4. Psychosocial Climate and Safety Outcomes**

This section will describe the results of the analysis of the psychosocial climate variables, upward communication, POS, LMX and Organisational Commitment and safety outcomes (accidents and near misses reported). This section will link the findings to previous research on the antecedents of safety outcomes.

Upward communication was shown to be a significant predictor of reported accidents and near misses and the relationship was negative i.e. poor upward communication decreased the probability of an accident or near miss being reported. These findings are in line with previous research which has found a negative relationship with poor upward communication and accidents reported (Hofmann and Morgeson, 1999).

The results also demonstrated a significant relationship between POS and accidents and near misses reported and this relationship is positive; suggesting the more supported employees feel by the organisation the greater the probability of accidents and near misses being reported. There is limited

research examining the relationship between POS and accidents. However these findings are contrary to previous findings which demonstrated high POS results in fewer accidents (Hofmann et al., 2003).

LMX significantly predicts accidents reported and the direction of the relationship is negative suggesting the less positive the supervisor relationship the more accidents reported. LMX did not show a significant relationship with the number of near misses reported. These findings support previous research which has demonstrated the more positive the leader subordinate relationship the less accidents reported (Michael et al., 2006).

Organisational commitment significantly predicts accidents reported but not near misses. The direction of the relationship is negative suggesting poor organisational commitment results in an increased probability of accident being reported. There is some research linking organisational commitment to safety climate (Mearns and Hope 2005; Mearns et al., 2010) but only one study to date has attempted to examine the relationship between organisational commitment and safety outcomes. Clarke, (2010) found organisational commitment was found to mediate the relationship between safety climate and safety outcomes. The findings of this study suggest there is a direct link between organisational commitment and safety outcomes (accidents). Engagement did not show a significant relationship with reported accidents or near misses reported.

The quantitative study generated some interesting findings. The examination of the safety climate antecedents for the most part supported previous findings on the psychosocial antecedents of safety climate, yet some variables such as organisational commitment and employee engagement have little research linking them to safety climate. Not much research to date has explicitly addressed the relationship between organisational attributes and safety climate and outcomes, and some of the results in relation to safety outcomes demonstrate some contradictory relationships. These results and their theoretical contributions are discussed in more depth in the following section.

### 8.3. Interpretation of Key Findings and Theoretical Contributions

The analysis of the psychosocial safety climate antecedents show that upward communication, POS, Employee Engagement, LMX and Organisational Commitment predict safety climate, this supports previous findings (Hofmann et al., 2003; Gyekye and Salminen, 2007; Mearns et al., 2010; Nahrgang et al., 2010; Clarke, 2010). The findings in relation to safety outcomes (reported accidents and near misses) are less clear cut. Upward communication and organisational commitment demonstrate a predictive relationship with accidents and the direction of the relationship is positive, this supports previous research findings (Hofmann and Morgeson, 1999; Clarke, 2010)

The other factors which significantly predict accidents and near misses reported are related to previous findings (Hofmann and Stetzer, 1996; Brown et al., 2000; Rumundo, 2000; Griffin and Neal, 2000, 2006; Mearns and Flin, et al., 2001; Zohar, 2002, 2003; Goldenhar, 2003; Probst, 2004; Michael et al., 2005, 2006; Clarke, 2006; Christian et al., 2009; Beus et al., 2010; Nahrgang et al., 2010; Kath et al., 2010). However the direction of this relationship is not the direction you would expect in light of previous findings. For example when compared to the other five dimensions that demonstrate a significant relationship with safety outcomes; upward communication, POS, LMX and Organisational Commitment, Safety Climate is the biggest predictors of the probability of an accident and near miss being reported. However the direction of this relationship is positive, this means that the more positive the safety climate the higher the probability of accidents and near misses being reported.

Another counter intuitive finding is that POS is predictive of accidents and near misses reported but the direction of this relationship is positive i.e. the higher the POS the greater the probability of accidents and near misses reported. Previous findings demonstrate the opposite high POS is related to lower accidents rates (Hoffman et al., 2003). There are two possible explanations of these findings:

1) The methodology is flawed, the results are unique to this particular organisation/industry or the research results are atypical. There were various steps taken throughout the thesis to ensure methodological rigour (See Chapter 4). Adopting a triangulated methodology, combining both qualitative and quantitative studies reduces the limitation of single method bias. The results of the

qualitative studies also demonstrate some similar findings and provide contextual insights for interpretation of the results, which will be discussed later. In addition factor analysis scores of the dimensions included in the safety climate measure used in the quantitative study (Chapter 7) compare to the original safety climate questionnaire (included in the *Safety Climate Toolkit*) (Cox and Cheyne, 2000) demonstrating constancy across this particular industry.

2) On reflection, the methodology adopted was fit for purpose (Gilner and Morgan, 2000) and there is no reason for the sponsor organisation or the industry it operates in to be fundamentally different from any other industry sector. Another explanation is in relation to the measure of safety outcomes. Accidents and near miss data was collected as subjective self-report data not objective data from the organisation's accident database. Previous research has demonstrated these statistics are not comparable, with high levels of under reporting. For example Probst and Estrada (2010) found employees fail to report 71% of all work-related injuries to the company. The findings suggest that rather than measuring the occurrence of accidents and near misses, collecting self report accident and near miss data is actually a measure of a psychological and social phenomenon - reporting behaviour. These results can be explained through the theory of social exchange (Blau, 1964).

### **8.3.1. Reporting Behaviour as a Social Exchange**

Social Exchange Theory (Blau, 1964) implies that if one party acts in a way that benefits another party, an implicit commitment for future reciprocity is produced (Gouldner, 1960). Social exchange theory proposes that favourable treatment or resources received from others are more highly valued when employees believe them to be based on discretionary action rather than specifically mandated (Eisenberger et al., 1997). Rhoades and Eisenberger (2002) concluded from the results of their meta-analysis that employees' general beliefs that their organisation values their contributions and is concerned about their well-being are associated with high levels of affective commitment to the organisation, less withdrawal from active participation, and increased job performance and organisational citizenship behaviours (OCB).

Organisational citizenship behaviours are essentially discretionary behaviours (undertaken by employees) which go beyond an individual's job-role but improve the functioning of the organisation

(Organ, 1988). A meta-analysis by Podsakoff et al. (2000) has shown that discretionary actions such as OCBs have significant benefits for organisations in terms of their social environments and actual production levels. Furthermore, it has been shown that positive perceptions of organisation support and leader subordinate relationships (Remus et al., 2007) can result in employees showing increased organisational citizenship behaviours and commitment towards the organisation (Coyle-Shapiro, 2002).

Safety related exchanges can also be conceptualised from an exchange perspective (Hofmann and Stetzer, 1996). Safety research has broadened organisational citizenship behaviours to behaviours related to workplace safety, these are referred to as safety citizenship behaviours (Hofmann et al., 2003; Turner et al., 2005). Safety citizenship behaviours are similar to organisational citizenship behaviour except they focus on improving safety performance (Hofmann and Morgeson, 1999).

Some researchers in the field of safety have become interested in how the social exchange process helps shape safety related perceptions and safety behaviour and examined perceptions of organisational support (Hofmann and Morgeson, 1999; Mearns and Hope, 2005; Mearns and Reader, 2008; Mearns et al., 2010), the leader subordinate relationships (Hofmann et al., 2003; Michael et al., 2006; Kath et al., 2010), upward communication (Hofmann and Morgeson, 1999; Kath et al., 2010) and organisational commitment (Clarke, 2010; Mearns et al., 2010) Social exchanges between both the organisation and their supervisor have shown a relationship with safety outcomes including accidents, safety communication, safety citizenship behaviour and compliance (Hofmann and Morgeson, 1999, Hofmann et al., 2003, Mearns and Reader, 2008; Kath et al., 2010).

If as hypothesised reported accidents and near misses are actually measuring the psychological and social phenomenon of reporting behaviour, hence it is logical to assume accident and near miss reporting are actually safety citizenship behaviours. Reporting accidents and near misses can improve safety performance, as the information in regard to accidents can increase organisational learning and in turn inform the development of future safety solutions. If the accident or near miss is not reported by the employee then valuable knowledge is lost and this could prevent the organisation from identifying dangerous organisational, situational, or behaviour patterns and preventing improvements in the overall organisational health and safety. The findings suggest that reporting behaviour can be enhanced through positive employee perceptions of perceived organisational support (POS). The results of the qualitative studies support this hypothesis, with many reporting a lack of perceived support by management and the wider organisation lead to under reporting of accidents and near misses. Suggested models of the social exchange relationships are detailed below (Figure 15 and 16).

The aspects of the social exchange relationships identified in the studies will be discussed in more detail in the following sections.

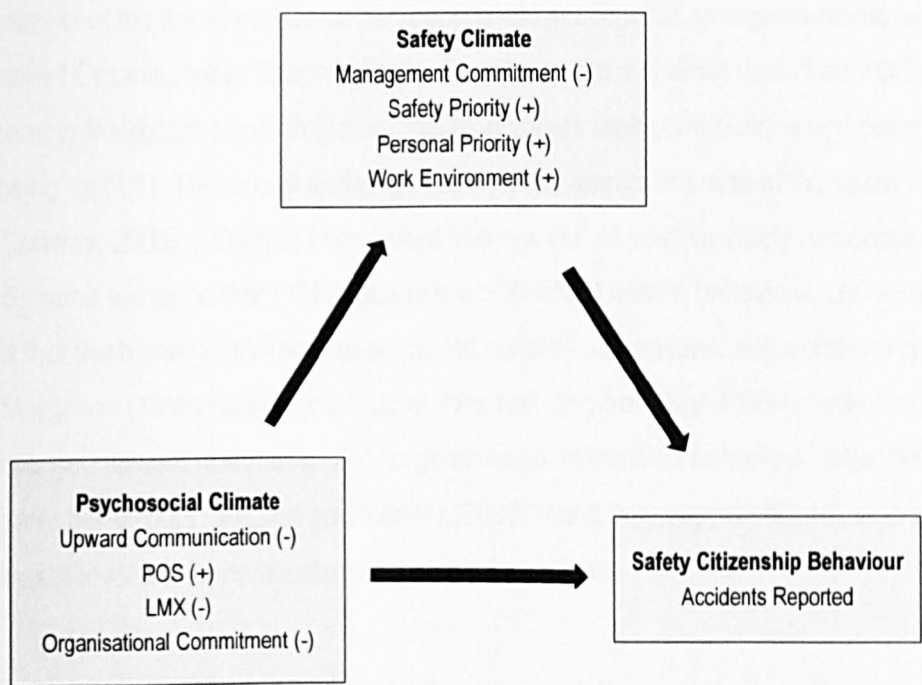


Figure 15: Suggested Model of the Psychosocial Climate, Safety Climate Reported Accidents Social Exchange relationships

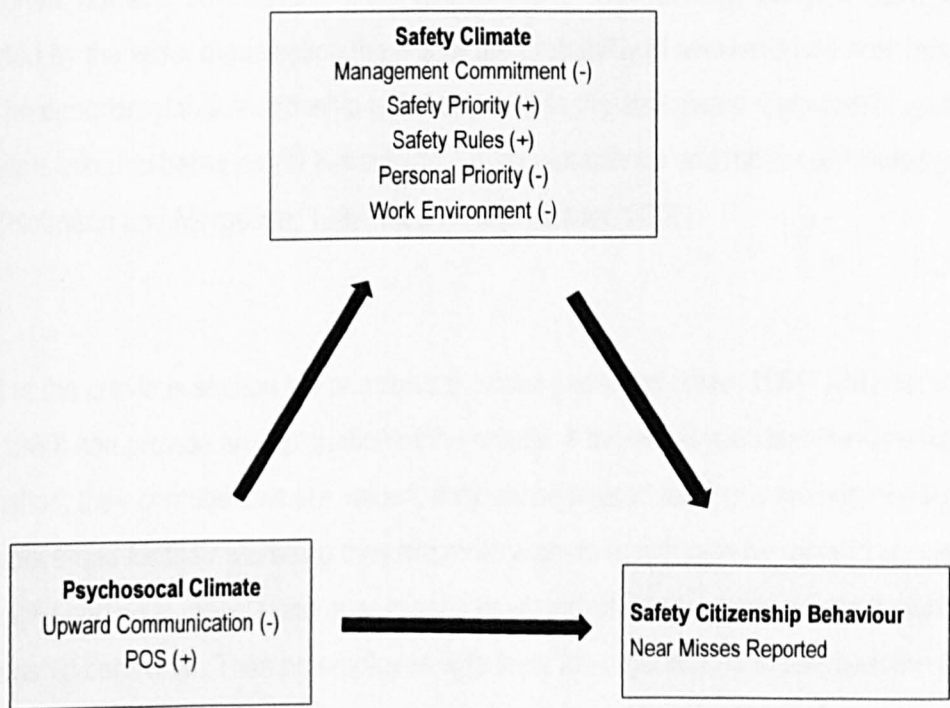


Figure 16: Suggested Model of the Psychosocial Climate, Safety Climate Reported Accidents Social Exchange Relationship

### **8.3.2. Perceived Organisational Support**

The aspect of the social exchange perspective which occurs at an organisational level is defined Perceived Organisational Support (POS). Eisenberger et al. (1986) described POS as 'global beliefs concerning the extent to which the organisation values their contributions and cares about their wellbeing' (p.501). This social exchange is solely the employer's side of the contribution (Coyle-Shairo and Conway, 2005). POS has been linked to a number of positive safety outcomes. Mearns and Hope (2005) found evidence that POS leads to lower levels of unsafe behaviour, Gykye and Saminen (2007) found that the higher POS improve employee's safety perceptions, and safety compliance. Hofmann and Morgeson (1999) found reciprocal actions resulting from high POS included raising safety concerns or increased upward communication, organisational citizenship behaviour, organisational commitment and safer behaviours. Mearns and Reader (2008) found high support at both an organisational and supervisor level led to more safety citizenship behaviours.

The results of the quantitative study show that POS predicts safety climate which supports previous findings (Hofmann et al., 2003; Gyekye and Salminen, 2007). POS predicts both accident and near misses reported, however the direction of this relationship is positive, suggesting the more employees feel supported by the wider organisation the higher the probability of accidents and near misses being reported. The direction of this relationship is the opposite to the anticipated relationship given that high POS has been linked to better safety behaviours, safety compliance and more safety citizenship behaviour (Hofmann and Morgeson, 1999; Mearns and Reader, 2008).

As outlined in the previous section the principles of social exchange (Blau, 1964) and reciprocity theory (Gouldner 1960) can provide an explanation of the results. If the employees feel they are supported by the organisation, their contributions are valued, they will be treated fairly and the organisation is genuinely concerned for their wellbeing they are more likely to reciprocate by reporting accidents and near misses. Reporting accidents and near misses as already suggested can be conceptualised as safety citizenship behaviour. Thus an employee who feels the organisation shows genuine concern for their wellbeing will feel free to raise safety concerns. Mearns and Reader (2008) found that care and concern for workers wellbeing led to reciprocal behaviours in terms of increased safety citizenship behaviour. Some of the questions included in safety citizenship measure were 'I report near misses' 'I report minor accidents' 'I report hazardous working conditions' the authors themselves note that this

may be measuring reporting behaviour. Thus these results would demonstrate that POS is positively related to reporting behaviour, supporting the findings of the quantitative study.

### **8.3.3. Safety Climate**

Safety researchers have demonstrated the relationship between safety climate and accidents and injuries (Clarke, 2006; Christian et al., Beus, 2010). The findings of the quantitative study show that safety climate is the largest predictor of accidents and near miss reporting when compared to the other significantly predictive variables (upward communication and POS). This finding supports previous research which has demonstrated the negative safety climates are predictive of greater accidents and injuries (Clarke, 2006; Christian et al., Beus, 2010) conversely the direction of this relationship is positive i.e. the more positive the safety climate the greater the probability of more accidents and near misses being reported. If as already suggested accidents and near misses reporting are seen as safety citizenship behaviours which safety climates have been shown to moderate (Hofmann et al., 2003) then these results would support previous research. Previous research has found that accidents are under reported in organisations that have poor safety climates (Probst and Estrada, 2010).

When the safety climate dimensions are examined separately, Safety Priority, the extent to which safety is prioritised over production is the largest predictor of the probability of an accident or near miss being reported. The direction of this relationship is positive i.e. the more the organisation prioritises safety the more accidents and near misses are reported. Pressure for production has been identified as one of the main safety climate dimension in reviews of safety climate measure (Flin, 2000; Seo et al., 2004). Research has identified pressure for production as a factor that is negatively associated with safety performance (Zohar 1980; Mearns et al., 1997; Glendon and Litherland, 2001; Janssens et al., 2005). Janssens et al. (1995) found that organisations that place a greater emphasis on production, the more employees perceive that safety is secondary to demands of production. Probst and Graso (2013) examined the relationship between production pressure and accident reporting. The authors conducted a study of 212 copper mining workers and found that production pressure was significantly associated with more negative reporting attitudes and a greater number of negative consequences from reporting accidents. Results also showed that individuals who perceived high levels of production pressure not only experienced more accidents overall, they also reported fewer of them to the organisation.



The results of the qualitative studies provide some insights into these findings. Often whilst the corporate message is safety first, the underlying message is get your job done on time and in budget. The sponsor organisation is a contractor for major energy companies and if the jobs run over time there are large financial penalties imposed on the organisation, site supervisors were rewarded and recognised for getting the job completed on time and senior managers' bonuses were attached to performance. Conversely many site based operational employees were able to recount examples where there had been negative consequences, reprisals and blame for raising safety concerns. This led to withholding of information about accidents and near misses. It is not surprising that the subordinates would reciprocate their leaders with the expected behaviour.

Interpreting these results in terms of social exchanges, employees take their cues from the wider organisation and their managers as to how safety is valued over production and is prioritised in the organisation and respond with the appropriate behaviours. If safety is highly prioritised this increases the probability of reporting behaviour. This behaviour is then reinforced by positive or negative consequences of reporting the accident or near misses.

#### **8.3.4. Leader Member Exchange**

The findings of the study show that leader member exchange predicts safety climate, this supports previous findings. Hofmann et al. (2003) demonstrated a link between LMX, safety citizenship, role definitions and this was moderated by safety climate. Hofmann and Morgeson (1999) found that LMX is an antecedent to safety communication, safety commitment and accidents. Immediate supervisors have been found to influence the safety culture and safety performance of the organisation (Zohar, 2002). The findings of the quantitative study in relation to safety suggest the poorer LMX relationship the greater the probability of accidents reported. Michael et al. (2006) found that high quality LMX was negatively related to self-report safety-related events. The research on LMX and safety climate suggests safety climate provides the cues that help workers identify appropriate behavioural reciprocation for positive LMX relationships (Hofmann et al., 2003).

The results of the qualitative studies provide some contextual insights to these findings. Many identified that poor leadership was seen as a key driver of safety performance. Managers were seen as unapproachable, unaccountable with a lack of action or feedback on safety concerns raised. This led to under reporting of safety issues, accidents and near misses. The qualitative results suggest that there was culture of blame and fear of reprisals, leading to under reporting of safety issues. The gangs and their Foreman lived and worked together on site, in caravans for the duration of the project and many of the gangs had worked in the organisation for many years leading to very strong working relationships. Results of the pairwise comparisons show a significant difference in LMX between white collar (office based) and blue collar (site based workers). So it could be hypothesised that strong leader member relationships actually motivated employees to conceal accidents to avoid their team being 'under the spotlight' getting punished or blamed.

Zohar has highlighted the impact that supervisor behaviour can have upon worker actions immediate supervisors set the norms of behaviour which influence safety and safety performance (Zohar, 2000; Zohar and Luira, 2004). So it can be suggested that the norm of behaviour on site where there are positive leader subordinate relationships is to under report and conceal report accidents to protect 'us' from the wider organisation 'them'. The quality of the leader's subordinate relationship predicts the probability of accidents being reported but high quality relationships may actually impeded accident reporting, in terms of social exchange employees may reciprocate a positive relationship with supervisors by reporting less accidents.

### **8.3.5. Communication**

Upward communication (Hofmann and Stetzer, 1996) is the degree of freedom employees feel to discuss safety issues with management. Quantitative results suggested that upward communication accounts for the largest predicted variance (37%) in safety climate and there is a significant difference in upward communication between site based blue collar workers and office based white collar workers. Results also suggest upward communication predicts reported accidents and near misses and the direction of this relationship is negative i.e. the poorer the upward communication the greater the probability of accidents and near misses being reported. These findings are in line with previous research which has shown that poor communication is linked to increased accidents (Hofmann and Morgeson, 1999). Positive safety climates, resulting from management demonstrating a committed and

non-punitive approach to safety management, promotes a more open communication and a free-flowing exchange of information about safety-related issues, whereas in negative safety climates, workers are wary of raising safety issues for fear of retribution, blame and punishment (Edmondson, 1996).

The results of the qualitative studies highlighted that communication was an issue across the whole organisation and key issue affecting safety. Those on site suggested that communication was exacerbated by a culture of blame and reprisals and a lack of action or feedback on issues raised. Certainly when looking at the results of the qualitative and quantitative results as a whole, it would suggest that due to the positive relationships with their immediate supervisors coupled with the poor safety climates characterised by blame, workers will most likely look for the easiest way to placate management and the wider organisation in order to escape getting the blame. This communication style has been shown to reduce the free flow of information over time (Gibb, 1961; Eadie, 1982; DeSalvo and Zurcher, 1984; Mas, Alexander and Turner, 1991).

Clarke (1998) found that employees' intentions not to report safety incidents was linked to their perception that management would take no notice, and Mullen (2005) found that employees were more likely to invest time and effort into raising a safety issue when they thought managers were open to suggestions. Upward communication can be seen as the reciprocal side of the social exchange relationship. If management are open to, and listen to employee safety concerns and act on them, this serves as positive reinforcement for employees to report safety concerns and so should foster more reporting behaviour.

### **8.3.6. Employee Engagement and Organisational Commitment**

The quantitative results show that employee engagement and organisational commitment predict safety climate but only organisational commitment predicted accidents reported. There have only been limited studies linking staff engagement to safety outcomes (Harter et al., 2002, Nahrgang et al., 2010). There is no research examining the direct link between employee engagement and safety climate, given the limited evidence linking engagement and the lack of clarity around the concept and its measures, it is

not surprising that the quantitative study did not generate a significant link between engagement and safety outcomes (reported accidents and near misses).

Organisational commitment is clearly defined as a concept, there is more research linking it to organisational outcomes (Allen and Meyer, 1990). Organisational commitment (Meyer, 1997) has been shown to have a significant influence on a range of work behaviours, including compliance with procedures (Shore and Wayne, 1994) and organisational citizenship behaviours (Organ and Ryan, 1995). The quantitative findings link with previous research by Mearns and Hope (2005), who found that stronger organisational commitment increased compliance with safety rules and regulations and Clarke (2010) in a meta-analysis of psychological climate (see Chapter 3), worker attitudes and safety outcomes found that more positive safety climate was associated with greater organisational commitment. Organisational commitment partially mediated the effect of safety climate on safety behaviour.

### **8.3.7. Summary**

The results of the qualitative studies would suggest that the degree of support employees perceive from their organisation and their supervisor, perceptions of safety climate, upward communication and organisational commitment influence reported accidents and near misses. Social exchange theory (Blau, 1964) and reciprocity theory (Gouldner, 1960) provide a useful theoretical explanation of the findings. Closer examination of the studies on citizenship behaviour (Hofmann and Morgeson, 1999; Mearns and Reader, 2008) suggest that safety citizenship behaviour may actually be reporting behaviour and it is reporting behaviour that is being measured in this context.

The qualitative study results provide some valuable contextual insights into these findings and suggest that if employees that don't feel supported by management and the wider organisation they may withhold information about accidents and near misses. Employees pick up cues from the organisation and their manager about what behaviours are valued and respond accordingly. Extrinsic motivators such as rewards and punishment reinforce these behaviours and contribute to accident and near miss reporting or under reporting.

## 8.5. Strengths, Limitations and Future Research

There are a number of potential strengths and limitations of the studies included in this thesis. The strengths and limitations will be discussed in this section along with directions for future research. The use of self-reported measures for safety outcomes can be criticised for being subjective (Clarke, 2000), however the under-reporting of accidents has been well documented in the safety literature (Glazner et al., 1998; Pransky et al., 1999; Leigh et al., 2004; Rosenman et al., 2006). Probst and Estrada found that 71% of experienced accidents went unreported by employees to the organisation. Individual-level under reporting of accidents has been linked to fear of; reprisals, loss of benefits or job loss (Sinclair and Tetrick, 2004; Probst, 2006; Probst and Graso, 2013). A lack of management commitment to safety and negative safety climates have also shown to be related to under reporting (Clarke, 1998; Probst and Estrada, 2010). Often in macho cultures such as the sponsor organisation, there is general acknowledgment that accidents and injuries are an occupational hazard (Pransky et al., 1999).

The qualitative studies suggested in the sponsor organisation there is poor safety culture, low levels of management commitment to safety and under reporting of accidents and safety incidents due to fear of reprisals and blame. In addition the industry the sponsor organisation operates in can be described as a macho working environment. Self-reported measures of accidents and near misses can be seen as less objective. Hence the use of self-reported measures of accident and near miss in the sponsor organisation was seen as a more accurate way of capturing data on near miss and accidents, given the contextual insights into factors affecting reporting behaviour identified through the qualitative studies. Further studies could collect both objective accident and near miss data from organisational accident databases and self-report measures. These measures could be examined to assess the level of under reporting and which psychosocial organisational and safety climate factors increased or suppressed accident reporting.

The quantitative study was cross sectional and data from the survey measures was collected at one point in time. This means that how these social exchanges and organisational psychosocial variables affect safety climate and safety outcomes over time was not able to be investigated (Bauer and Green, 1996). This limits the extent to which definitive claims can be made about causal processes. Very few studies have examined safety climate and safety outcomes over time (Neal and Griffin, 2006). Future

research could examine these social exchange relationships over time, to see whether psychosocial organisational climate and safety climate predict subsequent changes in safety outcomes.

The research was conducted in one organisation in the construction industry, again limiting the generalisability of the findings. Further research could examine whether these findings are replicated in other companies in the same industry, and whether these findings translate across industries.

A possible strength of the thesis is the adoption of a multi-method, triangulated methodology. Whilst this methodology is advocated in the safety literature (Cooper, 2000) very few studies examining safety climate and safety performance use this approach. Gilner and Morgan (2000) suggest that methodology should be fit for purpose. Using a triangulated, multi-method approach allowed in-depth contextual insights into the factors affecting safety culture and safety performance. The safety climate questionnaire allowed for these findings to be tested quantitatively. The contextual insights derived from the focus groups and interviews helped shed light on the quantitative findings, in terms of the social exchange relationships. Without these insights some of the results would have remained puzzling and possibly interpreted differently. Further research could replicate this methodological approach in other organisations and industries. The final section of the discussion chapter outlines the practical implications of the research findings.

## **8.6. Practical Implications**

As well as the theoretical contributions outlined in the previous chapters, the results of the studies have some practical implications, for the organisation and wider industry. These are outlined and discussed in this section.

The results suggest that not only safety climate but the wider psychosocial organisational climate factors shape accident and near miss reporting behaviour. This behaviour can be described as safety citizenship behaviour (Hofmann et al., 2003), which is influenced by the social exchanges between the employee and the organisation. The support an organisation and its management show for the employees and the quality of these exchange relationships influences reporting behaviour. This is an important contribution as there is common idea in industry that the best way to improve safety outcomes is through providing safety specific training or behavioural based interventions to front line workers (Huang et al., 2007). Training and interventions which focus on improving the wider

psychosocial climate factors, such as leadership, organisational commitment and communication will have a positive effect on overall reporting behaviour. Developing a supportive environment which values safety and reporting behaviour will increase accident and near miss reporting.

The findings suggest that front line leaders and the climates they help create can have a significant impact on their subordinates reporting behaviours. Although there is evidence that leadership interventions are effective in changing leader behaviour, most of these have focused on transformational leadership or safety specific leadership (Avolio and Shamir, 2002; Mullen and Kelloway, 2009). There is little guidance available on leadership interventions that focus on a wide range of leader behaviours. The current findings suggest that to improve safety culture and increase reporting behaviour and leaders would benefit from developing their leadership skills to become more supportive as opposed to just developing safety specific leadership skills.

Upward communication, the degree to which employees feel free to raise safety concerns appears to account for the largest variance in safety culture and has a significant impact on the probability of an accident and near miss being reported. Qualitative results suggest there was a lack of visibility of senior managers on site and a lack of action and feedback from the safety concerns raised. In order to improve upward communication, organisations should create opportunities for front line site based operational personnel to feedback their safety concern and receive feedback on these. An intervention which has proved successful in the healthcare setting (Thompson, 2011) is executive walk arounds. Where senior executives 'walk the floor' in hospitals and interact with front line workers. This has been shown to reduce patient safety incidents and improve safety climate. Regular site visits from senior management, should allow employees to feel more supported, increase upward communication and in turn increase accident and near miss reporting.

## **8.7. Summary**

Adopting a multi-method triangulated methodology enabled the development of in-depth quantifiable insights into safety performance which wouldn't have been achieved with a single methodology. It appears that the support organisations show for their employees and the quality of these exchange relationships both from the organisation and their managers, the degree of upward communication and the commitment employees have towards the organisation influences both safety climate and reported accidents and near misses. These findings suggest that the nature of social exchanges in organisations

plays an important role in understanding safety climate and safety behaviours. Management and organisational characteristics, such as supportive environments, positive leader subordinate relationship across the organisation, and opportunities for employees to communicate their safety concerns are important enablers with respect to the development of an efficient safety culture and safety outcomes. Appropriate social exchanges within an organisation may lead to benefits in terms of positive safety reporting behaviours. These have significant practical benefits for the organisation in terms of learning from safety incidents, allowing a more accurate picture of the organisation's safety performance to be developed. A clear picture of an organisation's safety performance is key for organisations to develop the appropriate interventions to improve safety performance and safety outcomes.



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# Appendix 1: Verbal Introduction

Hello, my name is Ceri Jones, I'm a Postgraduate research at the Institute of Work Health and Organisations. The research area I work in is health and safety. We have been asked by \* to look at the organisations current safety performance and understand how we can improve it. One of the ways we are doing this is to speak to number of employees in \*, like yourselves to try and understand how and why accidents occur in order to be able to prevent them in the future.

I need to make it very clear to you that we are independent of BNL and its management. All information you give me and anything that is discussed in this room will NOT be feed back to management and will only be used as part of the wider research study along with information from other employees throughout the company. No one will be identifiable as all information given to me through these interviews will be anonymised. The only exception to this is if you tell me something which may pose a risk of causing serious harm to yourself or others.

Several steps will be taken to protect your anonymity and identity. The typed interviews will NOT contain any mention of your name, and any identifying information from the interview will be removed. The typed interviews will also be kept in a locked filing cabinet at the University of Nottingham, and only those researchers involved in the study (who are sworn to confidentiality) will have access to the interviews. All information will be destroyed after 5 years time.

Taking part is voluntary and you can withdraw at any time, you don't have to take part if you don't want to but I would be very grateful if you could as it would help my understanding of why accidents, incidents and near misses occur in order to help prevent employees getting injured and hurt in the future.

I just want to remind you again that information given to me today will NOT be reported to \* management and your details will be anonymised. All information given to me today will form part of the wider research study only. At no time, however, will your name be used or any identifying information used in the reporting of this research study.

Any Questions?

# Appendix 2: Interview Questions

What is \* like as a company?

What's good about working for \*?

What could be better?

## 1 Health and Safety Leadership

### 1.1 Safety Roles and Responsibilities

Are you clear about your own role and responsibilities re health and safety – what are they

What do you perceive management's responsibilities to be and what do you perceive workers' responsibilities to be

### 1.2 Management Visibility

How involved are "management" (e.g. Band Managing Director/ others) with day to day health and safety (e.g. inspections/ audits/ safety tours/ risk assessment/ planning?)

What could be improved?

### 1.3 leadership and commitment to health and safety

How important is health and safety to \* as a company

How would you describe the leadership that management provide on health and safety – do they lead by example?

How do management demonstrate their commitment to health and safety?

What could be improved?

## **2 Prioritisation of Health and Safety over production**

What is the official \* line on the importance of safety versus production – is this message consistent throughout the management and supervisory chain

Would you stop work for safety reasons – would management support you in doing this?  
Any examples where you have done this

Do you have jobs/ tasks that are difficult to do safely?

Do you have some health and safety procedures which are difficult to follow?

Do you ever cut corners to get the job done?

Are management/ supervisors ever aware that corners are being cut and procedures are not being followed but do nothing about it?

What could be improved?

## **3 Engagement & Involvement**

What arrangements are there within \* to involve you in health and safety matters (e.g. Citizens forum/ health and safety meetings etc.)

Are you involved in risk assessments, method statements/ developing safe systems of work?

If you had a suggestion on how health and safety could be improved, how would you raise this?

How would you characterise worker involvement in this company (i.e. telling vs. selling vs. consulting vs. participating)

How would you rate your involvement in health and safety matters (high – medium – low?)

What could be improved?

#### **4 Two-Way Communications**

#### Safety Information Communication

What information do you get about health and safety (e.g. hazards and risk controls/ changes to law or company policy/ incidents and near misses/ outcomes of safety audits and inspections?)

How do you get information about health and safety (i.e. notice boards/ Intranet or IT systems/ newsletters/ training/ toolbox talks/ method statement briefings/ site inductions?)

What is the most effective way for you to receive safety information?

What is the least effective way for you to receive safety information?

Do you get the information about health and safety that you need to do your job safely?

What arrangements are there for reporting safety concerns?

What could be improved?

#### Approachability and responsiveness of management

If you were concerned about a safety issue could you raise it with your manager(s?)

How responsive would they be?

### **5 Organisational Learning**

#### Incident and Near Miss Investigation

How are accidents investigated – is there a formal accident investigation procedure

Who gets involved in accident investigation?

Are you informed of the outcomes?



Are remedial actions usually taken after an accident – and do you generally think they are appropriate, or inadequate, or over the top

Does the company learn from incidents that happen elsewhere in the construction industry?

Does the company investigate and publicise near misses and put in place preventative measures – any examples

Pro-active measures of health and safety

Does \* learn from the findings of safety inspections/ audits/ climate surveys (examples?)

What could be improved?

## 6 Attitude to Blame

Raising Safety concerns

Are you able to raise safety concerns or report near misses freely and without fear of being blamed?

Allocating blame in accident investigations

Do you think accident investigation in this company treats people fairly (i.e. just culture vs. blame culture/ disciplinary action & sacking)

Do you think accident investigation is good at identifying underlying causes and contributory factors e.g. lack of training or pressure to get the job done



# Appendix 3: Consent Form

## Consent Form

**Study Title:** Promoting Safety Performance

**Interviewer:** Ceri Jones - Postgraduate research at the Institute of Work Health and Organisations (IWHO) at the University of Nottingham

### Overview

I'm a Postgraduate research at the Institute of Work Health and Organisations (IWHO). The research area I work in is health and safety. We have been asked by \* to look at the organisations current safety performance and understand how we can improve it. One of the ways we are doing this is to speak to number of employees in BNL, to try and understand how and why accidents occur in order to be able to prevent them in the future.

Everything discussed as part of this interview will NOT be feed back to BNL management and will only be used as part of the wider research study and collated with information from interviews with other employees throughout the company. No one will be identifiable as all information given through these interviews will be anonymous. The only exception to this is if something is discussed which may pose a risk of causing serious harm to yourself or others.

Several steps will be taken to protect your anonymity and identity. The typed interviews will NOT contain any mention of your name, and any identifying information from the interview will be removed. The typed interviews will also be kept in a locked filing cabinet at the University of Nottingham, and only those researchers involved in the study (who are sworn to confidentiality) will have access to the interviews. All information will be destroyed after 5 years time in accordance with the data protection act.

### The Right to Withdraw

Taking part is voluntary and you can withdraw at any time, you don't have to take part if you don't want to but by taking part in the interviews you can help the researchers at IWHO develop and understanding of how and why accidents, incidents and near misses occur in order to help prevent employees getting injured and hurt in the future.

## **Questions**

If you have any questions you can ask the interviewer (Ceri Jones) now or at anything during the interview. If you have any further queries once this interview has been conducted then you can contact Ceri Jones at:-

Institute of Work, Health & Organisations,  
University of Nottingham, International House, Jubilee Campus,  
Wollaton Road,  
Nottingham NG8 1BB, UK

Email: [lwxcj@nottingham.ac.uk](mailto:lwxcj@nottingham.ac.uk)

Tel: 079715173

## **Informed Consent**

In order to participate in this research project, you will need to give your informed consent. By signing this informed consent statement you are indicating that you understand the nature of the research project and your role in that research and that you agree to participate in the research. Please consider the following points before signing:

- I understand that I am participating in a research project.
- I understand that my identity will not be linked with my data, and that all information I provide will remain anonymous and kept in accordance with the data protection act.
- I understand that I have been provided with an explanation of the research in which I am participating in and have been given the name and telephone number of an individual to contact if I have questions about the research.
- I understand that participation in research is not required, is voluntary, and that, after any individual research project has begun, I may refuse to participate further.

By signing this form I am stating that I am over 18 years of age, and that I understand the above information and consent to participate in this research.

---

**Signature:** \_\_\_\_\_ **Today's Date:** \_\_\_\_\_

**Print your First Name:** \_\_\_\_\_ **Print your Last Name:** \_\_\_\_\_

# Appendix 4: Template

Priori Themes		Sub Themes			
1	Communication	1.1.	Top Down	1.1.1.	Lack of Opportunities to feedback
		1.2.	Poor Communication to site	1.2.1	Lack of Face to Face
2	Leadership	2.1.	Visibility on site	2.1.1.	Support and Advice
		2.2.	Accountability, Approachability and Responsiveness		
		2.3.	Understanding of site	2.3.1.	Informed of outcomes of accidents and near misses
				2.3.2.	Identification of Root Causes/Organisational Learning
3	Job Demands	3.1.	Poor Planning		
		3.2.	Working hours/Working Week		
		3.3.	Client Demands/Commercial Pressure		
4	Health and Safety Prioritisation	4.1.	Importance of Safety vs. Production		
		4.2.	Corner cut to get the job done		
		4.3.	Health and Safety Procedures	4.3.1.	Correct PPE/Equipment
5	Employee Engagement	5.1.	Consultation in decision making		
		5.2.	Reduced Moral		
		4.3.	Lack of Reward and Recognition		
6	Culture	6.1.	Blame/Fear of Reprisals	6.1.2.	Under reporting
		6.2	Us and Them		
		6.3.	Un-fair treatment		

**Appendix 5: Safety Climate Questionnaire**

# 1. Safety Climate Survey

The University of Nottingham and \* are undertaking a number of initiatives aimed at raising health and safety standards. The company has decided to focus on employee attitudes and perceptions as one of these initiatives. We are conducting a confidential survey, aimed at all levels of employees working here.

To help with this task we would like you to complete the following questionnaire, your confidentiality is assured. We ask only for basic job information in order to help interpret the results. The questionnaire is relatively simple to complete, it should take about 30 minutes. It asks about your attitudes to safety issues, as well as any suggestions you might have to improve things.

Please try and answer all of the questions, being as open and honest as you can. The conclusions will be fed back to you once the survey has been completed and the results have been analysed.

All responses are anonymous and no individual will be identified in any report or feedback to the company.

Many thanks for your help.

If you have any questions you can ask Project Manager Ceri Jones at:-

The Institute of Work, Health & Organisations,  
University of Nottingham, International House, Jubilee Campus,  
Wollaton Road,  
Nottingham NG8 1BB, UK

e-mail: lwxcj@nottingham.ac.uk

Tel: 07971517306

**\* 1. In order to participate you will need to give your informed consent. By ticking the boxes you are indicating that you understand the nature of the survey and that you agree to participate in the research. Please tick the following points if you agree to take part.**

- ☐ I understand that all information I provide will remain anonymous and kept in accordance with the Data Protection act (1998)
- ☐ I understand that I have been provided with an explanation of the survey in which I am participating in and have been given the name and telephone number of an individual to contact if I have questions about the research
- ☐ I understand that participation in the survey is voluntary and that I can withdraw at any time

## 2. Demographic Data

### \*1. Sex

- ☐ Male
- ☐ Female

### \*2. How many years have you worked for the company?

Number of Years

### \*3. What area of the business do you work in?

- ☐ Finance
- ☐ Tender/Bids Department
- ☐ Support Services
- ☐ Supply Chain
- ☐ Broadcast
- ☐ Rigging Services
- ☐ Design
- ☐ Transmission
- ☐ Other (please specify)

### \*4. Where are you based?

- ☐ On-site
- ☐ Head Office
- ☐ Newton
- ☐ Other (please specify)

### 5. What is your current role within the business? (Optional)

### \*6. Have you ever had an accident; major, minor or LTA (loss time accident) whilst working for this organisation?

**(An accident can be defined as any event which results in injury, and/or damage and/or loss.)**

- ☐ Yes
- ☐ No

**1. How many accidents have you had whilst working for this organisation?**

How Many Accidents?

**2. When was your last accident in this organisation?**

- ☐ In the last week
- ☐ In the last month
- ☐ In the last 1 to 3 months
- ☐ In the last 3 to 6 months
- ☐ In the last 6 months to a year
- ☐ Over a year ago

**\*3. Have you ever had a near miss whilst working for this organisation?**

**(A near miss can be defined as any event which had the potential to cause injury and/or damage and/or loss but which was avoided by circumstance.)**

- ☐ Yes
- ☐ No



**1. How many near misses have you had whilst working for this organisation?**

How Many Near Misses?

**2. When was your last near miss?**

- ☐ In the last week
- ☐ In the last month
- ☐ In the last 1 to 3 months
- ☐ In the last 3 to 6 months
- ☐ In the last 6 months to a year
- ☐ Over a year ago

**3. Are there any comments or suggestions you would like to add?**

5. Management Commitment

\* 1. Senior Management only acts to improve safety after accidents have occurred

Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Indicate your level of agreement with the statement

\* 2. Corrective action is always taken when Senior Management is told about unsafe practices

Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Indicate your level of agreement with the statement

\* 3. In my workplace Senior Management acts quickly to correct safety problems

Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Indicate your level of agreement with the statement

\* 4. In my workplace Senior Management turn a blind eye to safety issues

Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Indicate your level of agreement with the statement

\* 5. In my workplace my immediate Manager/Supervisor show interest in my safety

Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Indicate your level of agreement with the statement

\* 6. My immediate Managers/Supervisor express concern if safety procedures are not followed

Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Indicate your level of agreement with the statement

7. Are there any comments and suggestion you would like to add?

6. Communication

\* 1. I feel comfortable discussing safety issues with my immediate Manager/Supervisor

Strongly Agree      Agree      Neither Agree nor Disagree      Disagree      Strongly Disagree

Indicate your level of agreement with the statement

☐

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\* 2. The organisation encourages open communication about safety

Strongly Agree      Agree      Neither Agree nor Disagree      Disagree      Strongly Disagree

Indicate your level of agreement with the statement

☐

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\* 3. The organisation openly accepts ideas for improving safety

Strongly Agree      Agree      Neither Agree nor Disagree      Disagree      Strongly Disagree

Indicate your level of agreement with the statement

☐

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\* 4. There is good quality communication here about safety issues which affect me

Strongly Agree      Agree      Neither Agree nor Disagree      Disagree      Strongly Disagree

Indicate your level of agreement with the statement

☐

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\* 5. I receive praise for working safely

Strongly Agree      Agree      Neither Agree nor Disagree      Disagree      Strongly Disagree

Indicate your level of agreement with the statement

☐

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6. Are there any comments and suggestion you would like to add?

7. Priority of Safety

\* 1. Senior Management clearly consider the safety of employees of high priority

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Indicate your level of agreement with the statement

\* 2. Safety rules and procedures are carefully followed in this organisation

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Indicate your level of agreement with the statement

\* 3. Senior Management considers safety to be equally as important as production

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Indicate your level of agreement with the statement

4. Are there any comments and suggestion you would like to add?



## 8. Safety Rules and Procedures

**\* 1. Sometimes it is necessary to depart from safety requirements for productivity's sake**

Strongly Agree

Agree

Neither Agree nor  
Disagree

Disagree

Strongly Disagree

Indicate your level of  
agreement with the  
statement

☐☐☐☐☐

**\* 2. Some health and safety rules and procedures are not really practical**

Strongly Agree

Agree

Neither Agree nor  
Disagree

Disagree

Strongly Disagree

Indicate your level of  
agreement with the  
statement

☐☐☐☐☐

**\* 3. Some safety rules and procedures do not need to be followed to get the job done safely**

Strongly Agree

Agree

Neither Agree nor  
Disagree

Disagree

Strongly Disagree

Indicate your level of  
agreement with the  
statement

☐☐☐☐☐

**4. Are there any comments and suggestion you would like to add?**

9. Supportive Environment

\* 1. We are not encouraged to raise safety concerns

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
Indicate your level of agreement with the statement	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

\* 2. We often give tips to each other on how to work safely

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
Indicate your level of agreement with the statement	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

\* 3. I am strongly encouraged to report unsafe conditions

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
Indicate your level of agreement with the statement	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

\* 4. A no-blame approach is used to persuade those acting unsafely that their behaviour is inappropriate

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
Indicate your level of agreement with the statement	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

\* 5. I can influence health and safety performance in this organisation

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
Indicate your level of agreement with the statement	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

6. Are there any comments and suggestion you would like to add?

10. Involvement

\*1. I am involved in the decisions made about how to carry out my job

Strongly Agree      Agree      Neither Agree nor Disagree      Disagree      Strongly Disagree

Indicate your level of agreement with the statement

☐

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\*2. I am involved with the decisions made about safety issues at work

Strongly Agree      Agree      Neither Agree nor Disagree      Disagree      Strongly Disagree

Indicate your level of agreement with the statement

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3. Are there any comments and suggestion you would like to add?

11. Personal Priorities and Need for Safety

\* 1. Safety is the number one priority in my mind when completing a job

Strongly Agree      Agree      Neither Agree nor Disagree      Disagree      Strongly Disagree

Indicate your level of agreement with the statement

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\* 2. Personally I feel that safety issues are not the most important aspect of my job

Strongly Agree      Agree      Neither Agree nor Disagree      Disagree      Strongly Disagree

Indicate your level of agreement with the statement

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3. I understand the safety rules for my job

Strongly Agree      Agree      Neither Agree nor Disagree      Disagree      Strongly Disagree

Indicate your level of agreement with the statement

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4. Are there any comments and suggestion you would like to add?



12. Work Environment

\*1. Operational targets often conflict with safety measures

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
Indicate your level of agreement with the statement	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

\*2. Sometimes conditions here hinder my ability to work safely

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
Indicate your level of agreement with the statement	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

\*3. Sometimes I am not given enough time to get the job done safely

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
Indicate your level of agreement with the statement	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

\*4. There are always enough people available to get the job done safely

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
Indicate your level of agreement with the statement	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

\*5. This is a safer place to work than other companies I have worked for

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
Indicate your level of agreement with the statement	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

6. Are there any comments and suggestion you would like to add?

## 13. Organisational Support

### \* 1. The organisation values my contribution to its success

Strongly Agree

Agree

Neither Agree nor  
Disagree

Disagree

Strongly Disagree

Indicate your level of  
agreement with the  
statement

☐☐☐☐☐

### \* 2. The organisation fails to appreciate any extra effort from me

Strongly Agree

Agree

Neither Agree nor  
Disagree

Disagree

Strongly Disagree

Indicate your level of  
agreement with the  
statement

☐☐☐☐☐

### \* 3. The organisation would ignore any complaint from me

Strongly Agree

Agree

Neither Agree nor  
Disagree

Disagree

Strongly Disagree

Indicate your level of  
agreement with the  
statement

☐☐☐☐☐

### \* 4. The organisation really cares about my well-being

Strongly Agree

Agree

Neither Agree nor  
Disagree

Disagree

Strongly Disagree

Indicate your level of  
agreement with the  
statement

☐☐☐☐☐

### \* 5. Even if I did the best job possible, the organisation would fail to notice

Strongly Agree

Agree

Neither Agree nor  
Disagree

Disagree

Strongly Disagree

Indicate your level of  
agreement with the  
statement

☐☐☐☐☐

### \* 6. The organisation cares about my general satisfaction at work

Strongly Agree

Agree

Neither Agree nor  
Disagree

Disagree

Strongly Disagree

Indicate your level of  
agreement with the  
statement

☐☐☐☐☐

### \* 7. The organisation shows very little concern for me

Strongly Agree

Agree

Neither Agree nor  
Disagree

Disagree

Strongly Disagree

Indicate your level of  
agreement with the  
statement

☐☐☐☐☐

### \* 8. The organisation takes pride in my accomplishments at work

Strongly Agree

Agree

Neither Agree nor  
Disagree

Disagree

Strongly Disagree

Indicate your level of  
agreement with the  
statement

☐☐☐☐☐

9. Are there any comments and suggestion you would like to add?

# 14. Employee Engagement

## \* 1. I know what is expected of me at work

Strongly Agree      Agree      Neither Agree nor Disagree      Disagree      Strongly Disagree

Indicate your level of agreement with the statement

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## \* 2. While at work, I receive regular recognition or praise for doing a good job

Strongly Agree      Agree      Neither Agree nor Disagree      Disagree      Strongly Disagree

Indicate your level of agreement with the statement

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## \* 3. I have the materials and equipment I need to do my work right

Strongly Agree      Agree      Neither Agree nor Disagree      Disagree      Strongly Disagree

Indicate your level of agreement with the statement

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## \* 4. At work, my opinions count

Strongly Agree      Agree      Neither Agree nor Disagree      Disagree      Strongly Disagree

Indicate your level of agreement with the statement

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## \* 5. My fellow employees are committed to doing quality work

Strongly Agree      Agree      Neither Agree nor Disagree      Disagree      Strongly Disagree

Indicate your level of agreement with the statement

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## \* 6. In the last year, I have had the opportunities at work to learn and grow

Strongly Agree      Agree      Neither Agree nor Disagree      Disagree      Strongly Disagree

Indicate your level of agreement with the statement

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## 7. Are there any comments and suggestion you would like to add?



## 15. Supervisor Support

### \* 1. My immediate Manager/Supervisor understands my job-related problems and needs

Strongly Agree      Agree      Neither Agree nor Disagree      Disagree      Strongly Disagree

Indicate your level of agreement with the statement

☐☐☐☐☐

### \* 2. My immediate Manager/Supervisor recognises my potential

Strongly Agree      Agree      Neither Agree nor Disagree      Disagree      Strongly Disagree

Indicate your level of agreement with the statement

☐☐☐☐☐

### \* 3. My immediate Manager/Supervisor would use his/her power to help me solve work related problems

Strongly Agree      Agree      Neither Agree nor Disagree      Disagree      Strongly Disagree

Indicate your level of agreement with the statement

☐☐☐☐☐

### \* 4. My immediate Manager/Supervisor would "bail me out" at his/her expense

Strongly Agree      Agree      Neither Agree nor Disagree      Disagree      Strongly Disagree

Indicate your level of agreement with the statement

☐☐☐☐☐

### \* 5. I defend and justify my immediate Manager/Supervisor's decisions when he/she is not there to do so

Strongly Agree      Agree      Neither Agree nor Disagree      Disagree      Strongly Disagree

Indicate your level of agreement with the statement

☐☐☐☐☐

### \* 6. I have a good working relationship with my immediate Manager/Supervisor

Strongly Agree      Agree      Neither Agree nor Disagree      Disagree      Strongly Disagree

Indicate your level of agreement with the statement

☐☐☐☐☐

### 7. Are there any comments and suggestion you would like to add?

16. Organisational Commitment

\*1. I do not feel like part of a family in this organisation as a whole

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
Indicate your level of agreement with the statement	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

\*2. I feel a strong sense of belonging to this organisation as a whole

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
Indicate your level of agreement with the statement	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

\*3. This organisation as a whole does not deserve my loyalty

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
Indicate your level of agreement with the statement	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

\*4. I am proud to tell others where I work

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
Indicate your level of agreement with the statement	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

\*5. I would be happy to work here until I retire

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
Indicate your level of agreement with the statement	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

6. Are there any comments and suggestion you would like to add regarding how to improve any of the areas covered in this survey?

## 17. Thank-you!

Thank-you for taking the time to complete the survey, your continued support and input is very much appreciated!

If you have any questions regarding the survey, please contact Ceri Jones at [lwxcj@nottingham.ac.uk](mailto:lwxcj@nottingham.ac.uk) or on 07971517306