THE UNIVERSITY
of LIVERPOOL

The Role of Trust in Offshore Safety:

The Development and Testing of a New Measurement Tool

Thesis submitted in accordance with the requirements of the University of Liverpool
for the degree of Doctor in Philosophy by Stacey Michelle Conchie.

March 2005

Acknowledgements

My sincerest appreciation to all of those, who during the past three years, have helped and supported me in the completion of this research.

In particular, thanks to Ian for agreeing to supervise me and for helping to find funding to carry out the research. Your words of (what I think was) encouragement (?!): *"It's your Ph.D."* is a part of the experience that I'll never forget, mainly because it exposed me to a part of life that I'm not very skilled in – decision making! Also thanks to Chris who unknowingly prepared me for the lows of a Ph.D. Strangely, your advice of "*Get out while you can, you're still young*" spurred me on rather than dissuaded me!

My sincerest appreciation goes to the people I worked with in the offshore industry, in particular Dave Lewis for arranging for me to visit an offshore platform. This was the highlight of my three years and brought a sense of realism to my work that cannot be captured in written words.

A special thanks to Mum for understanding and accepting my many short, or more accurate, non-existent visits, and also my brother, sister, and friends for being patient when I cancelled plans at the last minute. Also thanks to Paul for being there during the tears and for listening to my worries about factor analysis!

Finally, thanks to Alex for the support and encouragement over the years and for your belief that I can succeed. This has kept me going through each stage of my educational career and helped me to get where I am today.

Abstract

The Role of Trust in Offshore Safety: The Development and Testing of a new Measurement Tool

This thesis examines the nature and structure of trust climates offshore and their role in safety performance. To achieve this a mixture of qualitative and quantitative methods were used over two progressive phases. The first phase adopted a qualitative approach where a number of semi-structured interviews with offshore workers ($N = 14$) revealed trust climates comprise distinct attitudes of trust and distrust. The co-existence of these attitudes was perceived as necessary for good safety and both develop from perceptions of another's trustworthiness. This is judged by characteristics related to Integrity and Benevolence, and to a lesser extent Ability. Positive perceptions promote trust, while negative perceptions promote distrust. The structure of trust attitudes offshore and their role in safety was explored in the second phase using a questionnaire developed from the interview findings and a review of the literature. The questionnaire was designed to measure situational trust (e.g., trustworthiness) at an individual and organizational level, both generally and specifically with relation to safety. A measure of generalised trust (i.e., personality or predisposition to trust) was also included. Separate principle components analyses of data collected from an installation ($N = 203$) and industry ($N = 499$) survey indicated three different situation-based structures of trust offshore. An individual's predisposition to trust had a weak, to non-significant influence in the development of trust or distrust attitudes. At an installation level, trust climates structured around two dimensions that related to trust and distrust or three dimensions that related to trust with safety, distrust with safety, and a general trust/distrust attitude. At an industry level, trust climates predominately structured around a single-dimension. This suggested that trust and distrust formed a single construct and that workers hold only one of these attitudes towards another offshore. Both installation and industry structures were shown by confirmatory analysis to provide an adequate representation of trust attitudes held by offshore workers. However, a four-factor model of general trust, general distrust, trust with safety, and distrust with safety, was identified as a better industry level model compared to a uni-dimensional structure. Despite the diversity in sets of trust climate dimensions, all identified the same trust subcultures offshore: 'Operator / Management' and a 'Contractor / Frontline' group. These subgroups were formed from a fusion of organizational and social climate factors. Relative comparisons between the groups revealed higher levels of trust between the former group members compared to the levels of trust between latter groups members. The high level of trust in the Operator/Management group was attributed to their stable high status positions, which results in positive organizational experiences and facilitates the development of long-term relationships. The lowest levels of trust emerged between members of different groups. Analysis looking at the role of trust in safety revealed negative attitudes (i.e., distrust) as relatively stronger predictors of accidents and near-miss events compared to positive attitudes (i.e., trust). In most cases, attitudes towards management were most predictive of safety. In comparisons of trust levels and safety rates between different companies ($N = 4$) an association between high levels of trust in management and low accident rates emerged. The implications of these findings for organizational scholars, safety professionals, and the development of safety initiatives are discussed.

CONTENTS

FIGURES

TABLES

Chapter 1

Introduction

Over the last two decades, a significant amount of research has addressed the psychological and organizational contributions to accidents in high-risk industries. A number of advances have resulted from this research, with safety initiatives developed from these findings proving effective for reducing accident rates. However, safety professionals are now faced with the problem of how to advance understanding further to continue the steady reduction in accidents. One factor that has been implicated in recent safety writings (e.g., Reason, 1997; Clarke, 1999), and in safety seminars and workshops (e.g., *Managers and Safety in High Reliability Organizations*, 2002; *Workshop on Organizational Safety*, 2003), is interpersonal and organizational trust. At present, however, little systematic or empirical work has been carried out to understand trust within high-risk industries or in safety. Adopting the argument made by Gambetta (1988) and applying it to safety scientists,

> 'the importance of trust is often acknowledged but seldom examined, and scholars tend to mention it in passing, to allude to it as a fundamental ingredient or lubricant, an unavoidable dimension of social interaction, only to move on to deal with less intractable matters.' (Foreword, p.1).

This thesis aims to address this current empirical void by providing a detailed insight into the nature and structure of trust within industry and its role in safety.

1.1 Trust: A Missing Piece in the Safety Puzzle

The progression of safety research has witnessed a move away from a reactive approach to safety and towards a proactive approach where attempts are made to rectify 'deficits' that lead to an accident before they occur. A central focus of these latter approaches is an organization's safety culture. Safety cultures are defined as the shared perceptions, beliefs and attitudes that organizational members share towards safety, which when negative are associated with accidents or disasters (Hidden, 1989; Cullen, 1990). Developing good or positive safety cultures has therefore been a major aim of safety professionals. An emerging central feature of these cultures is interpersonal and organizational trust, which have been identified to influence many of its subcomponents such as shared perceptions (Clarke, 1999), safety attitudes (Mearns, Flin, Gordon, & Fleming, 1997), incident reporting (Reason, 1997), and safety leadership (O'Dea & Flin, 2001; Carroll, 2002). Trust is also implicated in the success of safety initiatives that are aimed towards modifying individual attitudes and behaviour (e.g., Donald & Young, 1996; Fleming & Lardner, 2001).

The emphasis that safety professionals place on the importance of trust stems from its presentation as a lubricant for a wide array of organizational processes (Bijlsma & Koopman, 2003). Trust is typically found to enhance cooperation (Morgan & Hunt, 1994; Parks & Hulbert, 1995; Parks, Henager, & Scamahorn, 1996), promote the acceptance of decisions (Tyler, 2003), increase organizational citizenship behaviour (McAllister, 1995; De Gilder, 2003), and reduce risk from opportunistic behaviour and conflict (Ratnasingham, 1999). Additionally, it acts as a heuristic that serves to reduce demands on cognitive processing (McEvily, Perrone, & Zaheer, 2003), and facilitates the development of improved communication through openness and knowledge sharing between organizational members (Bonacich & Schneider, 1992; Dirks & Ferrin, 2001). This type of communication is typical of good safety cultures and is necessary for learning to take place at both an organizational (McEvily, Perrone, & Zaheer, 2003) and an individual level (Boisot, 1995; Bijlsma, Prins, & Weber, 1999). However, while trust is identified as important in safety and in organizational settings more generally, the conditions necessary for its development in high-risk contexts and in safety remains to be established. Associated with this, the relative salience of these conditions when considered together remains to be shown. These issues will be addressed in this thesis.

A concern that is overlooked in the safety literature and in organizational writings more generally is the limitations associated with too much trust. An organization that relies excessively on trust as an organizing principle exposes itself to the problem of groupthink (Janis, 1972), and may experience strategic blindness, overconfidence, or the inability to innovate (McEvily, Perrone, & Zaheer, 2003). Further, in cases where high levels of trust are manifested in a strong emotional connection with another (i.e., affect-based trust; McAllister, 1995), cognitive distortions of the other's behaviour is likely to occur in order to maintain cognitive harmony (Tyler & Degoey, 1996). In some organizational settings the consequences of this are serious. For instance, in financial institutions fraud is more likely to go unnoticed (Granovetter, 1985; Shapiro, 1987) and in high-risk contexts safety might be jeopardized. As suggested by Pidgeon, Walls, Weyman and Horlick-Jones (2003), an element of 'critical trust', which refers to a practical form of reliance on another person or institution combined with healthy scepticism, is essential for effective risk regulation. This is similar to the suggestion of others (e.g., Shapiro, 1987; Kern, 1998) that an element of distrust is important within organizational settings.

The recognition that trust has disadvantages and distrust has potential benefits has led some researchers to conclude that a healthy balance of trust *and* distrust should be developed in dyadic relationships (Lewicki, McAllister, & Bies, 1998) and within social networks (e.g., Gans, Jarke, Kethers, & Lakemeyer, 2001). Implicit in these suggestions is the assumption that trust and distrust exist as distinct entities with different functions and antecedents. Within trust writings, the validity of this assumption is debated between two broad camps. Continuum based approaches present trust and distrust as bipolar opposites on a single dimension where low levels of trust are taken as indicative of distrust. Recent two-factor type theories, however, suggest that these attitudes operate as distinct constructs that co-exist within the same relationship. In this case, a low level of trust does not imply distrust. Important for safety is to understand the nature of this trust-distrust dynamic, as interventions are likely to be developed in accordance with the relationship between these two attitudes. For instance, while a continuum-based approach would suggest a single strategy would be effective in addressing both trust and distrust, a two-factor based approach might argue that a different strategy for each is important.

1.2 Objectives

The main objectives of the thesis are to; i) Establish the nature and structure of trust/distrust within industry; ii) Establish the role of trust in safety, and; iii) Identify the nature of a trust-distrust dynamic. To increase the reliability and representativeness of the results obtained, a combination of qualitative and quantitative methods will be used. As well as providing a systematic basis to the research, this also offers an element of triangulation (i.e., approaching the same topic with different methodologies), which will serve to increase confidence in the overall conclusions reached.

1.3 The Offshore Oil and Gas Exploration Industry

The offshore oil and gas exploration industry is used to explore the nature and role of trust in safety. The importance of trust in this industry was first identified in the early 1990's in the public inquiry into the Piper Alpha disaster in the UK (Cullen, 1990). Specifically, Cullen (1990) emphasised the need to develop trust between offshore stakeholders in order to establish an effective safety culture that would reduce accident rates. An effective safety culture develops from monitoring and auditing performance to ensure that safety programmes are being followed, which Cullen (1990) argued would be facilitated by trust. Additionally, he argued that a systematic approach to monitoring safety is imperative, but more important is that this system is reviewed and updated regularly in accordance with the experience of both the operator and of the industry. For this to occur, however, workers have to be willing to report safety experiences, something that Reason (1997) argued will only occur in climates of trust. Therefore, integral to effective safety monitoring and safety management offshore is trust.

The decision to study trust in this industry was driven both practically and academically. At a practical level, the offshore industry has witnessed considerable changes over the last decade. The fluctuations in oil prices and falling production levels in older oil and gas fields have resulted in a series of cost-reduction measure such as widespread restructuring, downsizing, and multi-tasking. Changes of this nature to organizational structures are prime causes for reductions of trust in management (Shaw, 1997). As research indicates, restructuring and its associated consequences of changes to psychological contracts and worker's perceptions of inappropriately high executive salaries are major reasons for a reduction in trust towards management and the organization (Shapiro, Sheppard, & Cheraskin, 1992;

Tyler & Kramer, 1996; McCune, 1998; Davis & Landa, 1999; Albercht & Travaglione, 2003; Zeffane & Connell, 2003). However, while the effects of these changes on offshore stress levels, job satisfaction and safety have been explored (see Parkes, 2002), their impact on trust is yet to be understood.

Also offshore are a number of practical measures taken to reduce accident rates that focus largely on the use of modification and empowerment programmes. In both of these initiatives trust is heavily implicated. In a review of four major offshore safety programmes, Fleming and Lardner (2001) reported most to be ineffective for improving safety performance and to be met with worker apathy. One of the main reasons identified for this was an absence of trust within workers and between workers and management. To address this problem, Fleming and Lardner (2001) argued that empowerment programmes should be used prior to the implementation of behaviour modifications. In doing this, responsibility and freedom are devolved to the workforce, which serves to increase trust between workers and management. The main limitation with this recommendation, however, is that empowerment programmes are also heavily dependent on trust (Kanter & Stein, 1979; Bennis, 1989; Manz & Simms, 1993). As suggested by Sutherland (2003, personal correspondence), the current failing of offshore empowerment programmes relates to the absence of a trust-building component within their structural framework. An understanding of trust and its subsequent introduction into empowerment programmes may therefore facilitate the success of behaviour modification programmes and ultimately improve safety.

As well as having practical benefits, focusing on this industry also contributes to the emerging body of academic understanding on the role of trust in offshore safety. Ongoing research by Cox and Collinson, for example, is aimed towards understanding the key conditions, process, and consequences of 'high' and 'low' trust relations in the offshore industry. As they anticipate, low trust relations will be associated with underreporting or the reinterpretation of unsafe behaviour. Of particular interest to them is how 'blame' can affect trust levels offshore. Adopting a different focus, Burns and Mearns conceptualise trust as an implicit attitude and seek to identify the ways that it differs from explicit trust attitudes in regards to safety. The main objective of their research is to develop a measure of safety culture that incorporates these two dimensions of trust.

Cox and Collinson, and Burns and Mearns approach the study of trust from a safety perspective. However, the research to be carried out here will adopt a trust perspective. That is, a greater emphasis will be placed on the development and dimensionality of offshore trust climates and how these impact on safety performance, rather than how a unified concept of 'trust' influences safety related factors. While both approaches show the potential role of trust in safety, they reach it in different ways and with different emphases.

1.3.1 Theoretical grounding of the thesis

The theoretical grounding of the thesis will be presented in Chapters 2 and 3. Chapter 2 will provide an overview of past and present safety research, which due to the detailed insight it provides into casual factors, will be discussed for industry generally. Using an aggregate overview of safety research to understand offshore safety is considered appropriate as general findings replicate in most specific industries. For example, the finding that negative attitudes are associated with accidents applies equally to the offshore industry as it does to the nuclear industry or the construction industry. Therefore, while slight nuances might exist between industries, generally the conclusions drawn from safety research are the same irrespective of the specific context studied. Proceeding from an overview of safety research, Chapter 3 will pay attention to the proposed role of trust in safety and its composition within organizational settings. An understanding of the complexity and multiple dimensions of trust that this will provide will enrich safety writings, as this insight is currently absent. Chapter 3 will also develop a number of hypotheses to be tested in subsequent Chapters.

1.3.2 Conditions important for trust offshore

One of the main questions to be answered in this thesis relates to the conditions that are necessary for the development of trust offshore (i.e., its nature). The answer to this will begin in Chapter 4 where an overview of the findings from a number of interviews with offshore workers will be reported. The Chapter will move from a general discussion of the importance of trust offshore and in safety, to a more specific discussion of the factors that workers perceive as important in the development of trust. The factors that promote distrust will also be explored. As well as providing a contextually rich understanding of trust and distrust in the offshore industry, the information reported in Chapter 4 will also form the basis of a new questionnaire.

Based on the interview data, Chapter 5 will develop a new measurement tool that will be specific to trust in the offshore industry and will be called the Trust Climate and Safety Questionnaire (TCSQ). Similar to most safety tools, the questionnaire will be designed to measure trust *climates,* rather than trust cultures. Climate tools measure aggregate attitudes of a workforce at a specific time and compared to measures of culture, which tends to manifest in several different co-existent forms offshore (Mearns et al., 1997), produce more reliable results. They also have the advantage of providing an insight into the less tangible concept of (trust) culture that operates at an abstract global level (UK Health and Safety Executive, 1999). The TCSQ will be designed to measure trust and distrust towards various groups offshore, both generally and specifically with relation to safety. A facet approach will be used to develop questionnaire items. As will be demonstrated in Chapter 5, this allows a standard approach to be taken to the development of a tool, where the identification and linking together of the main dimensions of a phenomenon (e.g., trust climates) produces a reliable and representative measure.

1.3.3 The role of trust in safety at an installation and industry level

The newly developed TCSQ will be used in a preliminary survey of trust climates on an offshore installation. The data gathered from this survey will serve three important functions. First, they will provide an insight into the structure of trust climates offshore, second they will provide the first understanding of the role of trust in safety, and third they will provide a test of the TCSQ's psychometric properties, specifically its validity and reliability (Chapters 7, 8 and 9, respectively). In Chapter 7, the structure of offshore trust climates will be explored through the use of exploratory factor analysis (EFA). This will identify the salient psychological dimensions that shape trust and distrust attitudes offshore. Using statistical variance as an indication of the relative importance of these dimensions, the strongest determinant of these structures will be identified. This meets the first objective of identifying the salient dimensions of offshore trust climates, and has the advantage of allowing tailored safety initiatives to be developed that target certain characteristics of trust, or a certain group.

In Chapter 8, the dimensions of trust climate extracted from the initial (installation) data will be used to test for 'trust subcultures' offshore (Pidgeon, 1991). These will be indicated by differences in trust profiles (i.e., scores on each of the trust climate dimensions) between individuals or groups. Based on the work of Mearns et al. (1997) and Collinson (1999), it is expected that trust subcultures will emerge that group workers according to employing company and related to this, job role. As well as testing for subcultures, Chapter 8 will also examine which dimensions of trust climates are most predictive of accidents, incidents and near miss involvement. While trust is recognized as important for safety, the type and level of trust with the greatest impact still remains to be established. This will be addressed in this thesis and will provide an insight into the second objective of the present research that relates to role of trust in safety.

In Chapter 9, the psychometric properties of the questionnaire will be reviewed and modifications will be made to sections of the TCSQ that are revealed to have poor properties. If the results of surveys using this tool are to be taken as credible, it is important that the TCSQ is shown to be reliable and valid. Chapter 9 will therefore report the results of tests that identify items for exclusion from the tool, and it will discuss the addition of items to improve the reliability of the measure of specific dimensions of trust.

The modified questionnaire will be used to survey trust climates at an industry level. Similar to the presentation of results for the initial (installation study), Chapter 10 will outline the underlying structure of trust through the use of EFA, and Chapter 11 will test for subcultures and the psychological dimensions that are most predictive of safety. The advantage of maintaining consistency in analysis between the installation and industry survey is that it allows for reliable comparisons. In

Chapter 10 the trust climate dimensions extracted for industry will be compared to those extracted from the installation study (Chapter 7). This comparison will enable the relative influence that contextual and individual factors have in shaping trust climates offshore to be established. For instance, the failure of previous research to replicate safety climate structures between surveys has been attributed to differences in contextual factors. This therefore suggests that context has a main role in shaping attitudes towards safety. In contrast, structures of trust are generally found to replicate reliably across different contexts and with different populations (e.g., Mayer & Davis, 1999). As these structures are based on evaluations of another person's characteristics, it might be argued that individual rather than contextual factors have a stronger influence in the development of trust attitudes. Based on these literatures, it might be concluded that a replication in trust climate structures would indicate a strong individual influence on trust and distrust attitudes (consistent with trust research), whereas a failure to replicate would implicate a stronger contextual influence (consistent with safety research).

1.3.4 Dimensionality of trust climates offshore

The final objective of the thesis is to establish the dimensionality of trust climates offshore using a confirmatory approach. The results of the analyses to be carried out in Chapter 12 will contribute to the thesis in two ways. First, they will offer a test of the relationship between trust and distrust (i.e., a trust-distrust dynamic). This will supplement the findings from the qualitative study in Chapter 4 and the exploratory factor analyses in Chapters 7 and 10. The results of all of these analyses will indicate if trust and distrust manifest empirically as a single dimension or two distinct entities. Agreement between qualitative and quantitative findings will increase confidence in the conclusions made and will provide a strong basis for the development of safety initiatives that implicate trust as important. Second, the confirmatory analysis will lead to the development of the first model of trust attitudes for the offshore industry. This model will provide a representative and reliable foundation for further work into the role of trust in safety, which because of its systematic development will allow researchers to initially adopt a confirmatory approach.

In sum, this thesis will approach the topic of trust and its relationship to safety in a systematic and structured way. It will first seek to understand offshore worker's perceptions of trust and distrust through individual interviews and use this information to develop a measure of trust climates, which will be used with a larger and more representative sample. While the qualitative aspect of the study will focus almost exclusively on understanding trust and distrust, the quantitative aspect will incorporate safety into this focus by taking a measure of safety performance. In this way it will be possible to explore the role that trust climates play in accidents, incidents and near miss involvement offshore.

Chapter 2

Safety Research: Past and Present

This Chapter gives an overview of research that examines safety within high-risk industrial organizations. It outlines the human and financial costs of accidents and then discusses the main causal factors that have been proposed to account for these events. These proposals will show a shift in attention from lagging indicators of accidents that relate to human error and system faults, and towards the leading indicators of organizational and individual (psychological) factors.

2.1 Costs of Accidents

The severity of accidents and other safety related events are judged by human and financial costs. Human costs to workers and the general public are classified under fatal and non-fatal injuries, and relate to the effect of an accident in terms of deaths and in terms of quality of life, respectively. Financial costs are calculated from direct losses, such as the cost of immediate medical treatment and property damage, and indirect losses that relate to production or insurance premiums. Although human and financial costs are generally reported in official statistics as independent outcomes of an accident, in reality they co-occur. For instance, an accident that results in physical injury will also result in lost production and profit due to the number of days the victim spends off work. As the UK Health and Safety Executive (HSE, 1991) note, improvements in an organization's safety management system will result in a reduced cost to human life *and* an increased rate of production. It is through an inspection of the statistics related to each of these –

human and financial costs – that the importance of managing and improving safety is most apparent.

2.1.1 Human costs

Official statistics on the number of fatal and non-fatal injuries for the UK are produced by the HSE using figures from the Labour Force Survey (LFS) and local authorities that record under '*Reporting of Injuries, Diseases and Dangerous Occurrences Regulations*' (RIDDOR). The annual production of statistics allows comparisons to be made and areas of improvement to be identified. For safety professionals, this provides an indication of the relative effectiveness of safety strategies used in different industries, and provides a reasonably reliable way to assess the success of a safety initiative.

Provisional estimates reported under RIDDOR for 2002/2003 indicates the number of fatal injuries to workers was at 226 per 100,000. This marks a 10% reduction on the previous year estimates of 251 and is the lowest figure ever recorded, representing about a third of those reported in 1980. Around 1980, safety professionals started to shift their attention away from 'lagging' indicators of accidents that were identified after an event, and towards leading causes of accidents that allowed a proactive approach towards safety to be taken. From the statistics reported by the UK HSE it might be argued that this shift marked an important step forward in effective safety management. Compared to other UK European member countries, the UK is also indicated to have one of the best safety standards. Figures produced by Eurostat for the year 2000 revealed the UK to have the second lowest rate of workplace fatal injuries at 1.7, compared to the average of 2.8 for other member countries.

In contrast to fatal injuries, the number of non-fatal injuries to workers for 2002/2003 increased from the previous year by 1.5% to 28,426 from 28,011, per 100, 000, and the rate increased by 1.9% from 110.9 to 113.0. Less severe non-fatal incidents recorded as over 3-day injuries showed the opposite trend, and decreased in 2002/2003 by 2.8% to 126,004 compared to 129,655 for the previous year. This continues the steady decline since 1997/1998 and is the lowest for the period 1992/1993 – 2002/2003. However, the problem of under-reporting with self-report data suggests that this figure might under-represent the *actual* occurrence of injuries. For instance, the Labour Force Survey estimated the rate of non-fatal injuries to employees for 2001/2002 to be at 1,510. However, the reported rate was only 624. Further, it has been revealed that employees only report 44% of the non-fatal injuries that they should report under RIDDOR, which in 2002/2003 was slightly lower than in the previous two years (Labour Force Survey).

The official statistics of fatal and non-fatal injuries for the period 2002/2003 suggest that particular attention should be paid to reducing the number of major non-fatal injuries to workers. Compared to fatal injuries, these occur with greater frequency and increase annually. They are a salient problem in organizations and one that safety professionals have focused on in an attempt to understand their causal factors.

2.1.2 Financial costs

In the recent *'Revitalising Health and Safety'* Report, the HSE (2001) estimated the financial costs of work related injury and ill health, together with the associated loss of working days, to cost the British employer £3.3 to £6.4 billion per year. Of this, £910 to £3,710 million comes from accident damage to property and equipment alone (1995/1996 prices). Looking specifically at any one accident, the financial costs can range between hundreds to millions of pounds. At the lower end of the scale will be losses related to medical costs for minor injuries such as a cut finger, losses associated with the prosecution of a managing director, and redundancy of employees to keep a company afloat (HSE, 2001). At the other end of the spectrum are incidents such as the Piper Alpha disaster that cost the UK economy £2 billion, resulted in a loss to stock market shares, and claimed the lives of 167 workers. In less than sixty minutes, this major disaster costs the economy a third of its additional investment into the NHS for the year 2003-2004 (£5.9 billion; Department of Health Annual report, 2004). The importance of controlling for these events is well recognised.

As an indication of the financial benefits that can be achieved by reducing accidents, the HSE's Report (2001) cites the case of one company that saved £6,000 per year in sick pay, added £100,000 to revenues from raised productivity and created an efficiency benefit of £60,000 from reducing the number of repetitive strain injuries. Considering the costs of accidents, safety professionals have sought to understand the ways that the occurrence of these events may be reduced. This thesis contributes to this understanding by exploring the role of trust in safety. This will be one of the first attempts to understand how trust, which is emphasised as important within safety arenas, operates at an empirical level within industry and in safety.

2.2 Explanations of Accident Causation

The approach taken to reduce accidents has changed considerably over the past few decades. While early research focused exclusively on personality factors and human unsafe acts, contemporary work places greater emphasis on organizational and social-psychological factors. In the following sections, the research related to each of these factors will be briefly outlined.

2.2.1 Accident proneness

The first main theory of accident causation was provided by the Industrial Fatigue Research Board (IFRB) and suggested that unsafe acts were due 'accident proneness' (Greenwood & Woods, 1919). Based on the assumption that all workers were exposed to the same degree of risk, it was argued that some personality characteristic or dispositional trait existed that made some individuals more prone to accidents than others. It was therefore believed that the way to improve safety was to identity and remove individuals that displayed these characteristics. As an approach, accident proneness offered an attractive way for researchers to explain variations in accident rates and offered a promising means for accident prevention. The presentation of an individual rather than environmental factors as ultimately responsible for accidents promoted the illusion that high levels of safety were more attainable as individuals are more accessible and less costly to manage than the environment (Hollnagel, 1993).

Within academic circles, it soon emerged that the accident proneness approach lacked theoretical and statistical validity (Johnson, 1946; Haight, 2000). At a theoretical level, problems were identified with the lack of consistency in the application of the term accident proneness as the characteristics required for membership into an accident proneness 'club' constantly changed (Reason, 1991). However, the result of clarifying this inconsistency was a weakening of any supportive evidence for the approach, thus making the term accident proneness a hypothesis still to be tested (McKenna, 1983). Consequently, 'accident proneness' as a distinct personality trait to characteristics such as risk taking and extraversion is yet to be established. Objections have also been raised over the exclusion of 'chance' explanations of accidents (Mintz & Blum, 1949). According to these objections, apparent accident proneness may be explained by the random distribution of accidents due to probability, not an individual's predisposition. Further, at a statistical level, attempts to find a reliable measure that showed a correlation between accident proneness and accident rates were unsuccessful (Farmer & Chambers, 1926, 1929). The suggestion that accidents were due to an individual's personality or susceptibility was therefore an inadequate explanation to be replaced.

2.2.2 Domino theories

Maintaining an exclusive focus on the individual, Heinrich (1931) suggested that accidents were a consequence of a series of events or conditions that he labelled; *hereditary/social events, faults of the person,* and *unsafe acts and/or conditions*. Conceptualised as a line of dominos, Heinrich (1931) suggested that the occurrence of any of these events or conditions (i.e., the falling of a domino) automatically caused the next event to occur (or fall), which ultimately resulted in an *accident* or *personal injury* – the final two dominos in the sequence. While injuries can be avoided by removing any of the first four dominos (i.e., hereditary/social events, faults of the person, unsafe acts/conditions, and accidents), the prevention of accidents was only possible with the removal of unsafe acts and/or unsafe conditions. Focusing on this domino, Heinrich (1931) placed a great emphasis on unsafe acts rather than unsafe conditions, as these were believed to be responsible for 80% of accidents (i.e., 80:20 rule; Cooper, 1998).

Expanding on Heinrich's (1931) original domino theory, Weaver (1971) and Bird and Loftus (1976; both cited in Cooper, 1998) argued that attention should also be paid to poor supervision and management. In the 'Loss Causation' accident sequence model, Bird and Loftus (1976) proposed that accidents resulted from poor job factors (e.g., unguarded machinery) or poor person factors (e.g., lack of training) that are created by poor management control. For effective accident prevention they suggested that this management 'defect' should to be eliminated, which in turn would reduce the frequency of unsafe acts by workers.

Adams (1976; cited in Cooper, 1998) sought to modify rather than expand on Heinrich's (1931) theory. In his model of accident causation, Heinrich's (1931) first three dominos (hereditary/social events, faults of the person, and unsafe acts/conditions) were replaced with; *management structure, operational errors,* and *tactical errors*, and accidents were argued to be a consequence of organizational errors at any of these stages. The emphasis that Adams (1976) placed on organizational factors made his domino theory the first to move away from the problematic accident proneness approach, as the role of unsafe acts were assigned a more peripheral position in accident causation. As well as deflecting attention away from the individual, Adams (1976) was the first to explicitly indicate the multiple interactions between organizational structures, systems and subsystems, and unsafe conditions and/or safety performance (Cooper, 1998). A similar multiple causation approach was provided by Reason (1991) some years later.

2.2.3 Human error

Focusing on the role of 'human error' in accidents, Reason (1986, 1991) was able to provide insights into some of the complexities that domino theories lacked.

Consistent with these theories (cf. Adams, 1976), he placed the individual central to the causation process by arguing that accidents were due to unsafe acts that were preceded by cognitive errors. Drawing on the work of Ramussen and Jensen (1974), unsafe acts were associated with skill, rule and knowledge based errors that manifested either psychologically or behaviourally. At a skill level, human error was argued to take the psychological form of slips and lapses that resulted in accidents that were unintended by the individual. In contrast, rule and knowledge based errors manifest as mistakes and violations and are committed by the individual with the realisation that they have the potential to result in an accident.

Of the different types of human error, Reason (1991) argued that acts of violation are of particular interest in safety, since they represent behaviour that an individual voluntarily decides to engage in. A similar argument was made during the 1980's by Canter and his colleagues, where the importance of voluntary acts in unsafe behaviour was emphasised (Olearnik & Canter, 1989). Therefore, establishing and targeting the factors that impact on the decision to engage in an act of violation would allow for the development of effective interventions that reduce accidents. Although some researchers recognised the potential importance of this type of information (e.g., Donald & Canter, 1993), Reason (1991) expanded his work in a different direction by seeking to understand how unsafe acts manifest and operate at different levels of a social system such as an organization. It was here that Reason (1991) discussed the importance of *latent failures*.

Influenced by the work of Turner (1976), and similar to domino theories, Reason (1991) argued that accidents resulted from the interaction of a number of deficiencies within the causation process. To demonstrate this he used the analogy of pathogens in the human body to explain how within any organizational system there exists a number of factors that when combined with local triggers (e.g., unsafe acts) result in an accident. These organizational factors were labelled 'latent failures', and were argued to result from the errors made by top-decision makers and management. While these have the potential to weaken an organizations defence system, in isolation they are insufficient to cause an accident because they are largely corrected and controlled for in the system. It is only when these are coupled with *'active errors'* – unsafe acts performed by frontline operators – do accidents result. To understand the interplay between latent failures and active errors, Reason (1991) argued that an organization's defence system must be taken into account. The quality and complexity of this system plays a part role in determining whether an unsafe act results in an accident and is a main feature of Reason's (1998) Swiss cheese model.

Elaborating on the interaction between latent failures, active errors, and defence systems is Reason's (1998) Swiss cheese model of organizational accidents. Accidents (or disasters) at this level occur to complex systems or subsystems, which have multiple and diverse layers of defence. While the general causation process is the same as for individual accidents (e.g., latent failure plus active error equals an accident), in the case of organizational accidents this process is complicated by the numerous layers of defence. Similar to slices of Swiss cheese, Reason (1998) argued that each layer of defence has holes (or gaps) that are created by active errors and latent failures. For an accident to occur, an unsafe act must penetrate each layer of defence that can only be achieved when the holes in each slice come into alignment. However, as the holes are in constant flux and open and close in accordance with local circumstances, this condition rarely exists and so organizational accidents are rare events. This is in contrast to the more frequent occurrence of individual accidents that require the coupling of one layer of poor defence and direct exposure to risk. Therefore, the number of defence layers and their manifestation in term of complexity and opaqueness part determines the likelihood of accidents.

Implicit in Reason's (1991) work is the suggestion that management are ultimately responsible for accidents. Although Reason places the individual unsafe act as the immediate precursor of accidents, he argues that it is because of latent failures that unsafe behaviour results in these events. As he explicitly argued in his later work (Reason, 1998), management's failure to deal proactively with known deficiencies in defence systems was the main cause of disasters such as the Piper Alpha and Kings Cross Disaster. Moreover, management violations such as failing to enforce safety rules and regulations or authorizing unnecessary hazards have a widespread influence on promoting unsafe behaviour among workers (see also, Zohar, 2002) and so play a major role in accident causation. Similarly, Waganaar (1992) attributed responsibility for accidents to management by arguing that management and top decision makers have the conscious capacity to consider risks and to make crucial safety-related decisions. In contrast, frontline operators carry out tasks in an automatic and pre-attentive manner and therefore lack the capacity to evaluate the safety consequences of their actions. Targeting management rather than the individual worker is therefore implicated as an effective approach for accident prevention.

2.2.3.1 Summary and limitations of causation approaches

Of the different models of accident causation that focus, in large, on the individual, Reason's work into human error is perhaps the most well known and widely used. Within his various writings similarities can be found with the ideas central to the accident proneness approach and domino theories. For instance, Reason's (1991) early version of the resident pathogen model, which suggests that some systems are more susceptible to accidents than others, is similar to the notion that some individuals are more prone to accidents due to their characteristics. Further, the indication that organizational accidents require the alignment of latent failures in multiple layers of defence (Reason, 1998) is similar to the explicit interpretation of domino theories that accidents require the falling of multiple dominos (cf. Adams, 1976). Reason's original work therefore appears to encapsulate, structure and expand on the central ideas that underpin safety research predominately focused on the individual. This research suggests that central to accident causation and hence prevention is the unsafe act (and cognitive errors) of the individual. By eradicating these or by improving defences, safety can be improved.

However, while early causation models are theoretically attractive, they have a number of limitations. First, domino theories implicitly suggest that accidents can be due to errors at multiple stages of the accident causation process, although the absence of any explicit reference to this has led many researchers to regard domino theories as a linear process. Consequently, accident causation has been attributed to one aspect of the sequence of events (Cox & Cox, 1996), which has prevented a full understanding of the interplay between different causal factors. Second, domino theories and Reason's (1991, 1998) models have limited practical utility as their grounding in information collected after an event means that future accidents cannot be predicted (Cox & Cox, 1996). As research suggests, accident prevention is most effective when a proactive approach is adopted (e.g., Flin, Mearns, O'Connor, & Bryden, 2000), which requires an understanding of safety that extends beyond the individual unsafe act. For instance, public inquiries into major disasters such as Chernobyl (International Atomic Energy Agency, 1986), Clapham Junction (Hidden,

1989) and Piper Alpha (Cullen, 1990), indicate organizational, individual, and social factors as major influences. Focusing exclusively on an unsafe act therefore leaves a large amount of variance unaccounted for in accident causation.

The impact that organizational, individual and social factors have on safety performance is generally encapsulated under the umbrella concept of safety culture. Although this resides at an organizational level, it is only through an investigation of individual and social factors that the effect of culture in safety can be better understood. While an individual focus can cover a range of factors (e.g., personality, stress, etc.) researchers typically highlight the importance of the psychological factor of safety attitudes. Regarding social factors, which relate to the influence that other organizational members might have on an individual's safety performance, research now suggests trust between workers as important (Reason, 1997).

Effectively illustrating how trust might influence safety performance is the Theory of Planned Behavior (TPB; Ajzen, 1985). According to this theory, the immediate precursor of behaviour is intentions, which are influenced by attitudes, subjective norms and perceived behavioural control. While the role of attitudes in safety performance is well established (see shortly), the route by which social influences have their effect is yet to be understood. Based on recent emphases within safety writings, it is suggested that trust might offer this route. For instance, social norm effects depend largely on the extent to which individuals identify with a group (Terry, Hogg, & White, 1999), which research shows is based on the degree of trust towards others (Tyler, 2003). It might therefore be argued that trust towards a group committed to safety will promote the intention to act safely, and consequently reduce unsafe behaviour such as short cuts. Expanding this to management and the organization, it might be argued that trust at these levels will increase the normative effects of safety culture. In 'good' safety cultures this will result in good safety performance. In sum, this novel application of the TPB offers one explanation of how trust functions to influence safety performance through social routes. Compared to 'organizational' explanations, such as psychological contracts, it explains how trust operates at an interpersonal level between a group of workers or within dyads.

In the following sections, the organizational and individual (psychological) factors involved in safety will be discussed. This overview of current safety understandings will provide the bases for a discussion of the role of trust in safety, which will be the focus of the following Chapter and the thesis.

2.3 Organizational Factors: Safety Culture and Climate

Initial research seeking to understand the role of organizational factors in safety focused exclusively on the assessment of an organization's Safety Management System (SMS; Tinmannsvik & Hovden, 2003). SMS is regarded as the management process where informed decisions are taken to meet acceptable safety criteria and by doing so reducing the degree of risk to harm (Cox & Tait, 1991). These are generally measured using safety audits (Griffiths, 1985; Hurst, Young, Donald, Gibson, & Muyselaar, 1996), which give an indication of the quality of an organizations safety policies and procedures and the likelihood that these will prevent accidents. However, while safety audits provide information on what an organization *should* be doing, they fail to accurately reflect what an organization is *actually* doing (Mearns, Whitaker, & Flin, 2003). It is often these informal aspects of a SMS – an organization's safety culture – that are identified as the prime cause of accidents and disasters, rather than deficiencies in formal policies or practices (ACSNI, 1993). Further, measures of safety culture are typically found to act as better or equivalent predictors of safety performance and injury rates compared to objective measures such as safety audits (Hurst et al., 1996) and quantitative risk assessments (Flin, Mearns, Fleming, & Gordon, 1996; Rundmo, 1996). As a consequence of this work, organization safety culture now dominates researchers' attentions.

2.4 Safety Culture

Public inquiries into major disasters all identify an organization's safety culture as the main factor that allows accidents to occur (e.g., IAEA, 1986; Hidden, 1989; Cullen, 1990). Commentators of the Chernobyl disaster, for example, argued that this was evidence of a 'poor safety culture' both at the plant level and also within the former Soviet Union nuclear industry (OECD Nuclear Agency, 1987). The identification of a link between disasters and poor safety cultures has led some to conclude that 'good' safety cultures might exist (Pidgeon, 1998), and that these offer a way to reduce the potential for large-scale disasters and accidents (Cooper, 2000). This was reinforced by attempts in the offshore (May, 1998), nuclear (Rosen, 1997), and shipping (Payer, 1998) industries to produce good, homogenous, safety cultures.

The term 'safety culture' is a sub-component of the parent concept 'organizational culture.' In its broadest sense organizational culture is taken to refer to everything learned or otherwise acquired by a social group or organization that is perceived or passed on to its members (Lee, 1998). Culture is not 'ready-made' but evolves over time based on current and past events (Reason, 1998). Once established, it transcends individual members to become a property of the organization. Some argue that an organization *is* a culture (Turner, 1988; Schein, 1990), which provides a frame of reference for appropriate behaviour and provides a sense of shared identity between workers. However, others argue that more appropriate is to perceive a culture as something an organization *has* (Smircich, 1983), which is used by those in power to coerce and control workers to gain support for managerial ideology (for an extensive review see Guldenmund, 2000). Safety culture represents one of the many derivatives of an organization's broader culture that exists within any industrial organization.

The first definition of safety culture was provided by the International Atomic Energy Agency (IAEA, 1986) in response to the Chernobyl disaster and was described as,

> 'That assembly of characteristics and attitudes in an organization and individual which established that, as an overriding priority, nuclear plant safety issues receive the attention warranted.' (cited in Cooper, 2000, p. 113).

Since its initial appearance in safety circles, a number of alternative definitions of safety culture have been offered by academics (e.g., Turner, Pidgeon, Blockley, & Toft, 1989), public inquires (e.g., Cullen, 1990), and public bodies such as the Confederate of British Industry (CBI, 1991) and the UK Health and Safety Commission (HSC, 1993). Of the different versions, it is generally the one provided by the HSC (1993) that guides current research. Specifically, they define safety culture as,

> 'The product of individual values and attitudes, competencies and patterns of behaviour that determine commitment to, and the style of proficiency of an organisations health and safety programme.' (cited in Cooper, 2000, p. 114).

Implicit in this definition and common to most others is reference to the normative basis of safety culture (Cooper, 2000). For instance, the CBI (1991), define safety culture as the ideas and beliefs that *all members* of the organization *share* about risk, accidents and ill-health, Geller (1994) defines it as '...*everyone* feels responsible for safety and pursues it on a daily basis', and Berends (1996) relates it to, 'The *collective* mental programming towards safety of a group of organizational members' (italics added). The emphasis on 'shared' or collective perceptions in safety culture is consistent with Schein's (1990) developmental approach to organizational culture where shared assumptions were assigned a core position that are developed by a group as they learn to adapt to their environment. However, the main problem with normative definitions is their presentation of culture as an all-encompassing construct that means "all things to all men" (Lee, 1998; p. 219). Consequently, attempts to operationalize it have proven problematic because a set of concrete and key factors important in safety has not been explicitly identified.

The question therefore arises as to whether definitions based on empirical knowledge should replace those based on theoretical inference. Empirical definitions would offer a more succinct understanding of safety culture that would be testable for its reliability and validity, although they would suffer from a rather narrow focus that would be less rich in meaning (Cox & Cox, 1996). It is this perceived 'narrowness' that has prevented more refined definitions of culture from being offered, and which has led researchers to look for alternative ways to assess an organization's safety culture.

One of two approaches is generally taken to overcome the problem that a broad and poorly conceptualised definition of safety culture can have. The first is by inference from research that looks at the characteristics of low accident companies or departments, which is based on the assumption these companies have relatively good safety cultures (Lee, 1998). Basically this approach makes deductions about safety culture based on the quality of the broader organizational culture. The second approach focuses on measuring an organization's safety climate (Cox & Flin, 1998; HSE, 1999), which is typically viewed as the overt manifestation of an organizations safety culture (Reichers & Schneider, 1990; Schein, 1992; Guldenmund, 2000).

2.4.1 Low accident companies approach

Research focusing on the characteristics of low accident companies (Shafai-Shafai, 1971; Cohen, Cohen, & Cleveland, 1975, both cited in Cohen, 1977; Shannon, Walters, Lewchuk, Richardson, Moran, Haines, & Verma, 1996; Shannon, Mayr, & Haines, 1997) has identified a number of factors as important. At a safety level, these relate to management commitment to safety, high-ranking safety officers, daily safety communication, frequent on site visits, prioritisation of safety in meetings, regular and high quality training for existing and new employees, and posters designed to identify hazards. Other factors that reside at a job level include long-term career commitment, involvement in job-related decisions, and defined procedures for job promotion and placement. As found in an early study by Keenan, Kerr and Sheerman (1951), high levels of 'promotion probability' are generally associated with low accident rates because they increase alertness on the job. Collectively, these characteristics are taken as robust indicators of the quality of an organizations safety culture (IAEA, 1991), which when positive are generally associated with low accident rates.

The indication that safety culture is defined by both safety *and* job related factors is consistent with the suggestion that safety does not operate in a vacuum but is affected by a range of organizational factors that impact on an organizations culture and in turn its derivatives (Lee & Harrison, 2000). For instance, in a study looking at safety in the nuclear industry, Lee and Harrison (2000) found accident rates to be affected by a range of organizational domains including management style, work pressure, and job satisfaction. However, one of the major limitations with a low accident company approach is its failure to indicate the mechanism by which organizational factors influence safety performance. As research into safety climate and safety attitudes suggest, these factors are likely to influence behaviour through workers perceptions and attitudes. The more positive these latter two are, the better a workers safety performance can be expected to be. In the following sections, a discussion of these two research focuses (safety climate perceptions and safety attitudes) will be given.

2.5 Safety Climate

Similar to the conceptualisation of organizational climate (e.g., James & Jones, 1974, 1979), safety climate refers to the perceptions held by some group about safety (Brown & Holmes, 1986). These perceptions are typically based on specific events, conditions or experiences (Schneider, 1975), which in most cases are safety specific rather than general or job based (e.g., Neal, Griffin, & Hart, 2000). As perceptions serve to inform behaviour-outcome contingencies and ultimately influence behaviour (Fredrickson, Jensen, & Beaton, 1972), the development of *shared* perceptions has been identified as important in establishing a good safety climate (Cox & Cheyne, 2000; Prussia, Brown, & Willis, 2003). These enable an accurate understanding of the status of safety to be developed, which allows for the implementation of safety initiatives to target areas where heterogeneous perceptions exist. They also prevent the negative impact on worker-management communication, confidence in management, and commitment to safety that an absence of shared safety perceptions can produce (Clarke, 1999).

2.5.1 Climate perceptions

Research focusing on safety perceptions originated with the work of Zohar (1980), who sought to quantitatively address what he described as a 'climate of safety'. Based on the perceptions of workers from 20 Israeli industrial organizations, Zohar (1980) identified eight dimensions of importance for safety. Specifically, these related to the; *importance of safety training, effects of required pace on safety, status of safety committee, status of safety officer, effects of safe conduct on promotion, levels of risk at work place, management attitude towards safety*, and the *effect of safe conduct on social status*. Collapsing these into the two groups of 'Perceived relevance of safety to job' and 'Perceived management commitment to safety', Zohar (1980) argued that these two climate dimensions were most influential in shaping safety performance.

Although Zohar (1980) is credited with being the first to quantitatively identify the dimensions that underlie safety perceptions, his work has the major limitation of failing to correlate safety measure scores with safety. As a result, many of his conclusions are not validated empirically and, more importantly, it is not clear from his work how useful a safety climate measure would be. The predictive validity and reliability of his scales are yet to be established. In seeking to address this shortfall, Brown and Holmes (1986) measured the safety perceptions of 425 American production workers. Their results suggested that a three-factor structure was a more accurate representation of worker's perceptions, compared to the eight factors suggested by Zohar (1980) (see also, Glennon, 1982; Coyle, Sleeman, &

Adams, 1995). These three factors were labelled; *employee perception of how concerned management is with their well being, employee perceptions of how active management is in responding to this concern*, and *employee physical risk perception*. The robustness of this structure was supported by the finding that accident and non-accident groups differed in their climate perceptions on each of the three factors, but not on its overall structure.

While Brown and Holmes (1986) supported their structure with accident and non-accident groups, and in doing so revealed the usefulness of climate measures to safety, their dimensions failed to replicate in different contexts and with different populations. In a study by Dedobeleer and Béland (1991), a two-factor structure was found as a more accurate representation of the perceptions of 384 construction workers. These factors were labelled; *management's commitment to safety* and *workers' involvement in safety*, and have been replicated across different countries and with different occupations (Melià, Tomas, & Oliver, 1992; Oliver, Tomas, & Melià, 1993; cited in Dedobbeleer & Béland, 1998). Compared to Brown and Holmes' (1986) structure, these two factors were argued to represent a superior safety climate structure because of the omission of a risk perception dimension. As Dedobbeleer and Béland (1991) argued, the identification of risk as important in safety climate is a methodological artefact caused by the inclusion of items specific to this in measurement tools. In their later work, Dedobbeleer and Béland (1998) further argued that the association that risk perception has with the involvement and responsibility for safety is likely to stem form its association with perceptions of control. Similar to the conclusions reached in safety culture research (e.g., Lee & Harrison, 2000), this suggests that a general focus on organizational factors would offer a greater understanding of safety.

Support for the suggestion that risk is of minimal importance for understanding safety climate compared to other organizational perceptions comes from a study by Rundmo (1996). Looking at risk perception and risk behaviour in a sample of Norwegian offshore workers he found organizational and physical working conditions to have a stronger impact on risk behaviour compared to the effects caused by risk perception or job stress. He concluded that a more informed understanding of how safety can be improved would be acquired from an examination of the conditions in which workers operate and their degree of satisfaction compared to that acquired through a study of risk perception (see also Glick, 1985). Compared to perceptions of management commitment to safety and job related issues, it therefore appears that those relating to risk are of minimal use for understanding the state of an organization's safety climate and hence safety performance (cf., Neal, Griffin, & Hart, 2000).

2.5.1.1 Summary of safety climate (perception) research

Although numerous studies have sought to identify a single set of climate dimensions for industry, all have had limited success (Flin et al., 2000). A number of factors have been identified to account for these failures, which range from differences in statistical techniques used (Cooper, Phillips, & Duff, 1995; cited in Mearns et al., 1997) to differences in organizational contexts and managerial styles (McDonald & Ryan, 1992; Cheyne, Oliver, Tomás, & Cox, 2002). Alternatively it has been suggested that methodological factors are responsible that relate to the differences in items selected for inclusion in a measurement scale, and the differences in labels ascribed to factors that reflect similar constructs (Glendon & Litherland, 2001). However, despite differences between structures that are proposed to reflect the key dimensions of safety climate, two findings remain constant across studies. First, perceptions towards management are important in shaping safety. Second, and contrary to Neal, Griffin and Hart's (2000) suggestion that safety perceptions are shaped by safety specific events, general organizational events have an impact on perceptions at a safety climate level.

2.6 Safety Attitudes

The suggestion that safety culture reflects the beliefs, perceptions *and* attitudes that individuals share in relation to safety (IAEA, 1986; Pidgeon, 1991), paved the way for research into the role of safety attitudes in accident causation (Cox & Cox, 1991; Donald & Canter, 1991). Drawing on the theory of planned behavior (Ajzen, 1985) to develop one of the first attitudinal accounts of safety, Donald and Canter (1993; Donald, 1995) argued that accidents are under the control of the individual as the behaviour that leads to these events is intentional. Support for this was found in their study of safety attitudes in the Steel industry, where 90% of workers reporting an accident believed that it was preventable (Donald & Canter, 1993). The impact of attitudes in shaping performance in a range of contexts and on a range of issues is well documented (e.g., Fishbein & Ajzen, 1975; Ajzen, 1985; Dawes & Smith, 1985; McCaul, O'Neill, & Glasgow, 1988; Fishbein & Stasson, 1990). As a result, this has led some to argue that behaviour is ultimately under attitudinal control (Ajzen, 1991). Therefore, the way that an individual acts in or towards a situation is dependent on the attitudes they hold that are specific to that situation.

The term attitude is used to refer to an individual's internal state or general disposition and has been defined as "a psychological tendency that is expressed by evaluating a particular entity with some degree of favour or disfavour" (Eagly & Chaiken, 1993, p.1). Attitudes comprise three components that relate to cognition (beliefs and thoughts), affect (feelings and emotion), and behaviour (actions) (Katz & Stotland, 1959; Rosenberg & Hovland, 1960), and are directed towards some object or entity. This can be another individual, context, topic, or some form of action such as blood donation. While all three components are important in shaping the overall attitude, safety researchers originally focused on beliefs as a means to measure safety attitudes. However, more recently a stronger emphasis has been placed on individual feelings towards safety as these can have an equal if not stronger effect on safety performance (Rundmo, 2000).

One of the first studies purporting to identify the shared dimensions of safety attitudes was Cox and Cox (1991). Drawing on the work of Purdham (1984; cited in Cox & Cox, 1991), they identified four objects of importance in safety – hardware (hardware and physical hazards), software, people, and risks. They assessed the attitudes that workers held towards these objects using a sample of European chemical/gas manufacturing plants. From this, Cox and Cox (1991) identified the five orthogonal factors of; *effectiveness of safety arrangements, individual responsibility, scepticism, personal immunity*, and *safeness of the work environment*. Presenting these factors together with three of the four objects, they suggested that attitudes towards Software was indicated by the Effectiveness of safety arrangements, attitudes towards People by Individual responsibility and Scepticism, and attitudes towards Risk by Personal immunity and the Safeness of the work environment.

Although Cox and Cox (1991) aimed to show the shared aspect of employee attitudes towards safety, parts of their model appear to tap different constructs to attitudes. For instance, the attitude dimensions of risk might be better conceived as measuring workers perceptions. The vast body of research into 'risk perception' (e.g., Rundmo, 1992; Flin et al., 1996) supports this conclusion. Further, the factor personal immunity appears to tap locus of control (e.g., *'people who work to procedures will always be safe'*), which is conceived by others as a personality variable (Joe, 1971; Throop & MacDonald, 1971; Lefcourt, 1976), not an attitudinal dimension. At a statistical level, Cox and Cox (1991) may also be criticised for failing to link their 'attitude' measures with accident rates (Mearns et al., 1997). An understanding of which dimensions were most important for discriminating between accident and non-accident groups was therefore not provided.

Through other research that was specifically designed to study the role of attitudes in safety and the differences between accident and non-accident groups the practical utility of attitudes was revealed. The first empirical demonstration of this was provided by Canter and his colleagues in their study of safety in the Steel industry (Olearnik & Canter, 1989; Donald & Canter, 1991; Donald & Canter, 1993). Drawing on previous research (e.g., Zohar, 1980) and findings from interviews with Steel workers, Donald and Canter (1991) developed the Safety Attitude Questionnaire (SAQ) as a quantitative measure of safety attitudes and safety performance. Using this tool to conduct surveys at both plant and department level, Donald and Canter (1991) found that attitudes were more predictive of accident rates compared to expert judgements about the intrinsic hazardousness of the plant and its processes. They found a positive relationship between negative attitudes and accident rates, and identified the main influence in shaping these attitudes as perceived management commitment to safety (Donald & Canter, 1993; see also Nananidou & Donald, 2002). This provided empirical support for early arguments that negative attitudes were the precursor of 'unsafe behaviour', and that the origin of these attitudes was in poor management attitudes and practices (Jonson, 1982; Griffiths, 1985; Allen, 1986; see also Cohen, 1977; Zohar, 1980). This suggested that safety improvement might be most effective when targeting attitudes relating to managements' commitment to safety.

The link between negative attitudes and accidents has been replicated in various industries including nuclear (Lee, 1998; Lee & Harrison 2000), offshore (Mearns et al., 1997), rail (Clarke, 1998), aircraft maintenance (McDonald, Corrigan, Daly, & Cromie, 2000), and construction (Siu, 2001). In some industries, research has also identified the main attitude dimensions on which accident and non-accident groups differ. In the nuclear industry, Lee (1998) revealed accident victims to express negative attitudes towards *safety procedures, risks, permit to work system, job satisfaction, safety rules, participation, training, control* and *design of plant.* In the offshore oil and gas exploration industry, Mearns et al. (1997) revealed accident groups to express negative attitudes towards *speaking up about safety, supervisors' commitment to safety, rules and regulations, personal responsibility for safety* and *safety systems.* Dimensions on which accident and non-accident group did not differ were *offshore installation management commitment to safety, safety regulation* and *overconfidence in own safety.* As well as supporting a relationship between the favourableness of an attitude and the desire to engage in behaviour, the studies by Lee (1998) and Lee and Harrison (2000) also support the suggestion that safety is affected by both job and safety related factors.

The relationship between attitudes and behaviour is generally acknowledged by safety professionals as circular, in that attitudes can influence behaviour just as behaviour can influence attitudes. However, within safety research the dominant direction of 'attitudes to behaviour' is often emphasised (e.g., Lee, 1998; Lee & Harrison, 2000; Nananidou & Donald, 2002). In discussing evidence in support of this, Lee and Harrison (2000) argued that the experience of an accident would be expected to increase safety awareness, not reduce it, and thereby strengthen safety related attitudes. Using their findings from a study of safety in the nuclear industry they revealed that attitudes such as perceived commitment and effectiveness of staff selection, which are unlikely to be adversely affected by an accident post hoc, were negatively correlated with the number of injuries. It was also found, and contrary to the assumption that accidents would have the most serious negative effect on attitudes, that personal stress and general morale both scored positively in the major accident group. They therefore concluded that negative attitudes are the *cause* and not the consequence of accidents.

Research focusing on the psychological factors in safety has indicated accidents to be a product of intentional unsafe behaviour that stems from negative attitudes. Of particular importance in shaping these attitudes is the extent to which management is perceived as committed to safety. As well as safety factors, those relating to job or wider organizational events have also been identified as important. The similarity of these findings with those from studies into climate perceptions has prompted a search among some researchers for a common set of factors that underpin both of these focuses. The most promising of these attempts was made by Flin, Mearns, O'Connor and Bryden (2000) who identified the basic – 'Big Five' – taxonomy of *management (including supervisors), safety system, risk, work pressure,* and *competence.* These factors are of most importance in safety climate and safety attitudes and provide an indication of the quality of an organization's safety culture. They are therefore the factors on which safety research now focuses.

2.7 Summary

In this Chapter, the progression of safety research from the unsafe act of the individual, to the role of organizational and psychological factors were discussed. It paid heavy attention to the role of an organization's safety culture and highlighted how integral to this are the perceptions and attitudes of employees towards both job and safety related factors. While the notion of safety attitudes was originally introduced as an independent psychological explanation of safety to organizational factors (Donald & Canter, 1993), the progression of time has witnessed its fusion with the terms safety climate (Flin et al., 2000), and in some cases, safety culture (e.g., Lee & Harrison, 2000). As a result, the distinction between these three concepts is at times hazy. Also suggested as important in safety is the social influence of trust. Applying the TPB to explain safety performance, it was suggested that trust increases the social norm influence on behaviour when it is present. In the absence of trust, behaviour is likely to be under volitional control and group norms will play a less influential role. In the following Chapter, the importance attached to trust by safety professionals will be outlined followed by a discussion of its composition and dynamics within organizational settings.

Chapter 3

The Role of Trust in Safety

This Chapter outlines the importance of trust in safety and details the composition and dynamics of trust within organizations. This is done over two broad sections. The first section discusses theoretical and empirical work that looks at trust in safety and highlights the importance of studying trust within high-risk contexts. The second section explores trust in detail by discussing its antecedents at an organizational and interpersonal level. Additionally, the composition of distrust and its relationship to trust is explored. Understanding this trust-distrust dynamic is important because of its potential to influence whether future empirical work into the role of trust in safety focuses exclusively on trust or whether it incorporates a distinct measure of distrust. Drawing on existing research, a number of hypotheses are developed throughout the Chapter.

3.1 Defining Trust

Although a considerable amount of attention has been paid to defining trust, a concise and universally acceptable definition remains elusive (Kramer, 1999). Instead, researchers are faced with a "potpourri of definitions applied to a host of units and levels of analysis" (Shapiro, 1987, p. 624). At one end of the spectrum are definitions that emphasize social and ethical facets (e.g., Hosmer, 1995), and at the other end are those that draw on the strategic or calculative form that trust can take (e.g., Burt & Knez, 1996). Although some perceive this lack of conceptual clarity as a limitation (Bluhm, 1987), others regard it as a necessary and potentially valuable asset (Bigley & Pearce, 1998). For instance, applying the same definition to interorganizational trust on a short-term project and to interpersonal trust among long-term workers fails to capture the context specific and interpersonal dynamics that differ between the two cases. A rational/calculative form of trust is likely to define the former short-term situation, while an emotionally laden trust would apply to the latter long-term condition. A tailored approach in defining and studying trust therefore has benefits.

Despite the divergence in particulars, most researchers agree on the two central elements of *risk* (Luhmann, 1988; Boon & Holmes, 1991; Ratnasingham, 1999) and *vulnerability* (Zand, 1972; Barber, 1983; McAllister, 1995; Cummings & Bromily, 1996; Lewicki & Bunker, 1996). The necessity of trusting in situations where another's actions cannot be predicted (Lewis & Weigert, 1985; Davenport, Davis, & Grimes, 1999; cf. Gambetta, 1988) places the individual in a vulnerable position as trusting another increases the risk of betrayal (Fitness, 2000). Combining these elements together is the often-cited definition provided by Mayer, Davis and Schoorman (1995) who define trust as;

> 'the willingness of a party to be vulnerable to the actions of another party based on the expectation that the other will perform a particular action important to the trustor, irrespective of the ability to monitor or control the other party.' (p. 712).

Implicit in this definition is the assumption that trust operates as an attitude. For instance, a willingness to be vulnerable implies some form of behaviour, while expectations are formed from a combination of beliefs (Robinson, 1996) and emotions (McAllister, 1995; Bromiley & Cummings, 1996). As outlined in the previous Chapter, these reflect the three components of attitudes that relate to cognition, affect and behaviour. Further, the suggestion that behaviour ensues from expectations is consistent with an attitudinal approach, specifically the Theory of Planned Behavior (Ajzen, 1985). In sum, it is generally agreed that trust reflects the psychological state of an attitude (Whitener, Brodt, Korsgaard, & Werner, 1998).

3.2 Trust in Safety

Within safety writings, a recognition of the importance of trust in good safety performance is starting to emerge. Trust has been identified as the foundation of an effective safety culture (e.g., Reason, 1997; Parker, 2002) and as a factor that influences many of its underlying processes such as shared perceptions (Clarke, 1998, 1999), safety communication (HSC, 1993), and safety leadership (Mearns et al., 1997; Carroll, 2002). It has also been implicated in the success of empowerment programmes (Sutherland, 2003, personal correspondence), and as a necessary prerequisite for safety initiatives that target safety attitudes (Donald & Young, 1996) or behaviour (Fleming & Lardner, 2001; Cox, Jones, & Rycraft, 2004). As trust is integral to all aspects of safety, an understanding of how it develops and relates to safety performance is anticipated to mark an important step forward in attempts to reduce accidents. This thesis is one of the first to explore the role of trust in safety and will provide important information that may be used in the development of effective safety initiatives.

One of the most extensive discussions on the importance of trust in safety was provided by Reason (1997). In his writings on safety culture, he identified four components of; Reporting culture, Just culture, Informed culture, and Flexible culture, and argued that underlying each of these is trust. Of the four components, Reason (1997) argued that a good safety culture is essentially an Informed culture, and that these three other components facilitate its development. For instance, an

Informed culture will only develop in an organization where a Reporting culture exists and where workers openly report safety related information to management and other members. However, in most industries this is hampered by perceptions of blame (Horlick-Jones, 1996; Collinson, 1999; Pidgeon & O'Leary, 2000), which as suggested by O'Leary and Chappell (1993) serves to reduce trust and, in turn, the free flow of open communication. As they argue,

> 'For any incident reporting programme to be effective in uncovering the failures which contribute to an incident, it is paramount to earn the trust of the reporters ... Without such trust, the report will be selective and will probably gloss over pivotal human factors information. In the worst case-that in which potential reporters have no trust in the safety organization-there may be no report at all ... Trust is the most important foundation of a successful reporting programme ... A single case of a reporter being disciplined as a result of a report could undermine trust and stop the flow of useful reports.' (p. 12).

To reduce blame and thereby promote the development of an Informed culture, Reason (1997) argued that organizations need to establish a Just culture. Defined as an "atmosphere of trust" (p. 195), Just cultures operate to encourage and reward individuals for providing essential safety related information. To be successful, however, they require a shared belief between workers that organizations will not punish errors or unsafe acts regarded as 'normal' (Perrow, 1984), but equally that they will punish actions that all workers agree are unacceptable. Therefore, Informed cultures are indirectly facilitated through Just cultures and more specifically trust.

While Reason (1997) stressed the importance of removing blame at an organizational level, other research suggests that blame also exists at a workgroup level. In a study looking at safety and surveillance on North Sea oil rigs, Collinson (1999) indicated reluctance among contractor staff to report safety events because of a fear of blame from operator staff. A good safety culture (i.e., an Informed culture) will therefore require the removal of blame at all levels of the organization. One way to achieve this was indicated by O'Leary and Chappell (1993) and Reason (1997), and relates to the development of trust. At a workgroup level, trust promotes environments of 'psychological safety' (Edmondson, 1999) where group members use reports of mistakes and errors as a way to learn from events, not as a reason to 'blame' the individual. At an organizational level, trust will promote the formal reporting of safety events that will aid in the development of a Reporting culture and hence an Informed culture.

The group most important in developing trust at these two levels is management. The level of trust in management influences the amount of trust invested in the organization (Creed & Miles, 1996) and between workgroup members (Pfeffer, 1992). As well as reducing blame, an increase of trust in management will also promote effective safety leadership and in turn reduced accident rates (see below).

Trust in Management

Research looking at low accident companies (Cohen, 1977), safety climate perceptions (Zohar, 1980; Brown & Holmes, 1986; Dedobbeleer & Béland, 1991), and safety attitudes (Clarke, 1998; Hofmann & Morgeson, 1999; Flin et al., 2000; Nananidou & Donald, 2002) all implicate management as the most important influence in safety. Of particular importance is the degree to which management are committed to safety, which is inferred through behaviours such as involvement in work and safety activities, frequent and informal communication with workers (Davis & Stahl, 1964; Andriessen, 1978), and empowerment of workers to make safety decisions (Niskanen, 1994; Donald & Young, 1996). As well as indicating managements' commitment to safety, these behaviours have also been associated with a transformational leadership style (or 'participative management', O'Dea & Flin, 2001), and reduced accident rates. In a study by Hofmann and Morgeson (1999), for example, high quality leader-member exchanges (equivalent to transformational leadership but at a dyadic level) were found to result in open communication on safety issues, a greater commitment to safety, and low accident rates. To explain the success of transformational leaders, theorists generally implicate trust (Bass, 1990; Hogan, Curphy, & Hogan, 1994). As argued by Dirks and Ferrin (2002), transformational leaders engage in actions that promote trust from workers, which in turn results in desirable gains through workers increasing their commitment to the goals set out by the leader. In the case of safety, and with a committed leader, these goals will be directed towards accident prevention.

The dependency of successful 'safety leadership' on the existence of trust is explicitly recognized in safety research (e.g., Carroll, 2002). Looking at effective safety practices among offshore installation managers, O'Dea and Flin (2001) found characteristics associated with a transformational leadership style (e.g., communication, empowerment and involvement) to be important, but also of equal if not more importance were relationships defined by trust, openness and honesty. A similar finding was reported by Flin and Slaven (1996) following a review of offshore research, where it was concluded that supervisors adopting a transformational leadership style are generally more successful at instilling into workers elements of a good safety culture. As indicated by Mearns et al. (1997), supervisors adopting this style are typically supportive, genuine and honest, and have relationships with workers based on respect, openness and trust. It may therefore be concluded that key to effective safety leadership and hence accident prevention is trust in management.

Support for this conclusion comes from a meta-analysis of leadership research carried out by Dirks and Ferrin (2002). They argued that individuals are more likely to feel safe and more positive about a leader that they perceive to be trustworthy. Conversely, those with low levels of trust in a leader are likely to report negative attitudes and find states of dependency psychologically distressing. It might therefore be hypothesised that as psychological distress has the potential to increase the likelihood of cognitive errors, which in some cases are the precursor of accidents (Reason, 1997), then;

H^S1: *Negative trust attitudes will be associated with relatively higher accident rates.*

Further, in the case of safety leadership, it might be argued that trust in supervisors is more important than trust in managers, as the former group are typically found to have the greatest impact on workers safety performance (Rundmo & Sjoberg, 1996; Clarke, 1999; van Vuuren, 2000; Zohar, 2002). While managers also influence safety, this tends to be indirect and based on the impact that their policies and practices have on supervisory conduct (Foulkes, 1973). Research has also indicated that workers typically use the actions of supervisors to infer managements' commitment to safety (Leather, 1988). Combined with the observation of Dirk and Ferrin (2002), and the suggestion that managers and supervisors should be studied as separate groups (e.g., Thompson, Hilton, & Witt, 1998), it is hypothesized that;

H^S2a: *Accident victims will report more negative trust attitudes towards senior management compared to a non-accident group.*

H^S2b: *Accident victims will report more negative trust attitudes towards supervisors compared to a non-accident group.*

Although trust is often implicated as important in safety culture/climate and in shaping safety attitudes, empirically it has received minimal attention. In a study by Mearns, Whitaker and Flin (2003) a single indicator measure was used to assess trust in offshore supervisors. While the results of this study revealed the importance of trust in safety, it failed to identify the factors that promoted a trust attitude. As research into the distantly related topic of trust in risk regulators indicates, trust can vary along a number of different dimensions (e.g., trust-scepticism, affective-competence), depending on the antecedents that exist (e.g., Frewer, Howard, Hedderley, & Sheperd, 1996; Metlay, 1999; Pidgeon, Walls, Weyman, & Horlick-Jones, 2003; Poortinga & Pidgeon, 2003). Using a single measure of "I trust my supervisor" (Mearns, Whitaker, & Flin, 2003) fails to capture this diversity. A single indicator measure also fails to identify the domain of organizational functioning where trust is most important. As safety culture is affected by both job and safety related factors, it would be of practical benefit to explore if differences in levels of trust exist between these domains, and if so, which impacts more on safety. This thesis will be the first to begin to explore this dynamic.

In a different study by Stetzer, Morgeson and Anderson (1997), a two-item measurement scale of trust climates was developed, which was originally intended to assess the impact of trust on absenteeism and accident rates. However, the poor internal consistency of this scale resulted in its omission from further analysis and consequently from an insight into how trust relates to safety. What would have made this study stronger, and safety research more generally, is an understanding of the factors that contribute to the development of trust in a safety context. As will be illustrated in this thesis, an understanding of these factors allows reliable measurement tools to be developed and used empirically to study the relationship between trust and safety. The benefit of this is its identification of the levels and salient features of trust that are necessary for good safety. In the following sections, research on trust in general within organizations will be explored.

3.3 Antecedents of General Trust in Organizational Contexts

Within organizations, workers typically develop trust in two referents, the organization and the individual (Whitener, 1997; Aryee, Budhwar, & Chen, 2002). Although these represent distinct attitude objects (Gill & Butler, 1996), a strong relationship between the two exists (Zaheer, McEvily, & Perrone, 1998). As noted by Blomnqvist and Stahle (2001), a deterioration of trust at one level is typically associated with a deterioration of trust at the other. Most illustrative of this is the relationship between trust in the organization and trust in management, the latter of which is the focus of most interpersonal trust studies (e.g., Butler & Cantrell, 1984; Deluga, 1994; Whitener, 1997; Clark & Payne, 1997; Tan & Tan, 2000).

Management often act as a global representation of the level of interpersonal trust within an organization as they have a major influence in shaping the structure of trust cultures (Whitener et al., 1998) and trust climates (Rosen & Jerdee, 1977; Pfeffer, 1992), both of which determine the levels of trust expressed by organizational members. Therefore, by exploring the link between organizational and managerial trust specifically, research also provides an insight into the relationship between organizational and interpersonal trust generally.

The direction of causation between the level of trust in management and the level of trust in the organization has been presented in both ways. At one level, the strong relationship between organizational and managerial trust has been attributed to workers using managements' actions as a way to determine the level of trust to be placed in the organization (Pfeffer, 1992; Konovsky & Pugh, 1994; Creed & Miles, 1996; Tan & Tan, 2000). As argued by Eisenberger, Huntington, Hutchinson and Sowa (1986), employees form general perceptions about the intentions and attitudes that the organization hold towards them from the policies and procedures enacted by managers and supervisors. This was later echoed by Settoon, Bennett and Liden (1996) who found employees interpreted human resource practices and the trustworthiness of management as an indication of the personified organizational commitment to them. It is therefore argued by some that the level of trust placed in management will influence the level of trust invested in the organization (Levinson, 1965).

An alternative explanation rests on the basis that the organization is used as a way to determine the trustworthiness of its senior members. Trust in top management, for example, has been found to rest largely on the outcomes of monitoring organizational processes (Carnevale, 1988; cited in Tan & Tan, 2000), where efficiency and fairness of organizational systems are major determinants (McCauley & Kuhnert, 1992; Albrecht & Travaglione, 2003). Looking at the relationship between perceived organizational support (POS; specific to worker-organization relationships) and leader-member exchanges (LMX; worker-supervisor relationships), Wayne, Shore, Bommer and Tetrick (2002) found that while POS influenced LMX relationships, the reverse did not hold true. As trust is integral to both of these dynamics, these results suggest that trust at an organizational level influences trust at a supervisory level. Taken together this research suggests that;

H^T1: *There will be a strong positive relationship between levels of trust in the organization and levels of trust in 'management'.*

Although a strong relationship exists between organizational and managerial (interpersonal) trust, they are generally accepted to operate as distinct factors. In recognising this, researchers have given much attention to the investigation of the conditions under which people are likely to attribute trustworthiness both to organizations (Brockner & Siegel, 1996; Brockner, Seigel, Daly, & Tyler, 1997) and the individual (Gabarro, 1978; Butler, 1991; Tyler & Lind, 1992; Tyler & DeGoey, 1996; Clark & Payne, 1997; Mayer & Davis, 1999).

3.3.1 Organizational trust

Transmitted in policy form or through proxies of the organization, organizational support (Eisenberger et al., 1986; Whitener, 2001) and organizational justice (Van den Bos, Wilke, & Lind, 1998) have been identified as global variables used by employees when deciding whether to trust the organization (Tan & Tan, 2000). Perceived organizational support (POS) refers to general perceptions held by organizational members concerning the extent to which the organization values their contributions and well-being (Eisenberger, et al., 1986). Operating in a type of social exchange framework (Blau, 1964), POS creates a sense of trust that the organization will notice and reward actions performed on its behalf (Cook & Wall, 1980). In turn this creates a sense of obligation to repay the organization through behaviours that support its goals (Eisenberger, Fasolo, & Davis-LasMastro, 1990). In essence, organizational members enter into a psychological contract with the organization (Morrison & Robinson, 1997). For instance, workers believe that the organization has agreed (explicitly or implicitly) to provide them with certain rewards in return for contributions they make to the organization (Turnley & Feldman, 2000). Behaviours associated with positive perceptions of POS include commitment to fulfil job requirements and a reduced intention to leave the organization (Farrell & Rusbult, 1981). Less direct evidence also suggests that POS, and its relationship to trust, might promote safer work performance. In a study by Donald and Young (1996), the success of local level budgets (safety initiatives empowering workers to make decisions) in reducing accidents was attributed to the strong symbolic indication of trust that local budget control showed from management to the workforce. Consistent with POS, it might be argued that workers reciprocated this trust by acting in a way consistent with the organizations goals directed towards safe work performance and the sensible use of budgets.

One of the ways that workers determine POS is through an organization's trustworthiness, which is indicated by a number of factors. These include dedication to another's welfare, growth, and wholeness (Kouzes & Posner, 1993), service quality (Seiders & Berry, 1998), task competence, interactional courtesy, legal competence, financial balance, and honest communication (Caldwell & Clapham, 2003). The importance of honest communication was further indicated by Allen (1992) who reported sincerity from top management as the strongest promoter of POS. However, in cases where this information is not available, workers have been reported to rely on fairness information, especially perceptions of procedural justice (Van den Bos, Wilke, & Lind, 1998). Compared to trustworthiness information, organizational justice processes feature more centrally in the development of POS

(Fasolo, 1995; Shore & Shore, 1995; Moorman, Blakely, & Neihoff, 1998; Masterson, Lewis, Goldman, & Taylor, 2000).

Organizational justice refers to individual or group perceptions of the fairness of treatment they receive from an organization (James, 1993). This is generally inferred in one of three ways; perceived fairness in which resources and outcomes are allocated (distributive justice; Adams, 1965), the way policies are enacted and decisions are made (procedural fairness), and the way management treats workers (interactive justice). While perceptions of distributive and procedural justice are directly implicated in organizational trust, interactive justice is generally associated with trust in supervisors (Aryee, Budhwar, & Chen, 2002). Its influence in shaping organizational trust is therefore minimal and indirect. Regarding the relationship between justice mechanisms and POS, Wayne et al. (2002), identified 'Inclusion' (the opportunity to be involved in important decision-making processes and receiving important information), and 'Recognition' (visibility to top management that is perceived as a discretionary reward given by the organization which indicates that it cares) to act as strong determinants of POS. Inclusion has strong parallels with procedural justice, and Recognition offers a means by which distributive justice can be evaluated. This therefore suggests that one of the main ways to measure POS is by tapping the more tangible concepts of justice mechanisms.

Out of distributive and procedural justice, it is generally the latter that acts as a stronger promoter of organizational trust (Tan & Tan, 2000; Aryee, Budhwar, & Chen, 2002). As studies by Folger and Konovsky (1989) and Barling and Phillips (1993) have shown, after controlling for procedural justice, distributive justice failed to significantly predict organizational trust. In part, this may be attributed to the perception that more discretionary powers are involved in procedures than in the allocation of resources (Shore & Shore, 1995). The actions that contribute to perceptions of procedural justice are therefore regarded as voluntary and as having a greater personal reference.

The importance of justice mechanisms and the relative dominance of procedural justice in shaping attitudes towards the organization is also recognised in safety research. In a study of offshore oil and gas workers, Collinson (1999) reported dissatisfaction among contract workers with the quality of personal protective equipment (PPE), and negative attitudes towards the organization by all workers due to its operation of blame cultures. Poor PPE may be argued to reflect a form of distributive justice, while blame cultures (the tendency to blame individuals, often unjustly for accidents or incidents) reflects a form of procedural justice. The relative dominance of blame cultures within industry (e.g., Pidgeon, 1991; Douglas, 1992; Allison, 1993; Horlick-Jones, 1996; Pidgeon & O'Leary, 2000) compared to issues surrounding PPE or other distributive matters suggests that in high-risk industries;

H^T2a: *Procedural justice (e.g., blame cultures) will be a stronger determinant of organizational trust compared to distributive justice.*

H^T2b: *Positive perceptions of procedural justice will be associated with high levels of trust, while negative perceptions will be associated with low levels.*

3.3.2 Interpersonal trust

A variety of factors have been proposed to act as antecedents to the development of interpersonal trust. These include familiarity (Gulati, 1995), frequency of interaction (McAllister, 1995), likeability (Doney & Cannon, 1997), and cooperation (Pruitt & Kimmel, 1977; Burt & Knez, 1996). While it is agreed that these influence trust development to some extent, generally found to be of greater influence are individual (personality) and situational (trustworthiness) factors. Referred to as generalized and relational trust, respectively (Jones, Couch, & Scott, 1997), researchers have paid particular attention to the relative importance of these two sets of determinants in trust formation.

3.3.2.1 Personality: Propensity to trust

Propensity to trust refers to a generalized predisposition or personality trait that develops to varying degrees dependent on the person's experiences with others (Rotter, 1967, 1971). These experiences promote the development of a general set of expectations that are assumed to influence initial attitudes and behaviour towards others in novel situations (Rotter, 1967; Stack, 1978; Payne & Clark, 2003). In cases where experiences with others (and hence expectations) have been positive, it is assumed that trust attitudes and behaviour towards another will also be positive. For instance, in studies using the widely known propensity measure, the Interpersonal Trust Scale (ITS, Rotter, 1967), it has emerged that those high on trust perceive others as honest and well intended, while those low on trust generally tend to be cynical, skeptical and assume others are dishonest (Costa & McCrae, 1992; cited in Gillespie, in press).

Although initially appealing, personality has since been found to have minimal (Scott, 1980; Goto, 1996; Mayer & Davis, 1999; Payne & Clark, 2003) to no influence (MacDonald, Kessel, & Fuller, 1972; Driscoll, 1978; Wheeless, 1978) on trust development when strong contextual factors exist. Compared to personality factors, context based trust has also emerged as a stronger predictor of attitudes and behaviour in organizations (Kee & Knox, 1970; Schlenker, Helm, & Tedeschi, 1973;

Butler, 1983). To establish the impact of personality on trust formation offshore and its role in safety performance, which as of yet is unknown, it is hypothesised that;

H^T3a: *Relative to situational factors (e.g., trustworthiness), an individual's propensity to trust will have a weak influence in determining levels of interpersonal trust.*

H^T3b: *Propensity to trust will fail to significantly predict accidents, incidents or near-miss involvement.*

3.3.2.2 Situational trust: Trustworthiness

Trust is generally accepted to operate in a social exchange framework where an individual performs an act that benefits another based on the expectation of some unspecified future return. As Blau (1964) states, "since social exchange requires trusting another to reciprocate, the initial problem is to prove oneself as trustworthy" (p. 98). As a psychological dimension (Bijlsma & Kooman, 2003), trustworthiness is found to be one of the strongest components of trust (e.g., Deutsch, 1958; Mayer & Davis, 1999; Wong, Then, & Skitmore, 2000; Costa, 2003). Defined as *perceived* intentions, motives and competencies of a trustee (McEvily, Perrone, & Zaheer, 2003), these findings support the overwhelming number of studies which seek to understand trust through measures of individual characteristics (e.g., Butler, 1991; Mayer, Davis, & Schoorman, 1995; McAllister, 1995; Creed & Miles, 1996; Clark & Payne, 1997). However, an element of confusion within this research stems from the interchangeable use of the terms trust and trustworthiness when discussing these characteristics. As a result, trust is often used to refer to what is inherently trustworthiness, which has led some to suggest that relatively little work has been carried out into the latter relative to the former (McEvily, Perrone, & Zaheer, 2003).

However, as Hardin (2002) argues, this is more reflective of the misconceptualizaiton of the two terms rather than the true state of research.

Trustworthiness provides the motivation or motivations for acting, while trust refers to the accumulation of knowledge that this produces (Hardin, 2002). As suggested by Gillespie (in press), a willingness to be vulnerable by engaging in trusting behaviour is proximally closer to trust than perceptions of another's trustworthiness. Trust therefore operates as a distinct, mediating variable between trustworthiness and trusting behaviour. Empirical support for the independent nature of trust and trustworthiness is provided by Mayer and Davis (1999) who found the implementation of fairer performance appraisals increased trust in management but not perceptions of their trustworthiness. In a different study, Davis, Schoorman, Mayer and Tan (2000) found trustworthiness ratings to account for only 46% of the trust restaurant employees had in their manager. While trust exists independent of trustworthiness, these studies indicate that it is to a large extent influenced by it.

Individual trustworthiness characteristics

As few as one (Strickland, 1958), to as many as ten (Butler, 1991) individual trustworthiness characteristics have been identified as important in the development of trust. Following a review of this research, Mayer, Davis and Schoorman (1995) concluded that most of these characteristics related to one of three orthogonal factors, Ability, Integrity and Benevolence (see Table 3.1). *Ability* is defined as a set of skills or competencies that allow an individual to perform in some area. While the term Ability has been used by some researchers (e.g., Cook & Wall, 1980; Sitkin & Roth, 1993), others have used the synonyms of 'competence' (Butler & Cantrell, 1984;

Table 3.1: Antecedents of trust that are ascribed to the categories of Ability, Integrity and Benevolence[1].

Author(s)	Ability	Integrity	Benevolence
Altman & Taylor (1973)			Benevolence, Honesty
Butler (1991)	Competence	Consistency, Fairness, Integrity, Promise fulfilment, Openness	Loyalty, Receptivity
Clark & Payne (1998)	Competence	Integrity, Consistency	Loyalty, Openness
Cook & Wall (1980)	Ability		Intentions
Das & Teng (2001)	Competence	Goodwill	
Dasgupta (1988)		Credible threat of punishment, Credibility of promises	
Deutsch (1960)	Ability		Intentions
Ellison & Firestone (1974)			Benevolence
Frost, Stimpson, & Maughan (1978)			Altruism
Hovland, Janis, & Kelley (1953)	Expertise		Motivation to lie
Jones, James, & Bruni (1975)	Ability		Behaviour relevant to others needs and desires
Kee & Knox (1970)	Competence		Motives
Larzelere & Huston (1980)		Honesty	Benevolence
Lieberman (1981)	Competence	Integrity	
Mayer & Davis (1999)	Ability	Integrity	Benevolence
Ring & Van de ven (1994)		Moral integrity	Goodwill
Shaw (1997)	Achieving results	Integrity	Concern
Simmons (1999)		Behavioural integrity	
Sitkin & Roth (1993)	Ability	Value congruence	
Solomon (1960)			Benevolence
Strickland (1958)			Benevolence
Tan & Tan (2000)	Ability	Integrity	Benevolence
Whitener et al. (1998)		Consistency, Integrity, Delegation of control	Openness, Concern

Research carried out subsequent to Mayer, Davis and Schoorman's (1995) model of organization trust have been included in the table as a way to illustrate the robustness of ability, integrity and benevolence as encompassing categories.

[1] The allocation of characteristics to these categories is in accordance with definitions proposed by Mayer, Davis and Schoorman (1995).

Butler, 1991), 'expertise' (Hovland, Janis, & Kelley, 1953) and 'judgment' (Gabarro, 1978). The second category, *Integrity,* refers to the perception that the other person adheres to a set of principles deemed acceptable by the trustor (McFall, 1987). A similar, but somewhat restricted construct is 'value congruence', which has been defined as the compatibility of an employee's beliefs and values with organizational values (Sitkin & Roth, 1993). In this case, the individual investing trust has been replaced with an organization referent. Issues affecting the perceived degree of Integrity include the fairness of another's actions, whether information is transmitted honestly, and the degree of consistency between actions and behaviour (Simons, 1999). Finally, *Benevolence* is defined as a desire to do good for another aside from an egocentric profit motive. Suggesting some form of emotional attachment to another, Benevolence has been implicated in other studies through terms such as altruism (Frost, Stimpson, & Maugham, 1978), loyalty (Butler & Cantrell, 1984) and fulfillment of another's needs and desires (Jones, James, & Bruni, 1975). As well as grouping the vast array of trustworthiness indicators that have been proposed, the categories of Ability, Integrity and Benevolence have also been validated as reliable measures of trust (e.g., Mayer & Davis, 1999; Tan & Tan, 2000).

This body of research provides an insight into the factors or characteristics that might be important in the development of trust within high-risk work contexts. To validate the importance of these empirically, while also seeking to identify other factors that may contribute to the development of trust and which may subsequently be used in a reliable measurement tool, it was hypothesized that;

H^T4a: *Perceptions of trustworthiness will be based on Ability, levels of Integrity and displays of Benevolence.*

Cognitive-based and affect-based trust

Underlying individual trustworthiness characteristics are two psychological bases of trust that relate to cognition and affect. Cognitive-based trust has been defined as a *rational* or calculative decision of whether to trust another (Deutsch, 1958; Costigan, Ilter, & Berman, 1998), which is based on a number of objective, measurable criteria. In contrast, affect-based trust (or emotional trust) is determined by feelings of care and concern between trusting partners. Of the two types, affect-based trust has been argued to be more prevalent and influential in shaping organizational members' behaviour (cf., McAllister, 1995). For instance, in a study by Costigan, Ilter and Berman (1998) affect-based trust emerged as a significant predictor of organizational motivation, whereas cognitive-based trust did not. Further, Lewicki, McAllister and Bies (1998) have argued that contrary to popular belief, organizational relationships are characterized as one of high trust and high distrust. Assuming high trust to have an emotional basis (this being supported through the attribution of 'faith' to this level), this model supports the suggestion that affect-based trust is more prevalent in organizations. However, to develop affect-based trust, a cognitive foundation must first exist (Lewis & Weigert, 1985; Shapiro, Sheppard, & Cheraskin, 1992; McAllister, 1995; Lewicki & Bunker, 1996; Clark & Payne, 1997; Costigan, Ilter, & Berman, 1998; Davenport, Davis, & Grimes, 1999). Generally, once feelings of trust become more established and rooted, individuals rely more on beliefs about another's motives, and less on the direct coding at the behavioural level (Rempel, Holmes, & Zanna, 1985; Williams, 2001).

Drawing on Mayer, Davis and Schoorman's (1995) three broad categories, evidence exists to suggest that these tap the psychological – cognitive and affective – bases of trust. The first line of support is the finding that these categories form two distinct dimensions that relate to 'Integrity / Benevolence' and 'Ability'. Theoretically, this has emerged in reviews of trustworthiness indicators that when compared reveal a strong overlap between Integrity and Benevolence, but not Ability. For instance, in describing their organizational model of trust, Mayer, Davis and Schoorman (1995) cite studies looking at fairness (e.g., Butler, 1991) as an indication of Integrity. However, in a later review carried out by Shaw (1997), studies of fairness (e.g., Alexander & Ruderman, 1987) were suggested as a way to express concern that fits most comfortably in a Benevolence category. As Shaw (1997) argued, acting with integrity is among other things, related to or indicated by, benevolence. A similar, 'dual use' of an indicator to relate to both Integrity and Benevolence has been found with openness and honesty (see Table 3.1).

Studies by Larzelere and Huston (1980) and Gillespie (in press) also support this distinction. In contrast to Mayer, Davis and Schoorman's (1995) original conceptualization of the three trustworthiness characteristics as orthogonal, they found Integrity and Benevolence to comprise a unidimensional construct. As argued by Tinsley (1996), Integrity and Benevolence should be perceived as belonging to the same group of factors that measure an ethical-based trust, which is distinct from Ability. Similarly, it has been argued that Ability measures a cognitive type of trust (owing to its quantifiable bases), while Integrity and Benevolence relate to an affect or emotional trust (e.g., Tyler & Lind, 1992; Das & Tang, 2001; Tyler, 2003). This is the second line of support.

Theoretically, strong parallels exist between Integrity and Benevolence and factors identified in the development of affect-based (emotional) trust. Affect-based trust has been related to demonstrations of care and concern (Clark & Mills, 1979; Holmes & Rempel, 1989), and perceptions that another's behaviour is not motivated by self-interest (Organ, 1988). These are highly similar to 'a desire to do good for the other aside from some egocentric profit motive' (p. 718), which Mayer, Davis and Schoorman (1995) ascribe to Benevolence. Also similar to Benevolence are altruism and behaving to meet another's needs and desires rather than ones own, which relate to affect-based trust. At an empirical level, a study of behavioural indicators of trust carried out by Gillespie (in press) identified the factors 'reliance' and 'disclosure' as important. Reliance was defined as relying on another's skills, advice and judgment, and was differentiated from Disclosure, which relates to communicating ideas openly and honestly, and sharing of problems, feelings and sensitive information. Supporting the suggestion that Integrity and Benevolence are related to affect-based trust, Gillespie (in press) argued that Disclosure has a stronger *emotional* and relational basis than does Reliance, as the sharing of information often expresses care and concern that shapes the features of benevolent behaviour.

In sum, research suggests that interpersonal trust is based on the three broad categories of Ability, Integrity and Benevolence. It further suggests that underlying these are the two psychological bases that relate to cognition and affect. In order to establish if these dimensions exist within high-risk industries it is hypothesised that;

H^T4b: *Affect-based trust (i.e., integrity and benevolence) will feature more dominantly in trusting relationships between industrial workers compared to Cognitive-based trust (i.e., ability).*

Establishing this is important because it will provide safety professionals with an indication of the level at which trust positively or negatively influences safety performance. In turn, this will provide an indication of the type of initiative that is likely to be effective for improving safety performance. For instance, finding a positive relationship between cognitive based trust and safety would suggest that safety initiatives should be aimed towards increasing another's perceived competence.

3.4 Interpersonal Distrust

Within safety research, the role of distrust has yet to be explored theoretically or empirically. Distrust has been defined as negative expectations regarding another's conduct, which typically manifests itself in a tendency to attribute sinister intentions to, and a desire to buffer oneself against the effect of another's conduct (Lewicki, McAllister, & Bies, 1998). Although safety researchers prefer to focus on trust, the following sections will show how an attitude of distrust is equally prevalent within organizations, and consequently is equally likely to affect safety performance.

3.4.1 Rational distrust

The antecedents of distrust are largely distinguished by their membership to a rational or irrational form (Deutsch, 1973; Barber, 1983). Rational distrust refers to a generalized expectancy or belief regarding the lack of trustworthiness of a particular individual, group or institution, which develops from repeated violations of expectations (Messick, Wilke, Brewer, Kramer, Zemke, & Lui, 1983). Acts most likely to promote rational distrust are betrayal or violations of trust (Harris, 1994; Jones & Burdette, 1994; Elangovan & Shapiro, 1998; Fitness, 2001), and psychological contract breach (Morrison & Robinson, 1997). For instance, in a study by Morrison and Robinson (1997) violation of psychological contracts – belief held by workers that that the organization has agreed, explicitly or implicitly, to provide them with rewards for contributions made to the organization – resulted in a sense of outrage and betrayal. In turn, this reduced trust and job satisfaction, and also had the potential to result in more serious consequences such as acts of revenge (Morrison & Robinson, 1997).

3.4.1.1 Betrayal

Within organizations, acts of betrayal are quite common. Jones and Burdette (1994) found that nearly 19% of men reported having betrayed at work, while Fitness (2000) found betrayal-related violations were among the most frequently reported types of anger-eliciting offenses by coworkers. Betrayal typically refers to situations where one party in a relationship is perceived to act in a way that favors their own interests at the expense of the other party's (Fitness, 2000). These acts must be perceived as voluntary and against known *expectations* where actual and potential harm can be caused (Elangovan & Shapiro, 1998). Acts identified as betrayal include coercive or threatening behaviour, withholding promised support, blaming employees for personal mistakes, favouritism, sexual harassment, improper dismissal, and misuse of private information (Harris, 1994). Additionally, changing of rules "after the fact" (e.g., psychological contract breach), formal contract breach, stealing of ideas, and lying, have also emerged as promoters of betrayal (Bies & Tripp, 1996).

Looking specifically at the differences between organizational groups, Burt and Knez (1996) found supervisors were typically distrusted because of an absence of support and feedback, an absence of encouragement, egotistical, and self-orientated behaviour. Acts of betrayal from colleagues included following their own agenda and not following through on commitments, while peers working on a different task were likely to be distrusted if they withheld political support. Whether an act is interpreted as betrayal is therefore influenced to some extent by the position of the offending party.

From the acts identified, distrust, at least in its rational form, might be argued to stem from negative expressions of the antecedents that underpin trust. This is supported by the strong parallels between acts of betrayal and the trustworthiness categories proposed by Mayer, Davis and Schoorman (1995). For instance, lying and changing of rules "after the fact" violates expectations of honesty and promise fulfilment, which are taken as indicative of Integrity (see Table 3.1). Violations of Benevolence are indicated by withholding promised support and misuse of personal information, both of which indicate a lack of care and concern for the other. However, in contrast to Integrity and Benevolence, violations of Ability have not been identified in studies of distrust. As suggested by Elangovan and Shapiro (1998), while drops in integrity and benevolence might indicate an increased chance of betrayal due to their voluntary nature, a failure in ability implies "can't" rather than "won't".

Applying Heider's (1958) Attribution theory, it might be argued that another's Ability is perceived as context dependent, which serves to reduce its influence in judgements about another's characteristics. However, when another person's behaviour is attributed to internal forces, as with Integrity and Benevolence, then it is likely to be used when making judgements about the other person's internal characteristics such as their trustworthiness. This might therefore explain why Ability has minimal influence in the development of distrust (and trust) attitudes compared to Integrity and Benevolence. These observations support the earlier suggestion that Ability is distinct from the categories Integrity and Benevolence (e.g., Tinsley, 1996). Further, as betrayal is a highly emotional experience (Gaylin, 1984; Fitness & Fletcher, 1993; Metts, 1994; Fitness, 2000), it also suggests that Integrity and Benevolence indicate affect, rather than cognitive-based trust.

The research cited here suggests distrust to be highly salient within organizations, and as likely to have some influence on safety performance. To test for the existence of distrust within high-risk work contexts it is hypothesized that;

H^T5a: *Distrust will develop from violations of integrity and/or benevolence, but not from perceptions of another as incompetent (i.e., lacking ability).*

Support for a relationship between distrust and safety would suggest that safety professionals should focus their attention on distrust as well as trust to fully understand the factors that impact on safety performance.

3.4.2 Irrational distrust

The second type of distrust manifests in an *irrational* form. Here there is an exaggerated propensity towards distrust arising without experiences that warrant or justify it. As suggested by Deutsch (1973), irrational distrust reflects an inflexible, rigid tendency to act in a suspicious manner irrespective of the situation or consequences. Although no less important to rational distrust, only a limited amount of research has been carried out into the factors from which it develops (Kramer, 1994). At a social level, factors related to categorization effects have been identified (Brewer, 1979; Kramer, 1989), while psychologically, researchers point towards a number of cognitive biases such as paranoid cognitions (Kramer, 1994), and the '*deceivers distrust phenomenon*' (Sagarin, Rhoads, & Cialdini, 1997).

Social categorization effects are most commonly observed in situations where ingroups and outgroups exist. According to Levinger and Snoek's (1972)

Categorization Theory, when first-hand information about another does not exist, physical or demographic stereotypes are likely to be used in forming attitudes and in deciding whether to interact with another. Consequently, some individuals will be regarded as “more trustworthy” or “less trustworthy” compared to some other group. As well as categorizing others, individuals will also maintain a category for themselves – the *ingroup* (Tajfel, 1982; Tajfel & Turner, 1986). Perceiving an individual as an outgroup member typically results in less trust being placed in them relative to ingroup members (Brewer & Miller, 1996) and distrust and suspicion (Thibaut & Kelly, 1991). In contrast, ingroup members perceive themselves and their members as more trustworthy, honest, and loyal compared to outgroup members (Brewer, 1979).

As well as occurring between coworkers (Dion, 1973), categorization effects have also been found in supervisor-subordinate relationships. For instance, Cashman, Dansereau, Graen and Haga (1976) found ingroup supervisors were rated as more competent and were trusted more by workers, compared to supervisors belonging to an outgroup. One way that categorization effects may occur is through transference from a known ‘proof’ source to an individual where no experience exists (Doney & Cannon, 1997). As found in negotiation research, distrust typically generalizes to anyone seen to be sympathizing with an opponent (Carnwell et al., 1989). Since social categorization effects typically influence attitude formation in the absence of direct experience with another, it provides one route by which irrational distrust can develop.

At a psychological level, irrational distrust has been associated with a number of cognitive biases that are used to interpret another’s, as well as ones own behaviour. Kramer (1994) found paranoid cognitions – the tendency to make personal attributions about another's behaviour due to the feeling of being the target of their attention – were positively related to increased suspicion about another's behaviour and motivations, and negatively related to trust. Through a process of misattribution and overattribution, paranoid cognitions engender an exaggerated or "irrational" distrust of others. Another bias associated with irrational distrust is the 'deceivers distrust phenomenon' (Sagarin, Rhodes, & Cialdini, 1998). Defined as the tendency of a liar to perceive the recipient of these lies as less honest and so untrustworthy, this bias is argued to operate through an ego-protection false consensus mechanism where the liar normalizes their behaviour through the belief that the other is dishonest. The "irrational" aspect of this distrust lies in the ungrounded perceptions of another as untrustworthy and dishonest.

Although other processes have been suggested to promote irrational distrust, their reliability as antecedents is more tenuous as distrust is not always the outcome. For instance, suspicion (Deutsch, 1958) and surveillance (Strickland, 1958) have been identified as strong indicators of irrational distrust, but have also been found in situations defined as trust. Kruglanski (1970) found a mere 18 out of 70 participants in one experiment, and 11 out of 40 in another cited distrust as the reason for differential monitoring. Other commonly stated reasons were classified into the categories of, "distributive justice" and "desire to motivate better workers" (p. 229). Further, in the work of Gans et al. (2001) monitoring has been argued as a necessary ingredient for successful social networks.

Evidence on rational and irrational forms of distrust suggests that a division of antecedents into functional and dysfunctional types might exist. While breaches of psychological contracts may be argued to be dysfunctional due to the negative impact they have on job performance (Morrison & Robinson, 1997), functional distrust operates through processes such as monitoring (as suggested by Kruglanski's, 1970 results). In accordance with this it is hypothesized that;

H^T5b: *Distrust in the form of monitoring or institutionalized controls will be perceived as functional, while acts with unnecessary harm to the self will be perceived as dysfunctional.*

This marks a step forward in much of the trust literature and suggest that distrust might play a positive role in organizational functioning and hence safety performance. As will be shown in the following sections, this is contrary to long held assumptions regarding the role of distrust.

3.5 Trust – Distrust Dynamic

Further illustrating the importance of examining distrust in safety are discussions surrounding the issue of a trust-distrust dynamic. Traditionally, these attitudes have been argued to exist as bipolar opposites on a single continuum. For safety professionals, this suggests that a reduction of distrust and so accident rates might be achieved through the promotion of trust in certain groups such as management. More recently, however, it has been argued that trust and distrust operate as distinct entities that co-exist within a relationship. As these are assumed to have different determinants (e.g., Sitkin & Roth, 1993; Morgan & Zeffane, 2003), the problem now faced by safety professionals is not how to promote trust but how to reduce distrust. The lack of consensus within the literature regarding the nature of this dynamic and the absence of attention paid to it within safety writings provided the motivation for its exploration in this thesis. Understanding this dynamic will guide the development of successful initiatives by indicating if either or both attitudes should be addressed.

Although the nature of a trust-distrust dynamic is not a new debate (e.g., Luhmann, 1979), only a limited amount of work has been carried out which is designed to specifically test the applicability of the above approaches (e.g., Clark & Payne, 1997; Omodei & McLennan, 2000; Gillespie, in press). Further, no research exists on the relationship between trust and distrust within a safety context. This thesis will be the first to empirically address this absence. Because of the relative newness of two-factor theories compared to a continuum approach, hypotheses will be developed in subsequent sections that are specific to this former theory. However, as these approaches are presented as contrasting explanations, by directly studying the former, an indirect insight into the latter is acquired.

3.5.1 Continuum-based approaches

Early writings on trust were heavily influenced by the belief that trust and distrust exist as bipolar opposites on a single continuum (Rotter, 1967, 1971). Accordingly, single measures were developed that were directly targeted towards one attitude with the assumption that they indirectly measured the other. For instance, high ratings on Rotter's (1967) ITS were taken as indicative of high levels of trust, while low scores were assumed to reflect distrust (Stack, 1978). In recent organizational writings a continuum-based approach has been used to explain the reaction that layoff victims have to future re-employment (Pugh, Skarlicki, & Passell, 2003)[2] and the experience of trust within organizations (Jones & George, 1998). As Jones and George (1998) argued, on entering an organization,

---

[2] Although Pugh, Skarlicki and Passell (2003) used the term 'mistrust', it is indicated shortly that these reflect the same state as distrust.

relationships are characterized by *conditional trust*, which over time develops into *unconditional trust* or spirals into *distrust.* These three states were assumed to have the same determinants (values, attitudes, moods, and emotions), and so were presented on a single continuum reflecting "The Trust Experience".

Two guiding principles underlying all continuum-based approaches are; one that trust is 'good' and distrust is 'bad', and; two that relationships are unidimensional.

3.5.1.1 Trust as 'good' and distrust as 'bad'

Traditionally, trust has been associated with perceptions of an individual as good and benevolent, and distrust with perceptions of an individual as bad and malevolent (Quigley-Fernandez, Malkis, & Tedeschi, 1985). In early personality research those high on distrust were presented as less well adjusted, antisocial (Rotter, 1980), and competitive, envious, resentful, vindictive, and lacking feelings towards others (Gurtman, 1992). In contrast, individuals found to be high in trust were generally believed as better adjusted (Schill, Toves, & Ramanaiah, 1980), and are seen, and see themselves as happier, more ethical, and more physically attractive (Rotter, 1980). Similar to the belief that distrust is a psychological disorder to be corrected (Erickson, 1963), social psychologists regarded it as an unfortunate reality when trust fails and as a state to be avoided (Arrow, 1974). A similar presentation of trust as good and distrust as bad has been implicated within recent organizational writings.

Organizational research has emphasised trust as a way to create a more productive and cooperative workforce (Whitener et al., 1998), and has associated distrust with reduced performance (Organ, 1988; Walster, Berscheid, & Walster, 1976), an increased tendency to leave an organization (Porter & Steers, 1973), and reduced cooperation (Gambetta, 1988). All of these implicitly suggest that trust is positive and distrust is negative. This point is made explicitly in risk regulation research where trust has been associated with success (Kasperson, Golding, & Tuler, 1992), and distrust with failure (Kasperson, Kasperson, Pidgeon, & Slovic, 2003). The normative distinction between trust and distrust is also reflected in the differences in issues studied by organizational researchers across different countries. Specifically, European researchers focus on trust and its associated benefits, while North Americans are more interested in the "Dark Side" of trust (McAllister, 1997) that relates to distrust and the negative effects that it may have (Cvetkovitch, Siegrist, Murray, & Tragesser, 2002).

3.5.1.2 Relationships as unidimensional

Focusing on the composition of relationships rather than the morality of trust and distrust, continuum-based approaches assume that relationships are unidimensional and that a single component or dimension of the relationship is characteristic of the whole relationship (Lewicki, McAllister, & Bies, 1998). Trust in an individual in one situation is therefore argued to be associated with trust in the individual in all situations. The consistency across different areas of a relationship that this creates allows a state of psychological balance to be achieved and maintained by the individual. As argued by some theorists, individuals find a state of psychological imbalance intolerable and seek to resolve it (e.g., Festinger, 1957; Deutsch, 1968). Trusting *or* distrusting another irrespective of the context or dependent outcome offers one means by which this can be achieved.

3.5.1.3 Distrust and Mistrust

While early continuum-based approaches typically focused on a trust-distrust dynamic, research looking at the relationship between trust and *mistrust* has drawn similar conclusions. Mistrust refers to the tendency to perceive another as mean, selfish, malevolent, and unreliable in situations where ones well-being is involved (Omodei & McLennan, 2000). Similar to distrust, mistrust has been associated with a number of negative behaviours and outcomes such as poor interpersonal behaviour and work performance, psychological ill-health (Reis, Wheeler, Kermis, Spiegel, & Nezleck, 1985; McKay, 1991), and interpersonal maladjustment (Cook & Medley, 1954). In most cases, it has also been conceptualized as the opposite to trust (Williams, Barefoot, & Shekelle, 1985; Pugh, Skarlicki, & Passell, 2003; Omedei & McClennan, 2000). For instance, in a study comparing a single trust-mistrust measure with separate scales for each attitude, Omedei and McClennan (2000) found the former to offer a better fit to their data when tested using structural equation modelling. Trust and mistrust were therefore argued to operate as opposite ends of a single continuum, with measures of both being obtainable using a single scale.

The strong parallels between distrust and mistrust can be attributed to their interchangeable use by researchers. For instance, while some conceptualize Rotter's (1967) ITS as a measure of trust-mistrust (Omodei & McLennan, 2000) others present it as a measure of trust-distrust (Lewicki, McAllister, & Bies, 1998). Similar findings emerge with respect to Clark and Payne's (1997) 'Trust in Management Scale', which although originally developed as a measure of trust and mistrust, has since been referred to as a measure of trust and distrust (e.g., Gillespie, in press). It therefore appears that distrust and mistrust reflect the same *type* of trust. As defined by the Oxford English Dictionary, mistrust refers to a '*lack of trust or confidence;*

suspicion, distrust an instance of this' (OED, 2002). Based on the assumption that these attitudes reflect the same construct, the term distrust will be adopted for the remainder of the thesis. This will remove any unnecessary confusion by using both terms.

3.5.2 Two-factor type approaches

As an alternative to continuum-based approaches, two-factor type theories argue that trust and distrust exist as orthogonal attitudes with different antecedent factors (Wrightsman, 1974, 1991; Lagace & Gassenheimer, 1989; Gurtman, 1992; Gillespie, in press). While this approach concurs with continuum-based approaches that trust and distrust might be negatively associated, they argue that this association is based on the attitude held towards another in different domains of a relationship rather than because trust and distrust operate on a continuum. For instance, trusting another in general might be associated with trusting them specifically in a certain area of organizational functioning. However, it is equally likely that trusting them generally might be associated with distrusting them on some specific task. For this reason, it is equally possible for trust and distrust to be positively related.

Support for the distinct nature of trust and distrust was provided by Gurtman's (1992) study that tested a Circumplex model of interpersonal relationships. Consistent with a continuum approach, trust was assumed to exist in a quadrant of friendly-submission and distrust in an opposing quadrant that reflects a blend of the factors hostile-dominance. A test of this model, however, revealed that trust and distrust did not emerge in opposite quadrants (cf., Wiggins, 1979; Kiesler, 1983), and that their accessibility was positively rather than negatively correlated. Gurtman (1992) concluded that trust and distrust were not opposite ends of the same continuum, but two components of the same interpersonal "knowledge structure" (Higgins, 1990). Similar findings have been reported by attitude research in general, where positive and negative valent attitudes have been identified as distinct constructs (Watson & Tellegen, 1985; Burke, Brief, George, Robertson, & Webster, 1989). This has been shown both with general attitudes (e.g., optimism and pessimism; Stallings, Dunham, Gatz, & Bengston, 1997), attitudes directed at specific targets (e.g., interracial attitudes; Katz & Hass, 1988; Katz, Wackenhut, & Hass, 1986), and attitudes towards specific actions (e.g., blood and organ donation; Cacioppo & Gardner, 1993).

In arguing that trust and distrust do not exist on a continuum, two-factor theorists question the notion that relationships between individuals are unidimensional. As research into ambivalence indicates, individuals can hold both positive and negative attitudes towards the same attitude object (Otnes, Lowrey, & Shrum, 1997). This has been found in a variety of situations such as racial attitudes (Katz & Hass, 1988), attitudes towards smoking (Petty & Cacioppo, 1996), and expected benefit and harm from confederates in prisoner dilemma games (Nacci, Stapleton, & Tedeschi, 1973). As argued by Priester and Petty (1996) ambivalence is also likely to apply to trust and distrust. For instance, Lewicki, McAllister and Bies (1998) argued that in contrast to continuum-based approaches, relationships are comprised of *multiple domains* in which trust and distrust are compartmentalized. Through repeated interactions an individual learns in what context another can be trusted (Shapiro et al., 1992; Lewicki & Bunker, 1996) and in what situation distrust would be more suitable. Research examining trustworthiness characteristics, for example, has indicated that another might be regarded as highly competent on one task but lack the necessary skills on another (Zand, 1972). Trust based on Ability, and extrapolating from this, Integrity and Benevolence, may therefore be argued to be domain specific.

Expanding from the individual to social groups, it has been argued that a healthy balance of trust and distrust is needed to achieve successful functioning (e.g., Luhmann, 1979; Gans, Jarke, Kethers, & Lakemeyer 2001). As Luhmann (1979) argued, stable social systems are only obtained when trust and distrust exist, as "increases in trust or distrust - apart from increases in the other - may do more harm than good" (1979, p. 89). Similarly, Gans et al. (2001) argued that for social networks to be successful there must be a healthy balance of trust, confidence and distrust. Imbalance caused by too much trust results in networks denigrating to family-like or even Mafioso relationships, while too much monitoring (e.g., a behavioural manifestation of distrust) creates conflict that causes members to leave the group, or in the worse case, results in the dissolution of the network. The normative basis of trust as 'good' and distrust as 'bad' is therefore indicated to be somewhat flawed.

Distrust in network structures makes them less rigid and so more suitable for innovations (Kern, 1998), and organizations regarded as healthy and resilient contain elements of distrust and suspicion as well as their behavioural manifestations of vigilance and wariness (Barber, 1983; Shapiro, 1987; March & Oslen, 1994). As suggested by Pidgeon, Walls, Weyman and Horlick-Jones (2003), research often fails to distinguish between outright rejection (the most extreme form of distrust) and healthy distrust, which they call *critical trust.* Critical trust is the practical form of reliance on another person or institution combined with healthy skepticism, both of which are essential components for effective risk regulation. Consistent with a two-factor type approach it is therefore hypothesized that;

H^T6a: *Trust and distrust will co-exist within the same relationship through compartmentalization according to domain (e.g., area of organizational functioning).*

HT6b: *In some situations, trust will be dysfunctional ('bad') and distrust will be functional ('good').*

Addressing these hypotheses will give more depth to current safety understanding by showing if trust and / or distrust play a role in safety performance and if so, what this role might be. At present, safety professionals assign a positive role to trust in safety performance and neglect the existence of distrust or indirectly assume it to have negative consequences. However, neither of these assumptions have been validated empirically.

3.6 Summary

In this Chapter, the importance of trust in safety and the composition and dynamics of trust within organizations was discussed. A review of theoretical and empirical safety work identified high levels of trust as important. It was therefore hypothesized that non-accident victims would hold positive trust attitudes compared to accident victims who would hold negative trust attitudes. It was further suggested that these would be directed towards management. Regarding the composition of trust, a review of the literature identified justice mechanisms as important in trust development at an organizational level, and the trustworthiness characteristics of Ability, Integrity and Benevolence as important at an interpersonal level. Interpersonal distrust was also suggested to develop from perceptions of untrustworthiness based on violations of Integrity and Benevolence. It was therefore hypothesized that positive perceptions of organizational justice would promote higher levels of trust in the organization, and that interpersonal trust / distrust would develop from perceptions of another's trustworthiness. A trust-distrust dynamic was discussed with respect to continuum and two-factor based approaches. Consistent with the latter approach, it was hypothesized that trust and distrust would coexist as distinct entities in a relationship, and in some cases trust would be dysfunctional and trust functional. The methods used to test these hypotheses, and the results of a qualitative study that examined a trust-distrust dynamic and the determinants of these attitudes will be discussed in the next Chapter.

Chapter 4

Exploring Trust in High Risk Work Contexts

In this Chapter, the findings from a number of interviews with offshore oil and gas workers are reported. The interviews were designed with the objective of gaining an insight into worker's perceptions of trust and its importance in safety within high-risk work contexts. More specifically, the interviews aimed to gain an understanding of a trust-distrust dynamic and the main antecedents of these attitudes. The Chapter begins by outlining the objectives and methods of the thesis generally, and those used for data collection and analysis in the first stage of the study specifically. It concludes with a discussion of the main findings from this first stage and their implications for some of the hypotheses developed in the previous Chapter.

4.1 Objectives and Methods of the Thesis

The overall objective of the research was to gain an insight into the role of trust in safety performance. To achieve this it was first necessary to identify the conditions important for the development of trust within high-risk contexts and to understand its relationship with distrust (i.e., a trust-distrust dynamic). While safety researchers emphasise trust, it might be found that distrust plays an equally important and distinct role in safety. This possibility is reflected in the hypothesis that trust and distrust will manifest in a way that is consistent with a two-factor based approach (see Chapter 3). Specifically, trust and distrust were predicted to exist as distinct entities that compartmentalize in a relationship according to domain or area of organizational functioning.

To achieve the main objective and sub-aims, a two-stage approach was used. Stage one used qualitative methods to explore the perceived relationship between trust and distrust and the conditions important for the development of these attitudes within high-risk contexts. A qualitative approach is most appropriate at this stage because it provides a meaningful and contextually rich understanding of these issues that does not exist at an empirical level within safety writings. The absence of research on trust in a safety context means that quantitative methods such as questionnaires or card sorting tasks cannot be used as these typically rely on established findings. Therefore, the understanding provided by stage one created a solid foundation for further research and other methods.

Stage two used quantitative methods to explore the role of trust (and distrust) in safety. A questionnaire survey was used because it allows a large amount of data to be collected quickly and in a standardized way, which increases the study's objectivity. Questionnaires are also useful for gaining access to populations that are geographically removed and difficult to study using more intense and interactive methods. This was particularly beneficial in the current study as the offshore oil and gas industry provided the context in which to explore trust (see below). Finally, questionnaires are generally successful at collecting information on sensitive issues, such as trust and safety performance (Locke & Gilbert, 1995).

The questionnaire was developed using information collected from the interviews. Developing the questionnaire in this way allowed the problems associated with representativeness, which typically arises when a predetermined scale is applied to 'new' populations (Poortinga & Pidgeon, 2003), to be overcome. This increased the confidence in overall conclusions drawn from the quantitative stage of the study, which offered verification of the qualitative findings on a larger scale. As argued by Pidgeon, Walls, Weyman and Horlick-Jones (2003), qualitative approaches provide an insight into the complexities of people's attitudes while quantitative methods reveal the strength of these findings.

The high-risk work context used to explore the objectives of the study was the offshore oil and gas exploration industry because here trust features dominantly. As discussed in the Introduction Chapter, trust was implicated in the Piper Alpha disaster in the UK (Cullen, 1990) and has been argued to be a necessary element of successful safety leadership (O'Dea & Flin, 2001) and effective offshore safety initiatives (Fleming & Lardner, 2001). Further, the need for workers to live as well as work offshore increases the importance of safety and suggests that if trust plays an important role it will be most evident here. The intense periods of close proximity and frequent interaction between offshore workers also increases the likelihood that affect based trust will develop, which in typical organizational settings might not apply because of the time required for its development.

In the following sections, the details of, and findings from a number of interviews with offshore oil and gas exploration workers will be reported. In the next Chapter the development of the questionnaire, which forms the basis of the quantitative part of the study will be outlined.

4.2 Qualitative Study

4.2.1 Sample Characteristics

Participants were 14 male UK offshore oil and gas exploration workers. These were primarily recruited from two independent offshore unions following a letter that was sent to the unions' head offices outlining the nature of the study and the interviews. The head offices put forward ten participants, who were contacted directly to ensure that they were briefed on the nature of the study and were happy to participate. The remaining four participants were recruited through a snowballing process, where participants put forward by the unions provided details of other offshore workers that were happy to take part in the study. Because of the difficulty in gaining access to offshore populations, there was no attempt at any stage to recruit according to certain criteria such as age, offshore experience, and so on.

Of the 14 participants, 10 were operator staff and 4 were contractor staff. The operator personnel cover various roles offshore including technician, production worker, instruments, materials, team leader, senior supervisor (i.e., part of the management team), and health and safety officer. Two of the operator staff also act as safety representatives on their respective platforms. Regarding contractor staff, they occupy the roles of pipe fitter, insulator, electrical technician, and deck foreman. The average offshore working tenure of operator staff is 20 years (range 11-27 years), and for contractors is 21 years (range 19-25 years). The sample is therefore a good cross section of the offshore industry, with the main occupational roles, types of employing company (e.g., operator / contractor), and major oil and gas companies represented.

4.3 Data Collection: Semi-structured Interviews

Data were collected through individual semi-structured interviews that were conducted onshore within Universities or union offices at various locations throughout the UK. The use of semi-structured interviews has several advantages. First, it facilitates the development of rapport and empathy with workers. Second, it allows novel areas to be explored that are not considered as discussion topics prior to the interviews. Third, it allows a more refined understanding of the role of trust in safety to emerge by targeting issues that are highlighted by workers as important. Fourth, data are richer than that obtained with alternative approaches such as the 'structured interview' (Smith, 1995).

The optimal number of interviews to be carried out was driven by practical and theoretical factors. Practically, only a limited number of offshore workers were available to be interviewed, and theoretically this number was sufficient because exhaustion had occurred. For instance, analysis of the final interviews failed to contribute anything original to the list of codes that had been developed from earlier transcript data. As argued by Glaser and Strauss (1967), further data collection beyond this point serves only to add bulk to the coded data and nothing to the theory. As the interviews were directed towards theory development and verification, the number of interviews that were carried out was considered sufficient to fulfil this goal. Each interview lasted for approximately one hour and was guided by an interview schedule (see Appendix A).

4.3.1 Development of the interview schedule

The schedule was designed to offer a loose framework to the interviews and focused on issues relating to the role of trust in safety and the factors from which trust develops. The schedule had the advantage of allowing potential terminological ambiguities to be addressed prior to the interviews, and allowed greater attention to be paid within the interviews to the responses given. A review of the literature identified the three main areas of Safety, General areas of organizational functioning (i.e., domains), and general Trust as important starting points for understanding trust in safety. Issues surrounding Safety included responsibility for safety, safety communication, personal protective equipment (PPE), and general safety concerns. General areas of organizational functioning (e.g., job related factors), were discussed by asking workers if any aspect of their job might influence their safety performance or levels of trust placed in another with safety. Finally, issues relating to general Trust and Trust in another with safety (i.e., specific trust) were directed towards understanding a trust-distrust dynamic, the antecedents of these attitudes, and the levels of each offshore. The trust-distrust dynamic was approached through issues relating to the compartmentalization of trust and distrust and the morality of these attitudes (see Lewicki, McAllister, & Bies, 1998).

The order that issues were addressed during the interviews varied between workers and was based on the responses given to previous questions. To reduce researcher effects, minimal elaboration on questions was provided. In this way the possibility of prompting a certain 'type' of answer was much reduced. Before the beginning of each interview, a number of ethical issues were covered. The respondent was informed that the interview could be terminated or paused at any time, that they were not required to answer questions that they felt uncomfortable about, and that their responses were completely confidential. On agreement for the interview to be tape-recorded and later transcribed, the interviewee was assured that any identifying information would be blacked out within the transcript and that the tape would later be destroyed. All respondents agreed for the interview to be tape recorded and transcribed verbatim. To preserve the conversations as far as was possible, all utterances and pauses were included in the transcripts together with questions, elaborations and answers. Following this process, the tapes were destroyed.

Each interview was analysed immediately following transcription to allow subsequent interviews to be informed by analytic questions and emergent hypotheses. This resulted in the interview schedule being continually updated to integrate issues perceived as important by offshore workers while also omitting those that were identified theoretically as important in trust but not empirically for the offshore industry. This updating process had the advantage of preventing excess information from being collected. Although Glaser (1992) argued that this is *forcing* the data, others prefer to see it as *generating* data (e.g., Charmaz, 1995).

Ranking Exercise

To facilitate conversations on trust, which due to its sensitive nature makes it a difficult topic to explore, a ranking exercise was used. This was chosen over other methods such as brainstorming and card sorting tasks because of the limitations associated with these other method in the current study. For instance, brainstorming is typically used with focus groups rather than single individuals and card sorting tasks are most effective when knowledge relating to the core features of an issue exist. However, as trust has not been explored empirically in the offshore industry or in safety, information relating to these features (i.e., antecedents) is yet to be established and a standardized set of stimuli that can be reliably applied to a diverse range of individuals developed. While it might be possible for offshore workers to develop their own cards, the potential for idiosyncrasies reduces the ability to make meaningful comparisons.

The ranking exercise, which offered standardized material that was relevant to all workers, was taken from Pidgeon et al. (2003). In their study of public perceptions of trust in a number of government agencies, they found a ranking exercise, where workers were asked to rate their level of trust in a number of public agencies, to be effective in stimulating conversation. Modifying this exercise for use in the current study, workers were asked to rate their level of trust and/or distrust in a number of occupational groups offshore (refer to Appendix B). To control for presentation bias, a scale 'trust-distrust' was presented to seven respondents, and the reversed scale 'distrust-trust' was presented to the remaining seven. For each attitude (trust / distrust), the three levels of 'very little', 'some extent', and 'great deal' were presented. Additionally, a 'neutral' option of neither trust nor distrust was included to mark the midpoint of the scale. Workers used this option to indicate their attitude towards groups that did not operate on their installation or those where interaction is limited. The information collected from these scales was not analysed statistically as they were used as a way to facilitate conversation only.

4.4 Data Analysis: Grounded Theory

To extract the main themes from the interviews, data were coded using a modified version of Grounded Theory methods (Glaser & Strauss, 1967). This method was chosen because other qualitative approaches such as content analysis cannot be appropriately applied due to the absence of research specific to trust from which codes may be extracted. A coding scheme developed from related research (e.g., trust or safety) would therefore fail to be representative of the data collected from the offshore industry. For instance, the offshore industry has a unique working environment that requires workers to live as well as work offshore for a minimum of two weeks. A coding scheme developed from research looking at trust within a typical organizational context may not apply to the offshore industry. As argued by Blunsdon and Reed (2003), "the means by which workplace trust is fostered and develops needs to be considered in light of specific technical and social conditions impinging on the workplace" (p. 22). As the conditions offshore are relatively unique compared to other organizational settings, it was considered necessary to develop a set of codes that were specific to this industry and the data collected. One way to achieve this was through the use of Grounded Theory (see Pidgeon et al., 2003 for support).

Codes were taken directly from the transcript data and in most cases were a replication of the phrases or terms used by the respondent. This ensured that all codes were "grounded in" the data and that the coding scheme was a close representation of offshore worker's understanding of trust in safety. Similar to the original Grounded Theory methods advocated by Glaser and Strauss (1967), each line of transcript data was analysed. However, codes were applied to specific words, statements or sections of dialogue, rather than each line.

From the codes extracted, higher order categories were developed. This involved compiling frequently occurring or salient codes into a number of categories, with each category subsuming codes with some commonality. For instance, the category 'Ability' was used to refer to the codes, 'Expertise', 'Qualifications', and 'Experience'. Although categories comprised *in vivo* codes that were taken directly from the transcript data, the category itself was often a theoretical adaptation taken from the literature. For instance, the term 'Integrity' was used to capture the codes 'Openness', 'Truth', and 'Consistency'. While the codes are *in vivo,* the category label is a theoretical extraction. (For a list of categories, codes and definitions see Appendix C).

To assess the 'fit' of codes and categories to the data, constant comparisons within and between transcript data were carried out. This involved continually sorting and comparing codes and higher order categories between transcripts for similarities and differences. This process revealed a high degree of consistency between interviews and showed that codes could be applied to denote the same meaning in different transcripts. Similar to the approach taken by Pidgeon et al. (2003), the coding scheme was finalised following discussions between three independent coders on a series of transcripts. As Pidgeon et al. (2003) argue, this approach is similar to 'inter-rater reliability' checks within thematic content analysis except that in Grounded Theory the coding scheme emerges from the data.

4.5 Results and Discussion

4.5.1 The importance of trust in offshore safety

The overall objective of the interviews was to gain an insight into worker's understanding of trust in safety, and the importance workers attach to this relationship. In the interviews carried out, the presence of trust was recognised as important for living as well as working offshore. The hostile environments of offshore installations, together with the unique risks that individuals are exposed to (e.g., severe weather conditions), were perceived as strong reasons for the necessity of trust.

> *'I think the situation you're in offshore, you all have to trust each other to a certain extent. If you haven't got any trust and I didn't feel safe there, I wouldn't be there. At the end of the day, you're eatin, sleeping and living on the platform and err, in a dangerous situation there is nowhere to run to and hide. So you have got to have a certain amount of trust in everybody.' (M11, 7).*

> *'I think its down to personal survival because when you're offshore you can't run anywhere. If anything goes wrong you've got to tackle it there and then ... so there is a great deal of trust.' (M13, 29).*

> *'Everybody has got to trust their mate they're working with. It's such a dangerous atmosphere, you're in a thing where so much is happening all the time.' (M14, 21).*

One of the ways that trust increases feelings of safety is by reducing perceptions of risk. In its absence, perceptions of *physical risk* associated with the practical aspects of offshore work, and *psychological* or *relational risk* associated with another acting unsafely are increased. Important in reducing perceptions of relational risk is the belief that all workers operate by the same safety standards and that these standards are high. In the interviews, trust emerged as a key element of this process. As the following quote illustrates, trust ensures the successful transmission of an organization's safety culture values.

> *"...the individual you need to have trust, if there isn't any trust between people at that level then no matter what the safety culture is, it won't work." (M5, 5).*

Consistent with the theoretical writings of Reason (1997), this quote supports the suggestion that trust is a principal element of effective safety cultures. Further, it suggests that trust operates to sustain organizational safety values, which others have suggested act as a foundation for the development of trust (Sitkin & Roth, 1993). Based on the strong normative basis of safety cultures (Cooper, 2000), it might be expected that in climates of little or no trust, disparity in working practices and groups will develop and poor safety performance will emerge. Similar to the association between positive safety attitudes and reduced accident rates (Donald & Canter, 1993; Lee 1998), the findings reported here suggest that good safety is also dependent on positive trust attitudes.

Central to effective safety cultures are management (Flin et al., 2000). As research suggests, this group are key to influencing workers safety attitudes and hence behaviour, and are most successful when they are trusted (Mearns et al., 1997). Therefore, of concern for the offshore industry is the finding that levels of trust towards this group are low.

> *'I would say, I would say trust, backwards and forwards between er ... between management and er ... well between all groups is as bad as I've seen it since I worked in the industry.' (M1, 10).*

> *'I would say there was a big split between trust in the workforce and management.' (M4, 26).*

> *'I don't think the workers have any trust in the company at all.' (M6, 6).*

> *'So it's, the operating company have, okay trust in us, by the way you trust them with your life so you've got to have some sort of trust but you don't trust them too much.' (M8, 2).*

Consistent with the findings of others (e.g., Shaw, 1997; McCune, 1998), low levels of trust in management and the organization were attributed by workers to restructuring and the associated cost cutting and downsizing that has resulted. However, the restructuring itself does not affect trust but rather the degree of openness associated with this process. As argued by some of the workers,

> *'Erm ... and I think really, really you've got to be honest about it and say look guys, we know things are going to deteriorate. Things will be less safe but we've got to manage it like this to stay in business. Why not make that simple statement? Don't try to pretend things aren't going to change when they are changing, yeah. That would help* [to build trust], *it really would.' (M1, 11).*

> *'I would say they're less trusting of the motives behind the company, the company's changes, I don't think that they're reasonably kind to them. Secrets, and reducing staff isn't going to make things better. So distrust, yeah, probably there is a bit of distrust there between, as I say, more between ... offshore and onshore.' (M2, 39).*

These quotes provide the first indication of the factors that affect the development of trust at an organizational level. Specifically, they suggest openness and honesty as important.

4.5.2 Trust-distrust dynamic

One of the sub-aims of the interviews was to gain an insight into a trust-distrust dynamic to try and understand empirically the relationship between these two attitudes. This was explored through issues relating to the compartmentalization of trust and distrust within a relationship and the morality of these attitudes.

4.5.2.1 Compartmentalization

H^T6a: *Trust and distrust will co-exist within the same relationship through compartmentalization according to domain (or area of organizational functioning).*

The hypotheses that trust and distrust will co-exist within a relationship through compartmentalization was tested and supported by the interview data. Consistent with some theoretical writings (Lewicki, McAllister, & Bies, 1998), the workers interviewed agreed that attitudes of trust *and* distrust might be held towards the same individual or organization.

> *'I trust them to some extent in terms of their safety and the way they put what they want in a visual safety offshore. But that, in terms of the operating side, the cost side the budget side, erm, I have distrust in that side of things.' (M3, 19).*

> *'...with the managers if they told me my job was safe in the next five years, I'd know they were lying but if they told me they'd done risk assessment and felt it was safe to go ahead then I'd tend to trust that they had.' (M4, 13).*

These quotes express an attitude of trust towards the company and management with safety, but an attitude of distrust with regards to platform operations (M3) and job security (M4). As well as distinguishing between the domains of organizational functioning where trust and distrust are most appropriate, workers were also aware of the effects that one attitude can have on the other. In most cases, distrust was found to offset the positive effects of trust. For instance,

> *'The company will come out with a specific procedure and I trust that they are doing their best, right, on safety. I trust them to do their best. But because they are doing other things that annoy people, they convert that into not trusting. Its not logical, it doesn't make sense. It's the way it is'. (M6, 11).*

This quote suggests that within a relationship generally a single attitude will predominate, which may be different to that held within a specific domain of the relationship. For instance, the above quote shows that a company may be trusted with safety but due to the negative effects of their decisions in other aspects of the job, workers will predominately distrust the company (e.g., *not trusting*). Contrary to two-factor based approaches this suggests that at some level within a relationship, trust and distrust might be uni-dimensional.

Within some of the interviews it emerged that 'domain' might apply to areas of organizational functioning as well as 'personal' aspects of a relationship. It was further suggested that the level of trust held in another within one of these domains might affect the levels of trust in the other. For example,

> *'I don't think you trust somebody with personal information and you don't trust them to do their job safely.' (M7, 12).*

As the worker later argued,

> *'...if you trust somebody that much and er, eventually over a period of a couple of years where it becomes a friend and you're trusting him with personal things, then it might affect safety.' (M7, 17).*

Implicit in the comments of this worker (M7) is the suggestion that affect-based trust (indicated by the sharing of personal information) may affect cognitive-based trust (job related), but also that the former might develop from the latter. For instance, the quote, *"I don't think you can trust somebody with personal information and you don't trust them to do their job safely"*, suggests the necessity of trust at a cognitive (job) level for personal information to be disclosed. In sum, these quotes suggest that deep levels of trust in another might affect safety, which as the following sections will illustrate, can be in a negative way.

Although most offshore workers agreed that trust and distrust might be compartmentalized within a relationship, disagreement was expressed by one of the workers interviewed,

> '[Safety] *isn't something that you can differentiate ... that's a vision. Safety is something that's an aspect you consider when you're doing anything ... I don't think you can pigeon hole* [trust in safety], *I think that's your way of doing business. (M2, 30-31).*

As this worker argued, you trust another as a complete person not according to the domain in which they operate. Therefore, H^T6a was not supported in this case.

4.5.2.2 Morality of trust

H^T6b: *In some situations, trust will be dysfunctional ('bad') and distrust will be functional ('good').*

During the interviews, the hypothesis that trust might be bad for safety and distrust good was tested. In support of this, all of the workers interviewed identified problems that too much trust may have for safety,

> *'... if people sort of trust in you, you could lead them and a bunch of other people down the wrong path. So yeah, I see that as a real risk ... (M2, 42).*

> *'... we keep our erm, almost a mantra we have is review and challenge. Don't trust anybody if you like ... So trust can be a*

> *dangerous thing, in fact blind trust is lethal for safety.' (M5, 20).*

> *'I think its important not to trust anybody to a certain extent, not to trust them completely. ... You never go out, if you just send somebody out to do a job and you just trust them to do it and never go out and supervise it or look at it then I believe you have accidents and mistakes.' (M6, 22).*

> *'A guy you work with for a long time says, oh I've gone out and checked the valve and locked it, will you sign ... And it's okay, yeah, I know him, I trust him. We had an incident a couple of years ago ... said he'd closed the valve, and he'd just put the lever down the side of it.' (M11, 9).*

> *'... Like that little 10% you're not too sure on. That keeps you on your toes so I'd say that was a good thing not trusting them completely. ... And you shouldn't rely on other people for your safety. You've got to be alert all the time.' (M14, 19/20).*

These comments suggest that complete trust in another may have detrimental effects on safety. This finding advances current safety knowledge by suggesting that researchers should move away from discussing trust as an un-quantifiable entity and towards exploring optimal levels of trust for good safety. For instance, Clarke (1999) discussed the importance of "trust" for shared safety perceptions, and the UK HSE (1993) emphasised communications founded on mutual "trust" as characteristic of good safety cultures. However, the above quotes suggest that a moderate level of trust and an element of distrust (e.g., checking, supervising, etc) are important in safety. This is similar to Pidgeon et al.'s (2003) suggestion that effective risk regulation relies on situations of "critical trust", which refers to practical reliance on another combined with healthy scepticism. As the following quotes illustrate, this type of trust is also associated with the effective management of offshore safety.

> *'... perhaps a degree of suspicion. Which isn't always a bad thing.' (M1, 40).*
> *'But er, not trusting somebody is going to make you double check. Making you double check is going to make the job safe ...' (M7, 18).*

> *'I might go over and check personally because I might not trust they'd done it. Consequently I would make sure that whatever was being done was being done correctly. ... So I think there is an upside to distrust as well as a downside.' (M10, 12).*

> *'... when there's a job on the rig, electrical, generally it means breaking into systems that have been switched off. ... you'll have a piece of paper to say that so many people have checked this job ... The first thing you do is check it anyway. ... I've had quite a lot of junction boxes or panels that I've opened up and tested and they've been live because the guy that's done the isolation has isolated the wrong one.' (M12, 23).*

These comments emphasis the beneficial role that distrust towards another may have for safety. Together with the previous comments, it may be concluded that "healthy" safety cultures comprise an element of both trust and distrust.

H^T5b: *'Distrust in the form of monitoring or institutionalised controls will be perceived by workers as functional.'*

Evidence emerged from the interviews that supported the hypothesis that workers would perceive monitoring or institutionalised controls as functional.

Specifically, distrust in the form of surveillance and checking was perceived as an essential feature of a good safety culture and good safety practice. Further, these behaviours were perceived as equally important for both new and long-term workers, as both are equally vulnerable to accidents. As argued by some workers,

> *'… a bloke you've seen, I don't know, seen for 20 years and he's basically got a track record that you know but you still keep an eye on him.' (M2, 18).*

> *'Even a person as honest, trustworthy conscientious, er, the best operator in the world can make a mistake; can leave something undone. So it's not that I distrust you although it really is, you're saying to me, prove to me. And that's a healthy culture.' (M5, 22).*

> *'I know if I had six weeks on and I went back offshore, I wouldn't trust myself. If I said* [to] *the lads, just back off after six weeks, I know what I'm like. Keep an eye on me. I'm now at my most dangerous.' (M6, 22).*

While institutionalised distrust in the form of safety checks was perceived as functional for accident prevention, it was also perceived as a way to build trust. As argued by one worker, *'You get to do that a lot, you know you do a lot of STOP checks, so maybe that's building up a trust in that they've got to trust that what you mean you say.' (M6, 13).* Therefore, it might be argued that high-risk environments, especially the offshore industry, qualify as one of the situations that Lewicki, McAllister and Bies (1998) suggest distrust as more appropriate than trust.

4.5.3 Antecedents of trust and distrust

4.5.3.1 Company influences

One of the main aims of the interviews was to establish the conditions important for the development of trust and distrust offshore. Owing to the large number of contractor staff employed within this industry, it was possible that external sources such as employing company (i.e., the company an individual is employed by) would play a strong role. This was suggested by the work of Collinson (1999) who reported a division between offshore operator and contractor staff in both their attitudes and the treatment they receive from the operating company. In some of the interviews carried out in this study, employing company was identified to have some affect on the level of trust placed in another,

> *'We know historically that certain companies don't have the same standards that we do. Drilling companies ... I know the nature of their business, they've got a transient workforce. One month they will be off the coast of New Mexico with a Philippino workforce. ... its very difficult to train their workforce to the same standard that we're trained to.' (M10, 10).*

> *'... because of the old schemes of thought then there's always that little bit of distrust there because we've seen so many examples of bad workmanship. And even though these are working better, they really have to prove it to you* [and] *it takes a long time. You have a bit of distrust there, it takes a long time to get the trust.' (M13, 7)*

However, while employing company is recognised to influence the development of trust in some cases, more common is the finding that individual characteristics play a stronger role. Further, and of particular interest, was the finding that operator staff were perceived as less trustworthy compared to contractor staff. For instance,

> *'I mean if you know that he was from a company that is likely to have had the same safety culture, perhaps you would give him a bit more initial trust. But at the end of the day its back to whether he, you know, talks the job, does the job, like he would expect his company to want him to, yeah. So again, you're down to the individual because at the end of the day most of us at that point in time are not sure how they are as an individual ...' (M2, 37).*

> *'... I trust the person or the man. It doesn't matter if he's a service, contractor or a member of my team. Erm, at the end of the day its down to the individual. I've worked with some people in the operating company who ... because of their own, personality, for want of a better word, erm, have been less trustworthy than some of the contractors and service company who I feel have a higher level of integrity ...' (M3, 8).*

> *'... you make that decision* [whether to trust] *based on how you see them work and how you know them socially and knowing what they're like basically. So it doesn't matter whether they're contractors, whether they're staff, it's their attitude towards the job they do and how they go about it.' (M4, 3).*

> *'Well talking about the guys we deal with are, to me they are exactly the same as staff ... I think if there were a couple of guys there that I didn't trust ... I would say they were all staff guys.' (M7, 9).*

Implicit in many of these comments is the suggestion that history (Blau, 1964), and frequency of interaction (McAllister, 1995), play a role in the development of trust and distrust. This is implicated by comments such as, "they have to prove it to you and that takes a long time" and, "see them work and how you know them socially." More explicit comments are,

> *'I think its something you have to build. I mean you can only, erm, learn to trust somebody after you've worked with them for a while, got to know them a bit, see them on the job.' (M3, 9).*
> *'... I would say if you're talking about the offshore scenario its got to be, its got to be just over time. You can't just trust somebody straight away, there has got to be a bit history, a bit of background.' (M7, 15).*
>
> *'Obviously if I'm on a new installation they don't know me personally. Once you get to know them over a period of time it does help. First time you go on an installation and meet new people, you don't know who they are so they're not going to trust me until they know me.' (M9, 9).*

From these quotes it can be concluded that employing company has a strong influence on *initial* levels of trust and distrust in situations where interaction is limited. This is consistent with Levinger and Snoek's (1972) Categorization theory (see Chapter 3) and suggests that offshore, stereotypes are likely to relate to the individual's employing company. Therefore an employee of a trusted company is likely to be perceived as trustworthy. However, in situations of frequent interaction, such as within operator staff groups or between operators and core contractors, trust and/or distrust is based on perceptions of another individual's trustworthiness.

4.5.3.2 Individual influences: Trust

Regarding individual influences in the development of trust, two related hypotheses were tested:

HT4a: *Perceptions of trustworthiness will be based on Ability, levels of Integrity and displays of Benevolence.*

HT4b: *Antecedents of affect based trust (Integrity/Benevolence) will feature more dominantly in the development of trust compared to indicators of cognitive based trust (Ability).*

Analysis of interview data supported these predictions. Ability, Integrity and Benevolence emerged as important determinants of trust, and less emphasis was placed on Ability compared to the other two characteristics.

Evidence in support of the importance of Integrity was presented in the form of a number of indicators such as openness, honesty, and consistency (Mayer, Davis, & Schoorman, 1995). In a general sense workers noted that,

> *'...if you're going to have trust you've got to have openness and honesty.' (M1, 10).*

> *'... in terms of leadership it is very important that you get consistency and honesty from your supervisor ... Because if you want to trust somebody at the end of the day, they've got to be consistent with their views and the way they carry out the task.' (M3, 31).*

> *'What someone does and what they say and if the two match up then you, you get trust.' (M5, 3).*

'I trusted him on a personal level because he did what he said. He did exactly what it said on the label.' (M6, 15).

'And there is a lot of honesty there and he's very open so I do have a lot of trust for him.' (M13, 3).

The robustness of Integrity as a promoter of trust was further supported through discussions of trust specific to safety. As the two comments below illustrate, an individual who exposes another to risk may still earn trust if he is honest about the unsafe act.

'... the wire line supervisor told me they'd forgotten, he put a card on my desk telling me he'd forgotten to put a non-return valve in. Now you'd have to trust that man in the future. I didn't know it happened. That man is saying look we've done this, we've looked at our procedures and in the future this won't happen again. That sort of telling the truth builds trust.' (M5, 16).

'I tend to trust a little bit more people that are honest with me, again even if I'm sometimes told something I don't like. At least I know the guy is prepared to be honest to me.' (M10, 5).

The apparent inconsistency created by trusting somebody that has performed an unsafe act can be accounted for by the acceptance among offshore workers that mistakes are inevitable and often unintended by the individual. As the comment cited previously illustrates, "*even the best operator in the world can make a mistake" (M5, 22).* For the offshore industry, the finding of a relationship between openness and trust represents a significant problem for safety. Although openness about mistakes builds trust, the prevailing perceptions of blame offshore (Collinson, 1999) and in other industries (Pidgeon & O'Leary, 2000) reduces this type of reporting.

Evidence for the importance of Benevolence in trust development was most strongly presented in the form of perceived commitment to safety and considering others when making decisions. Both of these demonstrate a concern for the welfare of others, which has been argued to act as a strong indication of benevolence (Whitener et al., 1998). As noted by some workers,

> *'Well you know he considers people. He considers them in the planning, during the course of the job. And I mean, basically sort of a good bloke. You know, to work with and that. Kind, thoughtful, erm, considerate, you know, and so on and so forth. It all helps with building trust.' (M2, 34).*

> *'Demonstrate commitment. Key to earn trust with them.' (M2, 43).*

> *'If they've got the wrong attitude well then they take the wrong actions on a safety issue* [and that] *can destroy trust very easily.' (M5, 5).*

> *'I think you can trust the senior management who do care about safety.' (M5, 19).*

> *'Well they go about their business as safe as they can. The deck crew are safety conscious so is the catering. They've never had any accident that I've heard of so I trust them.' (M9, 4).*

Compared to the individual characteristics of Integrity and Benevolence, the importance of Ability in trust development was mentioned with relatively little frequency by workers. It was suggested in Chapter 3 that Ability has a weak influence in trust development because of its perceived non-voluntary nature

(Elangovan & Shapiro, 1998). This combined with demands of the offshore industry for multi-skilled workers, which often places individuals in situations that they are not skilled to deal with, offers one explanation for the minimal impact of Ability in offshore trust formation. This was supported by a comment made by one worker who argued, '*...trust is not a cut and dry thing across the board, it might be that he's just not had the background and the training.*' Consistent with Heider (1958), this suggests that offshore workers' attribution of another's Ability to external factors reduces their tendency to use this characteristic in decisions about another's trustworthiness.

4.5.3.3 Individual influences: Distrust

H^{T}5a: *Distrust will develop from violations of integrity and/or benevolence, but not from perceptions of another as incompetent (i.e., lacking ability).*

Partial support for the hypothesis that distrust would develop from violations of Integrity and Benevolence but not from Ability was found. While workers agreed that violations of Integrity and Benevolence are strong determinants of distrust, Ability was also implicated, although with relatively little frequency. For instance,

> '*... I would say a complete non team player. Very often they do lack in technical competence and they're often evasive. That's ... it's almost the inverse of what I've said* [in response to factors promoting trust]' *(M1, 40).*

> *'Somebody that's untrustworthy is somebody that will tell you one thing and actually mean another thing. Nice to your face and then stab you in the back. Somebody that will do anything to get his side of the job done at any cost.' (M8, 8).*

> *'I've got very little evidence to distrust them although I do have some. We are told certain things that never turn out to be the truth, in general terms.' (M10, 1).*

> *'And, basically the company had said whoever had done it, there wouldn't be any disciplinary action and then gave quite serious disciplinary warning out to people after it. That's not going to generate trust.' (M1, 9).*

> *'I'd say someone who's consistent all the way along, you know, the OIM I trust, I've never seen him push through anything that's got to be done whereas the other OIM I don't trust ... he's not consistent. ... Distrust I'd say comes down to consistency.' (M14, 16/17).*

An underlying feature of these quotes is that distrust develops from a perceived *violation* of some expectation. For instance, worker M10 comments that a person gaining trust through honesty will be distrusted when they are later revealed as untruthful. Similarly, worker M1 noted how a company that seeks to generate trust through what might be termed a 'Just Culture' destroys this by disciplining workers. The comment made by worker M1 also supports the prediction that procedural justice will be a stronger determinant of organizational trust compared to distributive justice (H^T2a), and that negative perceptions of procedural justice will be associated with low level of trust (H^T2b). The conclusion that procedural justice is more important for organizational trust compared to distributive justice is indicated by the absence of comments regarding the latter relative to the former.

Distrust of management

Discussions on the determinants of distrust offered a further insight into some of the reason for the decline of trust in management over recent years. Most of the workers interviewed suggested that low levels of trust were due to the egocentric drive of management to advance their career. This is similar to the observation that inappropriate high salaries operate to reduce trust in management (Shapiro, Sheppard, & Cheraskin, 1992; Tyler & Kramer, 1996). The effect that a perceived career drive has on the level of trust in management is accentuated when safety is perceived as negatively affected,

> *'Well why is that, well clearly because somebody's done something to earn the distrust, you know, the classical example is advance his own career over somebody else.' (M2, 44).*

> *'... fulfilling the role of operations supervisor, they also have some career objectives and obviously they will get a promotion out of it and do well for themselves and the company.' (M3, 5).*

> *'... way he thinks isn't necessarily about the safest way, the less stressful way, the most practical way to do the job, he's more interested in getting the job done to please his bosses.' (M3, 16).*

> *'A person I might distrust ... people, like I say have got vested interests, they make money on it, they've got their career on it, they've go to get on and get up ... (M4, 37).*

> *'British OIM's don't know where they're going next and its almost like a proving ground for them. It's a case of go out there and do a good job and by a good job basically what they*

> *mean is save us money any you'll get your pick of these three places.' (M7, 6).*

A drive for career advancement indicates a violation of affect-based trust, specifically the fulfilling of another person's needs (Lewis & Weigert, 1985), and concern for another person's welfare (Costigan, Ilter, & Berman, 1998). Similar to trust, it might therefore be concluded that distrust is influenced to a large extent by affective-laden perceptions of another as untrustworthy.

At an organizational level many of the conditions identified to promote distrust stemmed from breaches of integrity. While the recent restructuring offshore and the associated outcomes of redundancies and cost cutting has promoted distrust in the company, of greater influence is the 'secrecy' and lack of integrity during these periods. Other factors identified by workers to promote distrust include perceived breaches to psychological contracts (Morrison & Robinson, 1997), and threats to job security (Ashford, Lee, & Bobko, 1989; Anderson & Bateman, 1997). As noted by one worker,

> *'I would imagine with a lot of the people, quite a high percentage would say no because they did this, they didn't pay us the bonus, they didn't do that, you know they wouldn't give us the holidays, Charlie went to do so and so and they didn't pay his expenses for that. You know, that's what they mean by the word trust.' (M6, 14).*

In sum, discussions with workers revealed interpersonal distrust to develop from violations of the same characteristics implicated in the development of trust: Ability, Integrity, and Benevolence. At an organizational level, factors were identified that related to psychological contract breach, threats to job security, and secrecy during restructuring.

4.5.4 Theory development: 'An Integrative Approach'

A new finding that emerged from the interviews was that a trust-distrust dynamic might be accounted for using both a continuum and two-factor type approach. For instance, the comments made by workers suggest that at a global (relationship-based) level, trust and distrust operate as distinct entities that coexist through compartmentalization to define a relationship. While another might be trusted with safety, they may be distrusted with some other aspect of the job. However, at a local (within-domain) level, trust and distrust operate on a continuum where another person is trusted *or* distrusted. This was indicated by the findings that the antecedents of distrust are the converse of trust. Specifically, positive perceptions of Ability, Integrity and Benevolence promote trust, while a perceived violation of the expectations based on these characteristics leads to distrust. In sum, this integrative framework suggests that continuum and two-factor theories should be regarded as complementary rather than as competing explanations of a trust-distrust dynamic.

4.6 Summary

In this Chapter, a number of hypotheses were tested that related to the importance of trust in offshore safety, its relationship to distrust, and its antecedents. Findings from a number of interviews with offshore workers supported the importance of trust in safety by suggesting that it operates to reduce perceptions of risk and increase the successful transmission of safety culture values. However, although trust is important in safety, workers perceived too much trust to have detrimental effects. An element of distrust in the form of checking and monitoring was therefore regarded as essential. This advances current safety understanding in three ways. First, it suggests that safety professionals should pay attention to *optimal levels* of trust rather than to trust per se, second, attention should be directed towards distrust and its role in safety and third, attention should be paid to the domain specific nature of trust. The use of grounded theory methods made this insight possible because it extracts an understanding of a phenomenon from the data collected rather than assuming an understanding from existing research. Within existing literature, these findings do not exist. Also, new to emerge from the interviews is the finding that a trust-distrust dynamic may be explained by both a continuum and two-factor theory. Specifically, at a global relationship level, trust and distrust co-exist as distinct entities, while at a specific level they exist on a continuum. That is, another will be trusted (or distrusted) with some specific task based on positive (or negative) perceptions of another's Ability, Integrity and Benevolence. The consensus among offshore workers that trust and distrust are based on perceptions of these characteristics suggests them as reliable measures of these attitudes. In the following Chapter, the findings of this study will be used to develop a measurement tool specific to the offshore industry.

Chapter 5

Development of a Tool to Measure Trust Climates in the Offshore Industry: The Trust Climate and Safety Questionnaire

In the previous Chapter, a number of conclusions were made regarding the nature of trust climates offshore. As these conclusions are grounded in qualitative data, there exists a need to validate them objectively in a larger sample. In this Chapter, the development of a measurement tool designed to facilitate this test is discussed.

5.1 Underlying Assumptions: Theoretical and Empirical

One of the biggest problems faced by trust theorists when developing a measurement tool is in deciding the dimensions to include. The vast majority of scales that currently exist focus on single dimensions such as general trust (Cook & Wall, 1980), trustworthiness (e.g., Mayer & Davis, 1999), or the psychological foundations of trust (e.g., McAllister, 1995). These 'single dimension' scales are advantageous for their simplicity and the detailed insight they provide, but they fail to capture the interplay between several dimensions that define the structure of trust in a specific context. These scales are also limited by their focus on a single target object, which in most cases tends to be management (e.g., Clark & Payne, 1997; Whitener et al., 1998; Mayer & Davis, 1999). One of the aims of the questionnaire developed for this study is to understand the complexities of interplay in the development of trust and distrust attitudes offshore.

To facilitate the development of the questionnaire, the 'Trust Climate and Safety Questionnaire' (TCSQ), a number of assumptions were made. These were grounded in both theoretical and empirical work, and in most cases have been used in previous research as a single focal area of interest. Drawing on previous research, it was assumed that trust climates offshore would comprise both trust and distrust attitudes (Lewicki, McAllister, & Bies, 1998) held towards the organization and its members (Whitener, 1997). The strongest determinant of trust was assumed to be trustworthiness (Deutsch, 1958; Costa, 2003), while distrust was expected to develop from perceptions of another as untrustworthy (Hardin, 2002). Based on a vast body of research (see Mayer, Davis, & Schoorman, 1995), trustworthiness expectations were assumed to develop from perceptions of Ability, Integrity and Benevolence. In addition to these 'situational' determinants, trust climates were also expected to be a function of individual factors that relate to personality, or more specifically, an individual's predisposition to trust (Rotter, 1967).

Before applying these theoretical assumptions to the development of the TCSQ, it was first necessary to empirically validate them as important in the offshore industry. This validation was provided by the interviews with offshore workers detailed in the previous Chapter. For instance, workers agreed that trust and distrust might be compartmentalized within a relationship, in that the same individual may be trusted and distrusted. Workers were also able to distinguish between their level of trust / distrust in different occupational groups and the company, and discuss these with relation to experiences specific to these groups. The interviews also revealed the strongest determinants of trust to relate to another's level of Integrity, displays of Benevolence and to some extent their Ability. It also emerged that violations of expectations based on these characteristics promoted distrust. The only theoretical assumption that was not supported in the qualitative study related to the importance of personality in trust. However, this might be accounted for by its failure to emerge as a discussion topic during the interviews. Owing to the high degree of consistency between the literature and empirical findings of this study, these assumptions were used to measure trust climates in the offshore industry. In the following sections, the operationalization of these assumptions will be outlined.

5.2 Development of Trust Scale Items

To capture the above assumptions, it was first necessary to collapse them into a number of dimensions that could be used to form a basis for the TCSQ. Broadly, three dimensions were identified that related to attitudes of trust and distrust, internal and external influences in trust and distrust development (e.g., disposition / situational [trustworthiness], respectively), and organizational / interpersonal referents. To measure these dimensions within the questionnaire, a number of approaches were taken. For dispositional trust, a well-established Interpersonal Trust Scale was used (ITS; Rotter, 1967). For situational trust, new scales of items were developed to measure organizational and interpersonal trust and distrust that were specific to the offshore industry. Developing a new scale of items was necessary because of the specificity of situational influences (i.e., another's trustworthiness) to an organizational context. This ensures that the questionnaire is representative of the sample and phenomenon under study (Poortinga & Pidgeon, 2003). In the following sections, information relating to the development of these items will be discussed.

5.2.1 Organizational trust items

The importance of measuring trust attitudes towards the organization is suggested by the strong role that organizational trust plays in the promotion of interpersonal trust (McKnight, Cummings, & Chervany, 1998), and good safety cultures (HSE, 1997). For instance, a high level of trust at an organizational level is predicted in the present study to be strongly related a high level of trust in management (H^T1), and consequently between organizational members.

Attitudes of trust and distrust towards the organization can be measured using items developed from the comments made by offshore workers during the interviews (see Chapter 4). Rephrasing comments from the transcript data overcomes the problem associated with the limited amount of published research specific to organizational trust. In most cases, the items developed were found to reflect factors associated with trust in the literature. Specifically these included organizational support (Eisenberger et al., 1986; Whitener, 2001), organization culture (Grey & Garsten, 2001), justice mechanisms (Van den Bos, Wilke, & Lind, 1998), and psychological contracts (Robinson, 1996). These factors are not exclusive to trust development, but exist as distinct organizational entities.

5.2.2 Interpersonal trust items: A Facet approach

To measure interpersonal trust and distrust, items were developed using a facet approach (Guttman, 1959). This provided a structured approach to item development that ensured that all potential variations in the dimensions of interest were measured within the TCSQ. For instance, it ensured that items were included that measured general trust in another based on perceived ability, and also general trust in another based on perceived integrity. Further, the reported success of this approach for measuring attitudes such as safety (Donald & Canter, 1993), trust (Clark & Payne, 1997) and drug use (Donald & Cooper, 2001), suggest it to be a useful and practically reliable approach.

A facet approach requires a number of components or facets to be identified that make up an area of interest (e.g., trust climates). These are broken down into their constituent elements, which may be defined as the different values or points that logically and completely describe all variation within that facet (Donald, 1995). To link facets (and elements) together, it is useful to use a mapping sentence, defined by Shye (1978) as a "verbal statement of the domain and range of a mapping including connectives between facets in ordinary language" (p. 413). Additionally, a mapping sentence also includes a range facet that when ordered with the same underlying meaning for all items is considered as a 'common range'. This range covers all possible responses to an object and is critical to a facet approach because, when combined with the mapping sentence, it provides the basis for the development of questionnaire items and the operationalization of the construct (for a detailed discussion of facet theory see Shye, 1978; Canter, 1985; Donald, 1995).

In the current study, four facets were identified to encapsulate the dimensions related to situational influences and interpersonal trust/distrust. In the following sections the elements of these facets will be discussed followed by their measurement within the TCSQ. The range facet and the mapping sentence will then be presented.

5.2.2.1 Facet 1: Focus facet

A focus facet relates to the level (or domain) in which trust and distrust are assessed and comprises two elements: General and Specific. General attitudes are predominately measured by other scales (e.g., Cook & Wall, 1980; McAllister, 1995; Mayer & Davis, 1999), and provide an insight into attitudes towards another within the relationship as a whole, or in other words, another in general. In contrast, Specific attitudes provide a measure of attitudes towards another in a specific area of the relationship. As research suggests, trust is largely dependent on the domain under study (Zand, 1972), with differences between general and specific attitudes likely to exist (Lewicki, McAllister & Bies, 1998). Empirical support of this is Clark and Payne's (1997) study of trust in management where a distinction between trust in general management and trust in management specific to the job was reported. As they suggest, scales should be developed to include both forms of attitude as this allows a distinction between the macro and micro aspects of trust to be made.

Measurement within the TCSQ

A focus facet with the elements General and Safety-specific was used to part-underlie the interpersonal scales of the TCSQ. However, unlike Clark and Payne (1997), these facet elements were not used to refer to a general group (global management) and a specific group (immediate manager), but to a relationship in general and safety in particular. This allowed the question of whether workers distinguish between their trust in another with safety and their trust in another generally to be addressed. Establishing this would provide an indication of whether trust based safety initiatives should aim towards changing safety-specific behaviour or behaviour in general. This study will be the first to show the relationship between these focuses of trust/distrust within industry.

To measure the safety element, it was suggested during the interviews that this might be achieved directly using the term 'safety' or indirectly through 'profit' and 'maintenance'. The negative impact that a drive for profit has on safety is well documented (Mearns, Flin, Gordon, & Fleming, 2001), and was suggested by the workers interviewed as a promoter of distrust in management. The main caveat with using these indirect measures is their potential to be interpreted as independent domains to safety. However, their minimal use in the TCSQ combined with the strong salience of safety reduce the likelihood of this occurring.

5.2.2.2 Facet 2: Attitude facet

Capturing the attitudes of trust and distrust is an attitude facet. Generally, research focuses explicitly on the former in isolation of the latter as it is assumed that low scores on a 'Trust' measure are indicative of distrust (Rotter, 1967; Stack, 1978), or mistrust (Clark & Payne, 1997). However, more recently it has been argued that trust and distrust do not operate on a continuum but exist as distinct entities with different antecedents and different functions (e.g., Lewicki, McAllister, & Bies, 1998). In sum, this suggests that attitudes towards another will be predominately one of trust and/ or distrust depending on the context that is being evaluated.

Measurement within the TCSQ

Based on previous research, an attitude facet was used in the TCSQ that comprised the elements trust and distrust. These attitudes were included as distinct elements for a number of reasons. First, interviews with offshore workers suggested that trust and distrust have different functions and may co-exist as distinct entities, which is crucial for 'healthy' safety cultures. Second, distinct trust and distrust elements allowed two-factor and continuum theories to be tested quantitatively. That is, it allowed trust and distrust to be explored directly and independently, rather than relying on a measure of trust to provide an indirect insight into distrust. Third, the attitude facet allowed items to be developed that were exclusive to trust and distrust independent of their antecedent factors (i.e., trustworthiness). As outlined in Chapter

3, trust and trustworthiness are strongly related but independent constructs (Mayer & Davis, 1999; Hardin, 2002).

To measure trust and distrust, it was suggested from analysis of the interviews that the same determinants might be used, with their only difference relating to reported valence. Because of this, distrust items can be developed using the same factors as trust items, but framed negatively and reverse coded. While trust and distrust can be designed on a continuum this does not prevent the emergence of a two-factor type structure. For instance, combined with the focus facet, it is possible for another to be trusted with safety but distrusted generally.

5.2.2.3 Facet 3: Characteristics facet

Research suggests that certain individual trustworthiness characteristics are important in the development of interpersonal trust and distrust (Deutsch, 1958; Costa, 2003). Theoretically and empirically these have been shown to relate to the three broad categories of Ability, Integrity and Benevolence, which are indicated by a range of individual qualities (Mayer, Davis, & Schoorman, 1995; Mayer & Davis, 1999). At a more macro level, these characteristics can be grouped into the two psychological bases of trust that relate to cognition and affect. For instance, in Chapter 3 it was suggested that cognitive based trust is indicated through ability, while affect-based trust relates to integrity and benevolence (see also, Caldwell & Clapham, 2003; Erdem & Ozen, 2003).

Measurement within the TCSQ

Measurement of a characteristics facet within the TCSQ was achieved through the elements Ability, Integrity and Benevolence, which were validated during the interviews as important in the offshore industry. Consistent with the argument that, "it is not appropriate to simply develop one question per item, but rather to include a range of questions which might be seen as 'tapping' the relevant aspects of the conditions that relate to the trustworthiness of others" (Clark & Payne, 1997; p. 211) multiple indicators were used to tap these constructs. As well as indicating trust, these qualities were also identified in the development of distrust when they were perceived as violated. The identification of the same characteristics in the development of trust and distrust suggests that as well as trust, a cognitive/affect divide might also apply to distrust. This, however, has not been validated empirically. This study will be the first to provide an insight into whether distrust comprises distinct cognitive and affective components. In sum, the characteristics facet directly measures the micro aspect of trustworthiness and indirectly measures the macro dimensions of cognitive/affect based trust.

5.2.2.4 Facet 4: Target facet

As trust is specific to relationships, it is necessary to identify a target. Within industrial organizations, a number of roles have been identified to influence attitudes. These are Workmates, Supervisors, (Offshore) managers, Safety personnel and Contractor staff. In the following sections, a brief outline of each role and their inclusion in the TCSQ will be given.

Workmates

The importance of assessing attitudes at this level is stressed by trust and safety findings where positive attitudes towards workmates are associated with increased job satisfaction and organizational commitment (Pearce, Sommer, Morris,

& Frideger, 1992), and reduced accident frequency (Donald, 1994; Lee, 1998). In agreement with Whitener's (1997) observation that trust within groups reflects expectations and beliefs about group members as a whole not the aggregate levels between each dyad, the terms "your colleagues" and "the people you work with" were used to frame items in the TCSQ (see also, Pearce et al., 1992).

Supervisor

Offshore supervisors are recognised to play a key role in shaping workers attitudes and behaviour (Carnegie, 1995; Mearns et al., 1997), as their daily interaction with workforce members places them in the position of immediate leader and role model. As leaders, supervisors are most effective at managing safety when they develop a sense of respect and trust with workforce members (Mearns et al., 1997). This, combined with the finding that supervisors operate as a distinct and more influential group to managers (Thompson, Hilton, & Witt, 1998), necessitated their specificity in the TCSQ.

Offshore management

Management have been identified as a strong influence in the development of trust attitudes within an organization (Whitener, 1997), where the level of trust they portray to workers is reciprocated (Pfeffer, 1992). In the offshore industry, offshore management will in most cases be specific to the offshore installation manger (OIM). However, during the interviews carried out (Chapter 4) it emerged that on some platforms, offshore management will also be used to refer to the offshore production, logistic-coordinator, and operation supervisors. This is consistent with previous research that reports organizational members typically do not distinguish between members of a senior management team (e.g., Donald & Canter, 1993). Based on these observations, it was considered appropriate and reliable to use the single term "management" when framing items within the TCSQ to refer to offshore management. Further, labelling the section, "offshore management" reduced the tendency of workers to use onshore management as a referent when responding to items in this section of the TCSQ.

Safety personnel

Offshore safety personnel comprise safety representatives and safety officers (also known as offshore safety and environment officers; OSEO's). Although both roles are directly involved with safety issues offshore, an explicit distinction was made between these groups within the TCSQ because of differences in their functions and level of operation. Safety representatives occupy one of a variety of roles offshore that relate largely to frontline positions (e.g., production, technician, etc.). They act as a vehicle for workforce members to raise safety concerns with management and their interaction with workers is frequent and due to their perceived job and character similarity, is likely informal. In contrast, safety officers are employed solely to ensure that safety is adhered to. Their power to enforce safety policies, together with their close proximity to managers and infrequent contact with workers promotes formal interaction with workforce members. Safety representatives therefore operate bottom-up (workforce to management), while safety officers function top-down (management to workforce). A distinction between these roles was therefore important within the TCSQ.

Contractors

Contractor staff represent over 80% of the offshore workforce. It might therefore be expected that attitudes towards them will largely define the structure of offshore trust climates. Further, research by Collinson (1999) has identified the presence of in-group / out-group stereotypes offshore based on employing company, which influence attitudes and behaviour. The interviews held with offshore workers in this study indicate these biases to pose a problem for trust development in transient contractors but not core contractors. The inclusion of a contractor section within the TCSQ allowed these biases to be explored quantitatively. A contractor subscale also maintained consistency with a number of other safety attitude measures (e.g., Donald & Canter, 1993; Mearns et al., 1997; Lee & Harrison, 2000).

5.2.2.5 Range Facet: Response scale

Consistent with a vast number of measurement tools (e.g., Kelley, 1923; Symonds, 1924; Miller, 1956; Green & Rao, 1970; Ramsey, 1978; Peter, 1979; Donald & Canter, 1993), a seven-point Likert type scale was used to assess the level of agreement to trust/distrust items. Likert scales have the advantage of allowing a large number of responses to be collected relatively quickly and in a standardized way (Fife-Schaw, 1995). They also reduce the number of vague and ambiguous responses that can be given when open-ended questions are used. Finally, the use of a seven-point scale had the practical advantage of reducing the tendency of respondents to use the neutral (central) option when rating their level of agreement to an item (Matell & Jacoby, 1972).

In the TCSQ, the seven-point scale ranged from '*Very strongly disagree*' (1), to '*Very strongly agree*' (7). A neutral option of '*Neither agree nor disagree*' (4) marked the mid point of the scale. Distrust items were reverse coded, therefore, higher overall values indicated high levels of trust. This was taken to represent a good common range because all responses to the items were covered and the scale had the same meaning for all questionnaire items.

5.2.2.6 Modality of questionnaire items

Moving on from discussing the facets elements, it is important to note the modality in which the items developed from the elements were framed. As an attitude, trust and distrust are determined by the beliefs, feelings, and behavioural intentions that an individual holds towards a potential trustee (see Scott, 1980; Lewis & Weigert, 1985; Clark & Payne, 1997). Although all components are important for understanding the dynamics of trust, items within the TCSQ were conceptualised according to the belief modality only (cf., Clark & Payne, 1997). These relate to an individual's belief about the extent to which a target is likely to behave in a way that is "benevolent, competent, honest, [and] predictable in a situation" (McKnight, Cummings, & Chervany, 1998, p. 474). These are distinct from trusting intentions, which refer to the extent that an individual is willing to make himself vulnerable to a target's action. While beliefs and intentions are distinct modalities of trust and distrust, research generally supports a positive relationship between the two, both generally and specifically with relation to trust (Ajzen, 1988; McKnight, Cummings, & Chervany, 1998; Stewart, 2003). A strong relationship between beliefs and intentions (behaviour) is further supported by established social psychological theories such as Festinger's (1971) Cognitive Dissonance Theory and Bem's (1972) Self-Perception Theory. By measuring trusting beliefs, it is therefore possible to gain an insight into how an individual is likely to behave.

Framing items within the TCSQ according to a trusting belief had the practical advantage of producing a relatively short questionnaire that increases the likelihood of organizational participation due to its quick completion time. At an empirical level, a belief modality was indicated through interviews with offshore workers as a representative measure of trust and distrust in the offshore industry. For instance, compared to intention and feeling modalities, trusting beliefs were highly salient to offshore workers and provided a frame of reference for assessing another person's trustworthiness.

5.2.2.7 Mapping Sentence

The four facets: Focus, Attitude, Characteristics, and Target are linked together by the mapping sentence and Range facet, as shown in Figure 5.1. By linking one element from each of the four facets, 60 structuples (2x2x3x5) are generated. These can be transformed into questionnaire items using the normal language of offshore workers. For instance, the structuple: a1b2c1d1 (comprising the elements General / Distrust / Ability / Workmates) can be converted into the item, *'My workmates are not experienced offshore workers'* (see Table 5.1). Rather than use the element labels of the Characteristics facet within questionnaire items, a range of different individual qualities were used. For instance, Benevolence, which refers to demonstrations of care and concern may be measured by commitment to safety and shared values, while Integrity may be measured through the individual quality of consistency. Avoiding the use of the term Integrity and Benevolence served to reduce ambiguity when interpreting their exact meaning (for a list of the individual indicators used to tap Ability, Integrity and Benevolence see Table 5.2).

The extent to which **respondent (x)**

	(A) **Focus**	(B) **Attitude**		(C) **Characteristics**
has	{a1 General}	{b1 Trust}	in the	{c1 Ability}
	{a2 Safety-specific}	{b2 Distrust}		{c2 Integrity}
				{c3 Benevolence}

	(D) **Target**		**Range**	
	{d1 Workmates}		(very much)	
of his or	{d2 Supervisors}	→	(to)	trust/distrust.
her	{d3 Management}		(not at all)	
offshore	{d4 Safety Personnel}			
	{d5 Contractors}			

Figure 5.1: Mapping sentence underlying the interpersonal scales of the Trust Climate and Safety Questionnaire

To tap trust and distrust directly, only facets A, B, and D were used. The characteristics facet (C) was omitted from this process because it measures trustworthiness, which as explained in Chapter 3 exists as an independent dimension to trust and distrust. Combining facets elements A, B, and D generated a further 20 structuples (2x2x5). Of these, 8 were randomly selected to be included in the TCSQ. This had the advantage of keeping the questionnaire relatively short (which increases response rates; Fife-Schaw, 1995), while also providing an adequate direct measure of trust and distrust.

5.2.3 Dispositional trust items

As well as situational influences in trust, an individual disposition to trust has also been shown to have some influence (see Chapter 3). To measure an individual's predisposition to trust within the TCSQ, a shortened 8-item version of Rotter's (1967) Interpersonal Trust Scale (ITS) was used. This shortened scale has been validated as a reliable measure in some studies (Schoorman, Mayer, & Davis, 1996),

Table 5.1: Trust Climate and Safety Questionnaire items and facet elements

Facet elements	Trust Climate and Safety Questionnaire item
a1b1c1d1	I trust that my workmates are competent in their own areas
a1b2c1d1	My workmates are not experienced offshore workers
a1b1c2d1	I can trust my workmates to tell me the truth
a1b2c2d1	The people I work with would take credit for something they haven't done
a1b1c3d1	My workmates are kind and thoughtful
a1b2c3d1	My workmates would disclose to others information I told them in confidence
a2b1c1d1	The people I work with know the difference between having a laugh and doing a job safely
a2b2c1d1	My workmates lack the ability to decide if a job is safe to carry out
a2b1c2d1	I can trust my workmates to be open when it comes to mistakes they might have made
a2b2c2d1	I can't trust my workmates to maintain high levels of safety even when they say they will
a2b1c3d1	I can trust my workmates to support me if I had a complaint about safety
a2b1c3d1	My workmates don't care about my safety
a2b2c3d1	My workmates are not afraid to stop a job if they think it is unsafe
a1b1c1d2	I trust my supervisors ability to do his job
a1b2c1d2	My supervisor is incompetent when it comes to managing his team
a1b1c2d2	My supervisor keeps the promises that he makes
a1b2c2d2	I often find that what my supervisor says is untrue
a1b1c3d2	My supervisor would go out of his way to help me
a1b1c3d2	I can talk to my supervisor and know that he will want to listen
a1b2c3d2	My supervisor is afraid of upsetting management
a2b1c1d2	I can trust my supervisor's judgement when it comes to safety
a2b2c1d2	I don't trust my supervisors ability to make sure jobs are carried out in a safe way
a2b1c2d2	I can trust my supervisor to be fair in the way he deals with safety incidents
a2b2c2d2	My supervisor often emphasizes safety publicly but then cuts corners when carrying out his job
a2b1c3d2	My supervisor wants a job done safely even if it means extra time or extra cost
a2b2c3d2	My supervisor is not willing to listen to concerns I might have about safety
a1b1c1d3	Management are well qualified
a1b2c1d3	I am not confident in management's skills
a1b1c2d3	I can trust management o do what they say they will do
a1b2c2d3	Management are vague when answering questions the workforce have about issues that affect them
a1b1c3d3	I have a good rapport with management
a1b2c3d3	I am suspicious of the motives behind management's actions
a2b1c1d3	Management is successful at ensuring safety policies are adhered to offshore
a2b2c1d3	Management lack the experienced needed to know how to do a job safely
a2b1c2d3	Management are honest when it comes to safety
a2b2c2d3	Management lie about safety standards offshore to create a favorable picture
a2b1c3d3	Management frequently demonstrate their commitment to safety
a2b2c3d3	Management like to blame people when mistakes are made
a2b2c3d3	Management will overlook safety issues to advance their career
a1b1c1d4	I trust my safety officers ability to do his job
a1b1c1d4	My safety officer lacks the interpersonal skills necessary to carry out his role
a1b1c2d4	I can trust my safety officer to give me feedback
a1b2c2c4	My safety officer is not open to the suggestions I might have
a1b1c3d4	Safety representatives have my best interests at heart
a1b2c3d4	I see my safety officer as part of management
a2b1c1d4	My safety representatives lack the experience required to represent the workforce on safety issues
a2b1c2d4	My safety representatives are open and honest
a2b1c3d4	I can trust my safety representatives to listen to suggestion I might have about how safety can be improved
a2b2c3d4	My safety officer rarely supports the workforce when they raise safety issues
a1b1c1d5	Contractors are very capable at performing their job
a1b2c1d5	Contractors are not professional in the way they carry out their work
a1b1c2d5	Sound principles guide contractors behaviour
a1b2c2d5	Contractors are inconsistent in the way they carry out their work
a1b1c3d5	Contractors would go out of their way to help me
a1b2c3d5	Contractors are only concerned with looking after themselves
a2b1c1d5	Based on past experience, I know I can trust contractors to act safely
a2b1c1d5	I trust contractor's judgement in deciding whether a job is safe enough to carry out
a2b2c1d5	Contractors lack the training needed to carry out jobs in a safe way
a2b1c2d5	Contractors are open and honest about safety
a2b2c2d5	Contractors would conceal mistakes they might make even if doing so might put others at risk
a2b1c3d5	I can trust contractors to consider other peoples' safety when carrying out their work
a2b2c3d5	Contractors often take short-cuts to get the job done quickly even if it puts others at risk
a2b1d1	I trust the people I work with to carry out jobs safely
a1b1d2	I trust my supervisor to make decisions that affect me
a2b1d3	I can trust management to make sure the installation is run in a safe way
a1b1d3	I trust management on my installation
a1b1d5	Generally, I trust contractors
a1b2d1	Generally, I don't trust my workmates
a2b2d2	I can't trust my supervisors with a job that impacts on my safety
a2b2d5	I can't trust contractors when it comes to safety

Table 5.2: Indicators used to measure elements of the Characteristics Facet

Ability		Integrity		Benevolence	
Indicator	**Item** [1]	**Indicator**	**Item**	**Indicator**	**Item**
Competence	W1, S13, C10	**Openness/ Honesty**	W6, W12, W13, M6, M13, SP1, SP10, C2	**Support**	W2, S5, M2, SP4, C15
Ability	W7, S3, S14, SP9			**Care**	W4, W11, S15, C3
Expertise	SP6, M9	**Truth**	W9, S4, M11, C12	**Concern**	S6, S8, SP3, C1, C9
Judgement	S2, C13	**Behavioural-Integrity**	W5, S11, M3, SP2	**Safety Commitment**	W15, S12, M1
Interpersonal/ Job Skills	SP8, M4, M10	**Consistent**	S10, C8	**Rapport**	M7
Experience/ Training	W10, M14, C5, C11	**Fair**	S1	**Value Congruence**	M5, M12, SP5, SP7
		Sound Values	C7		
Professional	C6				

[1] Codes refer to the subscale and item number within the questionnaire (e.g., W1 refers to item 1 in the Workmates subscale)

but has been shown in others to have poor internal consistency (Mayer & Davis, 1999). This is demonstrated by the differences in Cronbach alpha estimates, which show a reduction from $\alpha = .71$ to $\alpha = .60$ between the two studies. The reliability of this scale in an offshore context remains to be established, as does the relative strength of dispositional compared to situation based trust.

5.3 Demographic and Safety Scales

Additional to a number of trust scales, the TCSQ was also designed to collect demographic information and self-reported safety data. An outline of each of these follows.

5.3.1 Demographic scale

To collect demographic and job related information, the TCSQ uses items taken directly from the Offshore Safety Questionnaire (OSQ; Mearns, et al., 1997), which were qualitatively based or categorical (e.g., male/female). Practically, collecting background information has the advantage of allowing the potential existence of trust subcultures offshore to be explored. As argued by Pidgeon (1991, 1998), within any organization there may exist a number of co-existent subcultures, which may relate to factors such as seniority, occupation or age (Mearns et al., 1997). Understanding these subcultures is important because they can reveal a range of perspectives or understandings, which may uncover issues of importance that would go unnoticed if culture were approached as a homogenous entity. Methodologically, analysing for trust subcultures based on some background criterion will also establish the TCSQ's discriminate validity.

5.3.2 Safety scale: Accidents, incidents and near miss involvement

The final scale within the TCSQ collects information related to the occurrence and frequency of accidents, incidents and near-miss events. Although objection has been raised over the accuracy of self-reported safety data (e.g., Glendon & McKenna, 1995) because of the problem of underreporting (Marottoli, Cooney, & Tinetti, 1997), they are generally accepted as a reliable measure and in most cases the most accurate means by which safety information can be collected (Mearns et al., 2001). Safety information was collected using mainly the dichotomous measure of "yes/no". Including this measure within the TCSQ was important for assessing the role of trust in offshore safety.

5.4 The Overall Structure of the TCSQ

The TCSQ was structured similar to the Safety Attitude Questionnaire (SAQ; Donald & Canter, 1993), which has been validated as an 'easy to use' tool across industries (Young & Chalk, 1995; Donald & Young, 1996), and cross-nationally (Siu, 2001; Nananidou 2000; Siu, Phillips, & Leung, 2003). The TCSQ comprises 9 sections, which relate to trust / distrust in the main occupational groups offshore (see target facet, $n = 5$), trust / distrust in the operating company ($n = 1$), dispositional trust ($n = 1$), demographics ($n = 1$), and safety-related information ($n = 1$) (see Appendix D for a copy of the questionnaire). The demographic and safety related questions were placed at the end of the questionnaire to increase their completion rates (Fife-Schaw, 1995). As demographic questions are relatively easy to answer they should be placed at a stage in the questionnaire when respondents begin to tire. Similarly, placing questions relating to sensitive information (i.e., unsafe performance) at the end of the questionnaire allows respondents to get accustomed to the types of issues that the questionnaire is interested in and allows them to build up a feeling of ease.

5.5 Summary

In this Chapter, the structure and properties of the newly developed TCSQ were discussed. This tool was designed to measure trust climates offshore and the role of trust in offshore safety. To do this, the scale measures interpersonal and organizational trust and distrust, both in general and specifically with relation to safety. As well as measuring the situational determinants of trust (e.g., trustworthiness), the scale also measures dispositional factors that relate to personality. Finally, a self-reported measure of safety is used that address accidents and incidents offshore and on the current installation and near miss involvement. In the next Chapter, the methods used to assess the scales psychometric properties that will also give an insight into a number of substantive issues will be discussed.

Chapter 6

Psychometric Property Tests

Following the development of the TCSQ, it is necessary to assess its psychometric properties to ensure that it measures trust in a reliable way. In this Chapter, the tests that were used to check the validity and reliability of the questionnaire are outlined. The decisions that were taken with respect to each of these tests are detailed.

6.1 Validity

The validity of the TCSQ was assessed on four levels: face, construct, discriminate, and predictive validity. Of the three types that were tested statistically – construct, discriminate, and predictive – construct validity is perhaps the most important as it is from this that the others are based (Meier, 1994).

6.1.1 Face validity: Preliminary viewing of the TCSQ

Prior to using the TCSQ, it was important to check for face validity (i.e., that items *appeared* to be measuring trust and distrust). To achieve this, eight individuals with offshore experience (management, frontline workers, contractor and operator staff) were asked to check the questionnaire for clarity of meaning and item redundancy. This resulted in the identification of a number of ambiguous items that required rewording. For instance, *'I trust the people I work with to act in a consistent way when it comes to safety'* was rephrased to *'I trust the people I work with to carry out jobs safely'*. Similarly, certain items were omitted because of their perceived irrelevance to trust development offshore. Examples include, *'The guys I work with are like a second family to me'* and *'My OIM has leadership qualities'*.

6.1.2 Construct validity: Exploratory Factor Analysis (EFA)

A questionnaire is generally argued to have construct validity if it can explain the co-variation in responses to items on a scale (Gable & Wolf, 1993). Although a variety of tests are available to check for this property (e.g., confirmatory factor analysis, structural equation modelling, etc.), the preliminary nature of the TCSQ suggested exploratory factor analysis (EFA) as the most appropriate. Basically, this method assesses construct validity by examining the statistical significance and theoretical consistency of inter-factor correlation scores with previous research. When both of these are satisfied, a scale may be argued to perform well in measuring this property. However, the calculation of factor scores requires a number of decisions to be made at various stages of the analysis. A brief overview of the approach taken in the current study will be given in the following sections. For a more detailed discussion of factor analysis see Rummel (1970), Mulaik (1972), Harman (1976), Gorsuch (1983), and Comrey and Lee (1992).

Exploratory factor analysis (EFA)

Factor analysis (FA) serves the two main functions of data reduction and summarisation, which it achieves by reducing a large number of items into a smaller number of factors. Each factor is comprised of items that are highly correlated with each other but relatively independent from items that make up a different factor. A factor therefore reflects some underlying process that causes a correlation between items. To carry out this analysis, a number of decisions must be made that relate to the technique used for deciding on the number of factors, the relationship between factors, the magnitude of the correlation required for inclusion in a factor, and labelling factors. Once factors have been extracted, their scores can be calculated and used as independent or dependent variables in subsequent analyses. Preceding these stages, however, is an assessment of the suitability of data for this type of analysis. The decisions that were taken in the current study in accordance with these stages will be outlined below.

Stage 1: Suitability of data

Data were screened for missing values, multivariate normality, linearity, and more specific to FA, sample size and the factorability of *R*. To assess for multivariate normality and linearity, skewness and kurtosis values for each questionnaire item were inspected and a visual examination of scatterplots was carried out. While multivariate normality and linearity are not assumptions of EFA, their satisfaction serves to add a degree of enhancement to the structure obtained. As suggested by Tabachnick and Fidell (2001), the failure to meet these assumptions is non-problematic when EFA is used only as a descriptive way to summarize the relationship in a large set of observed variables and when statistical inference is not used to determine the number of factors. Questionnaire items with skewness and kurtosis values within a $\pm$ 1.00 range were taken as normally distributed. Any item that showed considerable departure from this value (e.g., > $\pm$ 5.00) was considered for transformation.

Regarding suitable sample sizes for FA, generally these are determined by a case to variable ratio or by the often-cited guidelines produced by Comrey and Lee (1992). A variety of case to variable ratios have been suggested that range between

2:1 (Kline, 1986), 5:1 (Gorsuch, 1983), and 10:1 (Nunally, 1978). Applying these to the 88-item TCSQ suggests a necessary sample size of 176 – 880. However, as the samples used in the present study are likely to be lower than this upper range (owing to the relatively small numbers working on each installation), Comrey and Lee's (1992) guidelines were used to assess the suitability of sample sizes. They suggest a sample size of 50 is very poor, 100 is poor, 200 is fair, 300 is good, 500 is very good and 1000 is excellent. While these guidelines suggest 200 cases as a minimum for the use of factor analysis, others have suggested samples as low as 150 can be used when several high loading marker variables (> .80) are found (e.g., Guadagnoli & Velicer, 1988). Further, it has been suggested that small samples are acceptable if communality values are high (see MacCullum, Widaman, Preacher, & Hong, 2001). Owing to the relatively small numbers of workers operating on specific offshore installations, a sample size of 200 was set as the minimum cut off criteria in the present study.

Finally, the factorability of *R* was assessed using Kaiser-Meyer-Olkin's (KMO) (Kaiser, 1970, 1974) measure of sampling adequacy, Bartlett's (1954) test of Sphericity, and a visual examination of the anti-image correlation matrix. An indication that data are suitable for FA is suggested by KMO measures greater than .60, a significant value on Bartlett's test of Sphericity, and small scores on the off diagonal of the anti-image correlation matrix. While all of these measures are suitable for small samples, in larger samples, only the KMO measure and anti-image correlation scores offer a reliable test of data suitability. Bartlett's test of Sphericity is sample size dependent, therefore an increase in *N* commonly produces a significant result even when correlations are low. As a guideline, it is suggested that this test should only be used when data does not exceed a 5:1 case to variable ratio (Tabachnick & Fidell, 2001). This criterion was used in the current study.

Stage 2: Extraction of factors

The two main extraction techniques that are routinely used to obtain a factor solution are common factors and principle components analysis (PCA). Common factors analysis seeks to identify the latent constructs represented in the original variables using the shared variance of items. Because it excludes unique and error variance, common factors analysis has been argued to produce more reliable results than PCA, as this latter approach deals with all of the variance. While this has led some researchers to favour common factors analysis, Hair, Anderson, Tatham and Black (1995) argue that in PCA the first few factors do not contain enough unique or error variance to distort the overall factor structure. Also, Velicer and Jackson (1990) have shown PCA and common factors to produce essentially the same results, especially if the number of variables exceeds 30 (Gorsuch, 1983). Therefore, choosing a method based on the type of variance it accounts for is unlikely to yield strikingly different factor structures. Further, it has been shown that despite its appeal, common factors analysis has a number of problems.

The use of common factors analysis has been associated with a number of limitations. For instance, it suffers from factor indeterminacy, which as Hair et al. (1995) explain, means that several factor scores for any one individual can be calculated from the factor model results. Another limitation is that common factors analysis deals with covariance, which means that communalities must be estimated that may either be impossible or produce invalid results (i.e., values greater than one or less than zero) (Hair et al., 1995). Owing to the complications associated with common factors analysis, and the findings that essentially this method produces the same factor structure to PCA, the latter extraction method was used.

PCA[3] identifies the minimum number of factors needed to account for the maximum portion of the variance represented in the original data. The first principal factor accounts for the maximum amount of variance in a set of items, with each succeeding factor accounting for as much of the remaining variability as possible. The result is a set of orthogonal linear factors (components) that reveal a number of dimensions that are key to understanding the construct of interest. As suggested by Tabachnick and Fidell (2001), PCA offers a useful initial approach to confirmatory factor analysis because it provides an insight into the maximum number and nature of factors. This was beneficial in the current study because the novel combination of facets that were used (see Chapter 5) means that the number and salient dimensions of trust is unknown. Also, components analysis does not suffer from some of the convergence problems, boundary cases, and computation limitations of other FA approaches (Driel, 1978; Velicer & Fava, 1987), and for this reason has been used in a wide variety of settings (Velicer & Jackson, 1990). Of interest in this study, is the use of PCA in research on safety attitudes (e.g., Cox & Cox, 1991; Mearns et al., 1997; Lee, 1998; Nananidou, 2000; Lee & Harrison, 2000; Glendon & Litherland, 2001), and interpersonal trust (Cook & Wall, 1980; McAllister, 1995).

To decide on the number of factors to be extracted, the criteria of eigenvalue greater than one (Kaiser, 1974), a visual examination of the scree plot (Cattell, 1966), and the interpretability of the factors were used. Using both statistical criteria provides greater support for the stability of a factor structure when convergence is found (Scher, Stein, Ingram, Malcarne, & McQuaid, 2002). Relying solely on the

[3] Consistent with a vast body of research, the term 'factor' will be used to denote 'components'. This will avoid unnecessary confusion from using both terms.

widely used eigenvalue has been found to over-extract (Zwick & Velicer, 1986) or under-extract factors (Cliff, 1988). Additional to these statistical criteria, factor structures were also assessed for their interpretability and theoretical consistency (see Gorsuch, 1983). While a structure might be supported statistically, theoretically it might reveal an idiosyncratic clustering of items that do not relate to theory. For this reason, only a proportion of the components with eigenvalues greater than one might be used, as very often a large number of components are usually associated with a poorly defined structure (Hair et al., 1995).

Stage 3: Rotation

Once factors were extracted, factor loadings were rotated to increase their interpretability. Commonly, the type of rotation used is either oblique or orthogonal, and is based on the statistical criteria of how much shared variance the factors explain. When this is greater than 10% ($r > .32$), oblique rotation, which allows for covariance and correlations between factors, is used. However, when less than 10% variance is shared between factors, orthogonal rotation is used to minimize the factor covariance and produce factors that are uncorrelated. The one exception to this 'general' rule for choosing between rotation types is when the aim of the analysis is to extract factors for use as independent variables (IVs) or dependent variables (DVs) in subsequent analyses. In these cases, orthogonal rotation is the preferred technique regardless of whether the factors are highly correlated, because it produces independent factors.

As the present study aimed to use factor scores as a basis for testing the TCSQ's discriminate and predictive validity, orthogonal rotation was applied. Of the types available, the widely used varimax rotation was chosen, which operates to maximise the variance of factor loadings within factors across all items. Specifically, loadings that are low become lower after rotation and those that are high become higher. To interpret factor loadings, the rotated component matrix was used. In the current study, when oblique rotation was indicated as a more suitable technique to orthogonal, factor structures were extracted using both types of rotation and compared to look for any major differences. The results of these comparisons are reported.

Stage 4: Factor loadings and labelling

To indicate significant factor loadings the criterion of $\pm$ .40 was used. As well as being practically significant (Comrey & Lee, 1992), this has also been suggested statistically to achieve a power level of 80% ($p < .05$) in small sample sizes ($N =$ 200) (Cliff & Hamburger, 1967). As sample size increases the factor loading required to achieve the same level of power typically reduces (Hair et al., 1995). However, to maintain consistency within the present study, the same factor loading criterion was applied to all analyses regardless of the sample size obtained. Once items were assigned to factors, their communality values were inspected.

Communality (h^2) measures the percent of variance in a given item explained by the factors jointly, and may be interpreted as the reliability of the indicator. High values are typically indicative of a well fitting structure, although some have cautioned against setting communality values *apriori* to meet a high value because this creates the potential for items to contribute to a theoretically meaningless factor (Hair et al., 1995). A criterion for communality values was therefore not specified in the current study, but rather values were inspected as a rough guide to the fit of the structure.

The final aspect of defining the factor structure was the assignment of factor labels. Similar to Mearns et al. (1997), items with a loading of .53 or above were used to set the 'theme' of a factor and to aid in deciding on the most descriptive label. This is typically made easier when several marker variables are found to load on the same factor.

Stage 5: Factor scores

The final stage of the analysis was the estimation of factor scores. This can be achieved using a variety of approaches, although here the sum of standardized scores of each item in a factor was used. Standardizing scores prior to summation had the advantage of reducing items with high standard deviations from contributing too heavily to a factor score. Although some regard this approach as a 'simple-minded' technique (Comrey & Lee, 1992), it is typically found to be less vulnerable to bias compared to more sophisticated techniques such as regression (Tabachnick & Fidell, 2001). With regression estimates, factor scores are prone to bias due to their capitalization on chance associations between an item and some factor. A factor score might therefore be shown to correlate with a factor other than the one it estimates, and correlations can be found between factors scores even if the factors are orthogonal (Tabachnick & Fidell, 2001). Once calculated, factor scores can be used as DV's to test the discriminate validity of the scale, and as IV's to test its predictive validity.

6.1.3 Discriminate validity: Analysis of Variance (ANOVA)

The discriminate validity of the TCSQ was tested by using factor scores as DV's in a series of one-way analysis of variance comparisons between offshore groups. Similar to the work of Mearns et al. (1997), groups related to employing company, supervisory status, occupational group, years worked offshore, and years worked on the current installation. However, while comparisons were similar to those carried out by Mearns et al. (1997), no *a priori* hypotheses were developed that related to how groups differed in trust levels or types. This was due to the absence of research specific to trust in an offshore environment or in high-risk industries from which informed hypotheses could be based.

6.1.4 Predictive validity: Logistic regression

The TCSQ's predictive validity was examined using logistic regression. This test was considered appropriate for the current study because of its capacity to deal with a mixture of continuous and dichotomous variables, both of which were used in the TCSQ. The factors extracted from the PCA were used as IV's (continuous), and the safety indices, 'accidents / incidents' and 'near-miss involvement' operated as DV's (dichotomous). While other tests are available for dealing with dichotomous variables, such as discriminant function analysis, these are typically found to place more constraints on the data compared to logistic regression. Discriminant function analysis, for example, relies on the assumption that the outcome variables are normally distributed (Howell, 1995), and has the potential to produce a probability success outside of the acceptable 0-1 range.

In the following section, an overview of the methods relating to logistic regression that were used in the present study will be given. A more detailed discussion of this type of analysis can be found in Hosmer and Lemeshow (1989) and Mernard (2002).

Significant predictors (factors)

The initial phase of the analysis involved identifying which of the factors (IV's) predicted safety performance offshore (DV's). Each DV was analyzed in a separate set of analyses and was coded 1 to represent agreement (e.g., experienced an accident), and 0 to represent disagreement (e.g., not experienced an accident). Each IV was analyzed in a separate model (for each DV) using direct logistic regression. A number of measures were inspected to indicate their significance and power as a predictor. To indicate significance the Wald statistic that represents the ratio of the unstandardized logic coefficient to its standard error was used. Despite having the potential to result in a type II error due to a large logit coefficient inflating the standard error and thus lowering the Wald statistic (Mernard, 2002), it remains a widely-used indicator. Classification tables of prediction success, both before and after the IV was entered were also inspected. An increase in percentage score following the addition of an IV indicated it to be an important predictor in the model. Finally, Nagelkerke's R-square (Nagelkerke, 1991) was used to indicate the amount of estimated variance each predictor explained. The closer this value was to one, the more predictive the IV is of safety performance.

The second phase required all significant predictors from the first phase of the analysis to be entered into a single model (per each DV) and analyzed together using forward stepwise logistic regression. As the analysis was exploratory and research specific to trust and distrust offshore does not exist from which significant predictors could be identified, forward stepwise regression was considered appropriate. Further, the initial analysis of each IV separately using direct logistic regression overcomes the potential problem of misinterpreting predictors as non-significant due to their inclusion in a model where other predictors have more stringent critical values. As only significant predictors were included in the model, this analysis revealed which of the IV's accounted for independent, unique variance and hence was the most important in predicting safety performance.

The final phase of the analysis involved the interpretation of the odds ratio for variables in the final model (from the second phase of the analysis). In cases where this is less than one, it suggests that an increase in the value of the predictor variable decreases the odds of an event occurring. However, when this is greater than one, it suggests that an increase in the predictor increases the odds of an event occurring.

6.2 Reliability

6.2.1 Cronbach alpha coefficient

Consistent with a growing trend within psychometric testing (see, Hogan, Benjamin, & Brezinski, 2000; Charter, 2003), the reliability of the TCSQ was estimated using the Cronbach alpha coefficient (Cronbach, 1951). Although other internal consistency approaches are available (e.g., split-half, KR-21, KR-20, which produces the same value as alpha but is used for dichotomous data), these have limitations. For instance, the split-half coefficient is typically found to vary depending on how the test is split and is commonly used with dichotomous data. Cronbach alpha overcomes the first problem by looking at the mean value of all possible comparisons, and deals with data scored on a Likert scale.

To estimate a factor's reliability in the present study, items with significant factor loadings (.40) were used. Based on the estimates of Kline (2000), .70 was used as the minimum criteria to accept a factor as reliable. Factors with estimates in excess of .90 are indicative of good accurate measures (Guildford & Fruchter, 1978; Salvia & Ysseldyke, 1988; Gregory, 1999) of trust climates offshore.

6.3 Summary

In this Chapter, the methods that were chosen to test the TCSQ's psychometric properties were outlined. Validity was tested using EFA, ANOVA, and logistic regression. Reliability was estimated using Cronbach alpha. Consistent with the suggestion that tests of construct validity provide the basis on which other psychometric properties can be assessed (Meier, 1994), the following Chapter reports results specific to this property. In Chapter 8, the test results of the other psychometric properties will be reported.

Chapter 7

The Structure of Trust on an Offshore Gas Installation: A Pilot Survey using the Trust Climate and Safety Questionnaire

This Chapter reports on a pilot survey using the Trust Climate and Safety Questionnaire (TCSQ) to measure trust attitudes on an offshore gas installation. Data are analysed at two levels using principle components analysis (PCA). First, data from the full 88-item scale are analysed together followed by analyses of each subscale data ($n = 6$) separately. Respectively, this provides an insight into the underlying dimensions of trust as it manifests at a macro-level *between* groups, and at a micro-level *within* or towards different groups.

7.1 Questionnaire Distribution and Response Rate

A pilot survey of trust attitudes using the newly developed TCSQ was carried out on an offshore gas installation (Map) operating on the UK Continental Shelf (UKCS). Access to survey the installation was gained through an offshore safety and environment officer (OSEO) who took part in the qualitative study (i.e., interviews) and arranged for his installation to take part in the questionnaire survey. Initial contact with the OSEO was made through a trade union that provided a list of members that were willing to be interviewed about safety and trust offshore (see Chapter 4).

The Map installation is operated by a total of 280 individuals that divide over two shifts, A and B. A copy of the TCSQ was distributed to all workers by the OSEO at the end of safety meetings that are held at the beginning of each trip offshore. This ensured that all workers received a copy of the questionnaire and were given sufficient time to complete it. However, distributing the questionnaires in this way increased the potential for biased responding. Specifically, the presence of the OSEO had the potential to increase workers tendency to respond less negatively to items relating to poor safety or management. This is likely if workers believed that management and/or the organization would have access to the completed questionnaires. However, workers were assured as far as was possible that the responses given were confidential and that no person would be identified individually (see Appendix D). A freepost return envelope addressed to the Safety Research Unit at The University of Liverpool that accompanied each questionnaire offered further support to the confidentiality of the responses.

From a total of 280 questionnaires distributed, 214 were returned (76% response rate). This represents one of the highest response rates in UK offshore research on safety, where rates of 27% (Mearns, Whitaker, & Flin, 2003), 40% (Flin, Mearns, Fleming, & Gordon, 1996) and 63% (Cox & Cheyne, 2000) have been reported. It also represents one of the highest response rates of industry in general. In the nuclear industry Lee and Harrison (2000) report response rates of 45%, 46% and 74%. Williamson, Feyer, Cairns, and Biancotti (1997) report a 42% response rate for the manufacturing industry, and Clarke (1998) reports a 22% response rate for the railway industry. Therefore, the present 76% response rate is one of the highest obtained.

Of the 214 questionnaires returned, 11 were excluded because they were returned blank. This left a total of 203 questionnaires (cases) for the analysis.

7.2 Sample Characteristics

Details of respondents' characteristics, as shown in Table 7.1, indicate 99% (n = 190) are male and 1% (n = 2) are female. A total of 22% (n = 39) are supervisors, while 78% (n = 142) hold non-supervisory positions. Representative of the offshore industry are the 63% (n = 117) of respondents employed by contracting companies compared to the 37% (n = 68) holding an operator status. Collectively, the respondents represent 8 occupations, with maintenance staff occupying the largest group (41%), followed by construction workers (30%), and production staff (13%). The most common rotation worked on the Map installation is 2 weeks onshore / 2 weeks offshore (n = 181), and the most common shift pattern is all days (n = 142). The second most common shift pattern is one week of days and one week of nights (n = 16). Most of the respondents have extensive offshore work experience, with 148 of the 203 respondents reporting a working tenure of over 10 years. Of these, 74 have spent this time working on the Map installation. In contrast are those that report less than 1 years offshore work experience, either in the industry (n = 3) or on the Map installation (n = 28). The characteristics of Map installation workers are similar to those reported in an earlier survey of offshore safety attitudes by Mearns et al. (1997). Based on their industry wide sample it may be argued that the current sample is representative of most work groups offshore.

7.3 Data Screening

Initially, data were screened for missing values, multivariate normality, and linearity. Results indicate 16 (8%) of the 203 cases have missing values, with most of these (n = 13) having less than 2%, and 11 have only a single missing value. Of the

Table 7.1: Demographic details of Map installation workers

	Categories	Frequency	Valid Percentage
Gender	Male	190	99
	Female	2	1
	Missing	11	-
Job Category	Maintenance	75	41
	Construction	55	30
	Production	24	13
	Admin/Management	10	5
	Catering	5	3
	Deck Crew	4	2
	Medic	1	1
	Other	11	5
	Missing	18	-
Employer Type	Contractor Company	117	63
	Operating Company	68	37
	Missing	18	-
Shift Pattern	All days	142	80
	Half day/half night	16	9
	24 hour call	8	5
	All nights	1	1
	Other	11	5
	Missing	25	-
Rotation	2 on/2 off	181	97
	1 on/1 off	1	1
	Other	5	2
	Missing	16	-
Supervisor Status	Non supervisor	142	78
	Supervisor	39	22
	Missing	22	-
Number of installations worked on	1-5	67	35
	6-10	53	28
	More than 10	69	37
	Missing	14	-
Years worked on Map installation	Less than 1 year	28	16
	1-5 years	46	26
	6-10 years	29	16
	More than 10 years	74	42
	Missing	26	-
Years worked offshore	Less than 1 year	3	2
	1-5 years	9	5
	6-10 years	24	13
	More than 10 years	148	80
	Missing	19	-

remaining 3 cases, 2 have 9% missing data, and 1 has 11%. In these three cases, missing data are specific to 'generalized others' and 'operating company' subscales of the TCSQ, respectively. In contrast, all other cases of missing data show a random pattern. An inspection of the 88 items reveals 13 (15%) have missing values, each accounting for less than 1.5% (n = 3). Deleting an item to control for missing data would therefore be ineffective. Rather, missing value replacement using estimated mean scores was used. As Tabachnick and Fidell (2001) suggest, mean estimation offers an equally effective approach to other techniques when missing data are relatively small and shows a random pattern throughout a data set. When missing data are non-random, mean estimation can still be used if the amount of missing data is small and confined to a small number of cases. In the current sample, non-random data were confined to three cases.

An inspection of multivariate normality and linearity indicate all items to have skewness values within the acceptable $\pm$ 1.00 range. Of the 88 items, 18 are positively skewed and 70 are negatively skewed. However, an inspection of the kurtosis values reveal 21 of the 88 items to depart slightly from + 1.00. Fifteen items have a value greater than 1.00 but less than 2.00, 5 items have a value greater than 2.00 but less than 3.00 and 1 item, C4, has a kurtosis value of 3.35. The slightly peaked distribution of these items is reflective of 54 of the remaining 67 items. As both positive and negative distributions exist in the data set, a test for curvilinearity was carried out. To do this, scatterplots of pairs of items representing the most extreme[4] departures from normality (in both skewness and kurtosis), were inspected. This revealed departures from linearity but no evidence of curvilinearity. Transformation of items was therefore unnecessary and inappropriate.

Finally, a reliability estimate of the full 88-item TCSQ reveals good internal consistency, α .87. The TCSQ is therefore indicated as a reliable measure of trust climates in the offshore industry.

---

[4] As the number of potential scatterplots that may be produced exceeds 1000, only those for items with extreme departures from normality were inspected.

7.4 Preliminary Exploratory Factor Analysis (EFA)

Tests of the factorability of *R* indicate data to be suitable for factor analysis. Kaiser-Meyer-Olkin's measure of sampling adequacy (KMO) is greater than .60 at .89, and Bartlett's test of Sphericity is significant at the stringent $p < .01$ level, χ^2 (3828) = 12755.01. Also an inspection of the anti-image correlation matrix reveals small values on the off-diagonal. Based on a sample size of 203, the factor structure extracted may therefore be taken as a 'fair' (Comrey & Lee, 1996) representation of the underlying dimensions of the TCSQ.

Principle component analysis (PCA) using varimax rotation reduced the 88-item TCSQ into 6 factors, each with an eigenvalue greater than 1. An inspection of the factor structure, as shown in Table 7.2, indicates high communality values for most items suggesting that the factor structure offers a good fit to the data. This is further indicated by several marker variables within the structure. Slight model misfit is indicated for some of the items by low communality values, significant cross-loadings on different factors or non-significant factor loadings (< .40). Low communality values are indicated for items SP10 (h^2 .23), S9 (h^2 .25), W13 (h^2 .33), W5 (h^2 .34), and W12 (h^2 .36), and significant cross loadings are identified for items S15 and SP8. Regarding non-significant factor loadings, these are found for items M7 (.36), SP6 (.36), SP7 (-.34), C14 (.30), GO1 (.33), GO2 (.39), GO3 (.36), GO4 (.24), GO7 (.38), and GO8 (.27). In most cases, these items load onto a factor with a different salient theme.

Finally, estimates of reliability reveal most factors to have high internal consistency with Cronbach alpha values greater than the minimum criteria of $r = .70$ (Kline, 2000). One exception is factor 6,which has poor reliability, $\alpha = .44$. This may be accounted for by its measurement of trust in generalized others, which

Table 7.2: Six-factor structure of Trust Climates on the Map Installation

		Factors						
	Questionnaire Item	**1**	**2**	**3**	**4**	**5**	**6**	**h^2**
M15	I trust management on my installation	**.788**	.092	.210	.134	.099	.024	.701
M12	I am suspicious of the motives behind management's actions	**.775**	.201	.139	.038	.082	.070	.674
OC10	I don't trust the operating company	**.739**	.031	.170	.205	.192	.025	.655
M5	Management will overlook safety issues to advance their career	**.712**	.177	.270	.160	.077	.091	.651
M6	Management are honest when it comes to safety	**.709**	.069	.212	.147	.151	.163	.623
M11	Management lie about safety standards offshore to create a favourable picture	**.687**	.111	.218	.083	.076	.049	.547
OC8	The operating company are not sincere when they say safety is their number one priority	**.683**	.151	.207	.051	-.085	.106	.553
M13	Management are vague when answering questions the workforce have about issues that affect them	**.680**	.017	.177	.019	.057	.118	.512
M2	Management like to blame people when mistakes are made	**.654**	.235	.197	-.045	-.133	.073	.542
OC7	I can trust the operating company to keep their promises	**.643**	.171	.073	.110	.169	.221	.538
M8	I can trust management to make sure the installation is run in a safe way	**.624**	.136	.195	.335	.209	.169	.630
M4	I am not confident in managements skills	**.608**	.119	.075	.202	-.015	.165	.458
M9	Management are well qualified	**.599**	.281	.136	.088	.144	.256	.551
M10	Management is successful at ensuring safety policies are adhered to offshore	**.594**	.261	.140	.304	.334	.156	.669
OC5	With respect to safety, I can trust the operating company	**.594**	.029	.139	.202	.305	-.025	.507
M14	Management lack the experience needed to know how to do a job safely	**.580**	.098	.356	.053	.114	.149	.511
OC3	The operating company doesn't care about my safety, they care only about making profits	**.576**	.074	.217	.162	.230	-.135	.481
SP4	My safety officer rarely supports the workforce when they raise safety issues	**.564**	.079	.270	-.015	.295	-.169	.513
OC2	The operating company fully support the structures they have in place which allow me to work safely	**.558**	.229	.178	.201	.216	-.010	.482
OC1	A feeling of 'us' and 'them' exist between the workforce and the operating company	**.556**	-.304	-.014	.034	.081	.131	.337
OC9	The operating company doesn't invest enough money on maintaining my installation	**.552**	-.104	.098	.128	-.119	.233	.410
OC6	The company operate 'best practice' when it comes to safety	**.525**	.034	.224	.221	.374	-.013	.516
M3	I can trust management to do what they say they will do	**.519**	.082	.205	.044	.126	.289	.420
M1	Management frequently demonstrate their commitment to safety	**.519**	-.077	.228	.248	.237	-.059	.439
SP9	I trust my safety officer's ability to do his job	**.462**	.109	.260	.177	.384	.039	.473
SP10	My safety officer is not open to suggestions I might have	**.401**	.098	.098	-.072	.179	-.146	.232
M7	I have a good rapport with management	.358	.152	.152	.045	.279	.272	.333
C14	I can't trust contractors when it comes to safety	.297	.164	.164	.204	-.109	-.176	.211
Cronbach $\alpha = 0.95$								
C11	Based on past experience, I know I can trust contractors to act safely	.072	**.838**	.090	.149	.098	.082	.755
C1	I can trust contractors to consider other people's safety when carrying out their work	.150	**.811**	.125	.089	.168	-.077	.738
C2	Contractors are open and honest about safety	.134	**.792**	.077	.125	.070	-.014	.672
C4	Generally, I trust contractors	.175	**.780**	.092	.081	.166	.054	.685
C13	I trust contractors when it comes to safety	.056	**.750**	.167	.108	.164	.033	.634
C10	Contractors are capable at performing their job	-.015	**.750**	.219	.091	.099	.089	.629
C9	Contractors are only concerned with looking after themselves	.184	**.737**	.142	.074	-.093	-.027	.612
C15	Contractors would go out of their way to help me	-.061	**.729**	.062	.074	.097	.076	.560
C6	Contractors are not professional in the way they carry out their work	.064	**.725**	.259	.110	.025	.062	.610
C12	Contractors would conceal mistakes they might make even if doing so might put others at risk	.285	**.695**	.179	.147	-.058	-.041	.622
C8	Contractors are inconsistent in the way they carry out their work	.069	**.695**	.138	.136	.075	-.015	.532
C5	Contractors lack the training needed to carry out jobs in a safe way	.159	**.672**	.202	.140	.024	.052	.541

C3	Contractors often take short-cuts to get a job done quickly even if doing so puts others at risk	.391	**.594**	.199	.212	-.090	-.058	.594
C7	Sound principles guide contractors behaviour	.198	**.430**	-.016	.267	.139	-.071	.315
GO8	Most adults are competent at their jobs	.109	.271	.074	.144	.258	.171	.207
Cronbach $\alpha = 0.94$								
S5	My supervisor would go out of his way to help me	.199	.236	**.968**	.163	.182	-.060	.646
S6	My supervisor is not willing to listen to concerns I might have about safety	.286	.163	**.693**	.290	.127	-.129	.705
S10	My supervisor keeps the promises he makes	.260	.219	**.683**	.041	.145	.090	.613
S8	I can talk to my supervisor and know that he will want to listen	.184	.359	**.664**	.155	.190	.164	.691
S11	My supervisor often emphasises safety publicly but then cuts corners when carrying out his job	.225	.225	**.653**	.067	.035	-.092	.543
S7	I trust my supervisor to make decisions that affect me	.304	.248	**.647**	.083	.230	-.066	.633
S12	My supervisor wants a job done safely even if it means extra time and extra cost	.197	.195	**.647**	.170	.056	-.097	.537
S4	I often find what my supervisor says is untrue	.258	.088	**.630**	.297	.127	.026	.575
S1	I can trust my supervisor to be fair in the way he deals with safety incidents	.222	.211	**.613**	.283	.169	.235	.634
S14	I trust my supervisors ability to do his job	.276	.104	**.591**	.209	.054	.121	.498
S13	My supervisor is incompetent when it comes to managing his team	.136	.139	**.579**	.173	.052	-.080	.412
S2	I can trust my supervisor's judgement when it comes to safety	.164	.200	**.573**	.245	.200	.253	.559
S3	I don't trust my supervisors ability to make sure jobs are carried out in a safe way	.337	.027	**.544**	.354	.104	.072	.552
S15	My supervisor is afraid of upsetting management	.430	.300	**.437**	.168	.027	.047	.497
S9	I can't trust my supervisor with a job that impacts on my safety	.183	.033	**.433**	.150	-.038	-.026	.247
W15	My workmates are not afraid to stop a job if they think it is unsafe	.050	.211	**.429**	.386	.192	.343	.534
GO4	These days, you must be alert or someone is likely to take advantage to you	.089	-.129	.240	-.038	-.068	.195	.125
Cronbach $\alpha = 0.93$								
W9	I can trust my workmates to tell the truth	.087	.122	.218	**.720**	.051	.251	.654
W6	I can trust my workmates to be open and honest when it come to mistakes they might have made	.189	.141	.039	**.681**	.080	.276	.604
W1	I trust my workmates are competent in their own areas	.024	.211	.175	**.649**	.199	.063	.540
W8	The people I work with know the difference between having a laugh and doing a job safely	.051	.099	.238	**.641**	.333	.015	.592
W11	My workmates don't care about my safety	.087	.110	.168	**.637**	.058	-.181	.489
W14	I trust the people I work with to carry out a job safely	.076	.296	.335	**.606**	.184	.257	.673
W10	My workmates are not experienced offshore workers	.039	.162	.072	**.601**	.092	-.162	.429
W7	My workmates lack the ability to decide if a job is safe to carry out	.133	.128	.199	**.585**	.177	-.206	.490
W3	Generally, I don't trust my workmates	.173	.068	.127	**.580**	.091	-.094	.404
W2	I can trust my workmates to support me if I had a complaint about safety	.149	.223	.246	**.527**	.205	.142	.473
W12	The people I work with would take credit for something they haven't done	.222	.055	.207	**.507**	-.068	.061	.361
W13	My workmates would disclose to others things that I had told them in confidence	.251	.132	.088	**.460**	-.060	.167	.331
W5	I can't trust my workmates to maintain high levels of safety even when they say they will	.090	.046	.081	**.433**	-.027	-.360	.335
W4	My workmates are kind and thoughtful	.113	.206	.244	**.412**	.056	.350	.407
Cronbach $\alpha = 0.88$								
SP3	I can trust my safety representative to listen to suggestions I might have about how safety can be improved	.161	.158	.116	.126	**.757**	.070	.658
SP1	My safety representative is open and honest	.144	.142	.099	.092	**.757**	.016	.633
SP5	Safety representatives have my best interests at heart	.209	.077	.151	.175	**.701**	.137	.614
SP2	I can trust my safety representative to give me feedback	.384	.098	.180	.121	**.569**	-.088	.535
OC4	The operating company are clear about what they want with respect to safety offshore	.386	.058	.184	.250	**.487**	-.099	.496
SP8	My safety officer lacks the interpersonal skills necessary to carry out his role	.446	.110	.318	.013	**.470**	-.016	.533

SP6	My safety representative lacks the expertise required to represent the workforce on safety issues	.333	.176	.041	.277	.363	-.012	.352
Cronbach $\alpha = 0.85$								
GO6	Most repair people will not overcharge people who are ignorant to their speciality	.162	-.017	.082	.047	-.115	**.437**	.240
GO5	Most salespeople are honest in describing their products	.123	.041	-.056	-.015	.076	**.427**	.208
GO2	Most experts tell the truth about limits of their knowledge	.148	.273	-.124	.120	.197	.385	.313
GO7	Most people answer public opinion polls honestly	.132	-.020	.043	-.056	.117	.375	.177
GO3	Most people can be counted on to do what they say they will do	.157	.216	-.012	.158	.289	.355	.306
SP7	I see my safety officer as part of management	.308	.175	-.120	-.106	-.056	-.336	.267
GO1	One should be very cautious when dealing with strangers	.041	-.018	-.026	-.032	-.101	.326	.120
Cronbach $\alpha = 0.44$								
Eigenvalue		**25.27**	**6.37**	**4.36**	**3.12**	**2.65**	**2.34**	

Note: Figures in bold indicate items with significant factor loadings ($\geq .40$) and also indicate the factor to which they were assigned (and subsequently used to calculate its factor score). Items with significant cross-loadings on more than one factor were assigned to the factor that they loaded on the highest.

has been shown in other research to lack internal consistency due to its non-factor based nature (Wheeless, 1978).

The 6-factor structure, as shown in Table 7.2, reveals items to load according to occupational group. Specifically these are, 1. *Senior Management*, 2. *Contractors*, 3. *Supervisors*, 4. *Workmates*, 5. *Safety Representatives*, and 6. *Generalized others*. Most factors (2 to 5) are specific to a single group or type of trust (6). However, the Senior management factor comprises items specific to offshore managers, safety officers, and the operating company. The item, *'I am suspicious of the motives behind management's actions'* (M12), for example, has a high correlation with *'I don't trust the operating company'* (OC10). Together the 6 factors account for 51% of the total variance, with Senior management explaining 29%, Contractors 7%, Supervisors 5%, Workmates 4%, Safety representatives 3%, and Generalized others 3%. Based on the amount of explained variance, it might be argued that the level of trust and distrust in senior management has the greatest influence in shaping trust climates on the Map installation. The relative ordering of factors also suggests that situation based trust is more dominant then disposition trust, as generalized other items form the last factor. Further, the non-significant factor loadings of 7 of the 8 generalized others items indicate that the shortened version of Rotter's (1967) ITS to offer a poor measure of disposition trust in the offshore industry.

7.4.1 Discussion of the 6-factor structure

The multi-faceted nature of the TCSQ created the potential for a number of dimensions to underlie trust climates offshore and for factor items to cross load on different factors. The facets relate to attitude (trust or distrust), domain (safety or general), individual characteristics (ability, integrity, or benevolence), psychological foundations (cognitive or affective), and occupational group. From an analysis of the full-scale TCSQ, the single dimension of occupational group emerged as the only defining feature of these climates. The statistical soundness of this structure together with its similarity to other research (e.g., Cook & Wall, 1980), suggests it to be robust. It may therefore be hypothesised that at a macro level, *Trust climates offshore will structure by occupational group* (H^T7).

On the Map installation, attitudes of trust and distrust are, in large part, specific to distinct groups: Workmates, Supervisors, Safety representatives, and Contractors. However, attitudes towards Offshore managers, Safety officers, and the Operating company are highly similar, thus causing these groups to form a collective entity relating to Senior management. Consistent with the findings of others (Konovsky & Pugh, 1994; Creed & Miles, 1996; Tan & Tan, 2000), the strong relationship between trust towards managers and the organization might be attributed to the former offering a means to personify the latter's commitment to its members (Settoon, Bennett, & Liden, 1996), and to certain policies and practices (Eisenberger et al., 1986). The hypothesis that a strong positive relationship exists between levels of trust in managers and the operating company (H^T1) is therefore supported.

Regarding safety officers, their membership to a senior management group might be attributed to the similarities they share with senior management, such as infrequent contact with workers and the power to enforce rules and regulations.

Of the distinct groups identified, attitudes towards senior management were revealed to have the strongest impact on trust levels offshore (based on explained variance). The dominant role this suggests for management is consistent with their main role in shaping safety *culture* (Clarke, 1998; Hofmann & Morgeson, 1999; Flin et al., 2000) and organizational trust *culture* (Whitener et al., 1998). However, this finding also suggests that management play a strong role in shaping attitudes at a climate level. In contrast, an individual's propensity to trust emerged as having minimal impact on the development of interpersonal trust and distrust offshore. The hypothesis that an individual's disposition to trust will have a weak influence in shaping attitudes when strong situational factors exist (H^T3a) is supported. In sum, the findings reported here reveal trust climates offshore to structure around situational factors specific to occupational group.

7.5 Within-Subscale EFA

Although the full scale EFA provides an insight into the structure of trust at a macro-level, it fails to identify how trust structures *within* or towards the different groups identified. For instance, it does not show if trust attitudes held towards management structure in the same way as trust attitudes held towards workmates. Given the different roles of these groups in offshore safety, a difference in attitude structures might be expected. To explore for the degree of similarity in structures, separate within-subscale analyses were carried out on items relating to Workmates, Supervisors, Offshore managers, Safety personnel, Contractors, and the Operating company. Although results of the full scale EFA indicated offshore managers and the operating company to form a single group, it was considered inappropriate to combine them in this stage of the analysis because they measure different types of trust (e.g., interpersonal and organizational, respectively). Regarding the Generalized others subscale, the decision was taken to omit this from further analysis as its non-factor based nature suggests that a structure extracted is likely to lack theoretical clarity or statistical support.

Tests of the factorability of *R* indicate all subscales as suitable for factor analysis. KMO measures indicate all to exceed the criteria of .60; Workmates, .89, Supervisors, .92, Offshore managers, .94, Safety personnel, .86, Contractors, .94, and the Operating company, .88. Small values are also revealed on the off-diagonal of all subscale anti-image correlation matrices. Bartlett's test of Sphericity was not used to assess the suitability of data for FA, as each subscale exceeds the maximum criteria of 5:1 case to variable ratio. The ratio for Workmates, Supervisors, Offshore management, and Contractors is 13.5:1, and for Safety personnel and the Operating company is 20:1. As well as being suitable for factor analysis, estimates of reliability indicate good internal consistency for all subscales; Workmates, $\alpha = .89$, Supervisors, $\alpha = .93$, Offshore managers, $\alpha = .94$, Safety personnel, $\alpha = .84$, Contractors, $\alpha = .94$, and the Operating company, $\alpha = .88$. It may therefore be concluded that each subscale provides a reliable measure of trust and distrust attitudes towards their respective groups.

As the subscales are in most cases identical to the factors extracted from the full-scale EFA, a preliminary check of the suitability of applying varimax rotation was carried out. With the exception of Offshore managers and the Operating company, results indicate within-subscale factors to share less then 10% overlap in variance ($r < .32$). This suggests that factors are orthogonal and supports the use of varimax rotation. Regarding Offshore managers and the Operating company subscales, a comparison between the factor structures extracted using both types of rotation indicates no differences. In agreement with others (e.g., Velicer & Jackson, 1990; Fava & Velicer, 1992), it appears that in practice the difference between rotation techniques is only slight. To maintain consistency between within-subscale analyses and to satisfy the aim of extracting independent factors for use in subsequent tests, varimax rotation was applied to all subscales.

7.5.1 Workmates

PCA reduces the 15-item Workmates subscale into 3 factors, each with an eigenvalue greater than 1. Together these factors account for 60% of the total variance, with factor 1 explaining 42%, factor 2, 10% and factor 3, 8%. An inspection of the factor structure, as shown in Table 7.3, indicates a good fit to the data with moderate to high communality values revealed for most items[5]. A good fit is further indicated by several marker variables found in the structure.

Factor 1: Trust in workmates safety

Factor 1 comprises 5 items that collectively reflect trust in workmates. Three items are specific to trust in a safety context (e.g., '*I can trust my workmates to carry out a job safely*' and '*My workmates are not afraid to stop a job they think is unsafe*'), and 2 items relate to general trust. Items W1, '*I trust that my workmates are competent in their own areas*' and W9, '*I can trust my workmates to tell the truth*', measure trust in another based on the characteristics of ability and integrity,

[5] Although reliability estimates are given in the Table, a discussion of these will be reserved for the following Chapter where the scales psychometric properties will be assessed.

Table 7.3: Three-factor structure of workmates subscale

		Factors			
	Questionnaire Item	**1**	**2**	**3**	**h²**
W1	I trust that my workmates are competent in their own areas	**.782**	.317	.052	.715
W14	I trust the people I work with to carry out a job safely	**.755**	.211	.310	.711
W2	I can trust my workmates to support me if I had a complaint about safety	**.747**	.214	.117	.617
W15	My workmates are not afraid to stop a job they think is unsafe	**.738**	-.033	.241	.604
W8	The people I work with know the difference between having a laugh and doing a job safely	**.646**	.349	.206	.582
W9	I can trust my workmates to tell the truth	**.589**	.182	.545	.677
Cronbach $\alpha = 0.87$					
W5	I can't trust my workmates to maintain high levels of safety even if they say they will	-.055	**.782**	.076	.621
W7	My workmates lack the ability to decide if a job is safe to carry out	.283	**.766**	.104	.677
W11	My workmates don't care about my safety	.232	**.623**	.329	.550
W10	My workmates are not experienced offshore workers	.270	**.588**	.201	.459
W3	Generally, I don't trust my workmates	.469	**.501**	.083	.477
Cronbach $\alpha = 0.77$					
W13	My workmates would disclose to others information I had told to them in confidence	.025	.201	**.810**	.697
W12	The people I work with would take credit for something they haven't done	.148	.200	**.712**	.569
W6	I can trust my workmates to be open and honest when it comes to mistakes they might have made	.495	.154	**.587**	.613
W4	My workmates are kind and thoughtful	.399	.020	**.533**	.443
Cronbach $\alpha = 0.73$					
Eigenvalue		**6.31**	**1.47**	**1.24**	

respectively. Although these items are phrased generally, it might be argued that competence (W1) is evaluated with reference to safety, as an assessment of ability typically requires a target such as a goal, a task, or an area of expertise. Support for this conclusion was found during interviews with offshore workers (see Chapter 4), where low frequency of unintentional mistakes and an absence of unsafe behaviour were identified as indicators of another's competence. Factor one is therefore labelled, *'Trust in workmates safety'*.

Factor 2: Distrust of workmates safety

Factor 2 comprises 5 items that reflect distrust of workmates, predominately with safety (e.g., *'My workmates don't care about my safety'* and *'I can't trust my workmates to maintain high levels of safety even if they say they will'*). A general distrust in workmates ability is also represented in this factor, *'My workmates are not experienced offshore workers'*, although applying the same logic as with item W1 (factor 1) it might be argued that this item is evaluated with respect to safety. For instance, in the offshore industry 'green hat' policies require new-starts to wear a different coloured (green) hat to signal their newness to the installation, and in some cases the industry. Typically these individuals are monitored until they demonstrate their competency on a job, which is determined largely by the extent to which they follow procedures and by the number of mistakes they make. Experience and competency are therefore strongly related, and both are evaluated for their impact on safety. Factor two is labelled, *'Distrust of workmates safety'*.

Factor 3: General (affect-based) trust in workmates

Factor 3 comprises 4 items that measure general trust (W4) and general distrust (W12 and W13) towards workmates. Item W6, *'I can trust my workmates to be open and honest when it comes to mistakes they might have made'* is consistent with a trust theme but measures this at a specific rather than a general level. A possible explanation for item W6's loading on factor 3 relates to its indication of affect-based trust, which is reflected by the other three items in this factor. For instance, item W6 and W12 make reference to integrity, and item W4 and W13 tap benevolence. As discussed in Chapter 3, integrity and benevolence are strongly implicated in affect-based trust. Together with the 'general' domain dominance of factor three, this explanation is consistent with the suggestion that affect based trust is relationship-specific rather than domain-specific (e.g., McAllister, 1995). Factor three is therefore labelled, *'General (affect-based) trust in workmates'*.

7.5.2 Supervisors

PCA reduces the 15-item Supervisors subscale into 3 factors, each with an eigenvalue greater than 1. Together these factors account for 67% of the total variance, with factor 1 explaining 53%, factor 2, 7% and factor 3, 7%. An inspection of the factor structure, as shown in Table 7.4, reveals high communality value for most items, with the lowest found for S13 (h^2 .47) and S15 (h^2 .45). Compared to other items in the Supervisors subscale, they are the only ones that make reference to 'management' or 'managing'. The factor structure indicates a 2-item composition for factor 2. While some analysts might suggest that this is indicative of an unreliable and unstable factor (Tabachnick & Fidell, 2001), the factor loadings and communality values of these items are exceptionally high (.89 / .86 and h^2 .81 / h^2 .84, respectively), thus suggesting the factor to be statistically robust (Gorsuch, 1983). Therefore, factor two was retained within the structure.

Factor 1: General supervisory characteristics

Factor 1 comprises 10 items that predominately ($n = 8$) reflect a general attitude towards supervisors (e.g., *'I trust my supervisor to make decisions that affect me'* and *'My supervisor keeps the promises that he makes'*). The 'type' of attitude (i.e., trust or distrust) is not specified within the factor, although the ratio of 6:4 trust to distrust items suggests the former as more prominent. Inconsistent with a 'general'

Table 7.4: Three-factor structure of the supervisors subscale

		Factors			
	Questionnaire Item	**1**	**2**	**3**	**h²**
S10	My supervisor keeps the promises that he makes	**.792**	.266	.105	.709
S5	My supervisor would go out of his way to help me	**.766**	.256	.219	.701
S7	I trust my supervisor to make decisions that affect me	**.766**	.359	.090	.724
S12	My supervisor wants a job done safely even if it means extra time or extra cost	**.690**	.168	.254	.569
S6	My supervisor is not willing to listen to the concerns I might have about safety	**.685**	.211	.476	.740
S8	I can talk to my supervisor and know that he will want to listen	**.656**	.573	.069	.763
S15	My supervisor is afraid of upsetting management	**.604**	.300	.140	.474
S13	My supervisor is incompetent when it comes to managing his team	**.593**	.086	.294	.446
S4	I often find what my supervisor says is untrue	**.560**	.311	.420	.587
S14	I trust my supervisors ability to do his job	**.436**	.418	.387	.514
Cronbach $\alpha = 0.93$					
S2	I can trust my supervisor's judgement when it comes to safety	.235	**.890**	.178	.880
S1	I can trust my supervisor to be fair in the way he deals with safety incidents	.321	**.864**	.192	.886
Cronbach $\alpha = 0.93$					
S9	I can't trust my supervisor with a job that impacts on my safety	.104	.064	**.853**	.743
S3	I don't trust my supervisor's ability to make sure jobs are carried out in a safe way	.283	.487	**.592**	.668
S11	My supervisor often emphasises safety publicly but then cuts corners when carrying out his job	.490	.248	**.509**	.560
Cronbach $\alpha = 0.70$					
Eigenvalue		**7.90**	**1.05**	**1.01**	

focus are two items that reflect a safety-specific attitude towards supervisors, S6, *'My supervisor is not willing to listen to the concerns I might have about safety'* and S12, *'My supervisor wants a job done safely even if it means extra time or extra cost'*. A possible explanation for this inconsistency is 'item embeddedness' effects (Harrison & McLaughlin, 1993). The placement of items S6 and S12 among general items is likely to have resulted in a 'general' evaluative process being applied to all items, including those specific to safety. A label representative of most items in factor one is therefore, *'General supervisory characteristics'*.

Factor 2: Trust in supervisors' management of safety

Factor 2 comprises 2 items, *'I can trust my supervisor's judgement when it comes to safety'* and *'I can trust my supervisor to be fair in the way he deals with safety incidents'*. Together these reflect, *'Trust in supervisors' management of safety'*.

Factor 3: Distrust of supervisors safety

Factor 3 comprises 3 items that reflect distrust of supervisors in a safety context, for example, *'I can't trust my supervisor with a job that impacts on my safety'*, and *'I don't trust my supervisors ability to make sure jobs are carried out in a safe way'*. Factor three is therefore labelled *'Distrust of supervisors safety'*.

7.5.3 Offshore Managers

PCA reduces the 15-item Offshore managers subscale into 2 factors, each with an eigenvalue greater than 1. Together these factors account for 62% of the total variance, with factor 1 explaining 55% and factor 2, 7%. An inspection of the factor structure, as shown in Table 7.5, indicates moderate to high communality values for most items, suggesting that the structure offers a fair fit to most data. An item with poor representation in the structure is M7. This item is indicated to have a low communality value, h^2 .28, and a non-significant factor loading ($r < .40$). This item was therefore excluded from the interpretation of factors and the calculation of their scores.

Table 7.5: Two-factor structure of the offshore managers subscale

	Questionnaire Item	Factors 1	2	h^2
M12	I am suspicious of the motives behind management's actions	**.764**	.332	.694
M11	Management lie about safety standards offshore to create a favourable picture	**.761**	.306	.672
M13	Management are vague when answering questions the workforce have about issues that affect them	**.740**	.214	.594
M2	Management like to blame people when mistakes are made	**.735**	.186	.575
M5	Management will overlook safety issues to advance their career	**.663**	.470	.660
M14	Management lack the experience needed to know how to do a job safely	**.630**	.437	.588
M15	I trust management on my installation	**.617**	.584	.722
M4	I am not confident in management's skills	**.589**	.368	.483
M7	I have a good rapport with management	.394	.358	.284
Cronbach $\alpha = 0.91$				
M8	I can trust management to make sure the installation is run in a safe way	.319	**.828**	.787
M1	Management frequently demonstrate their commitment to safety	.147	**.808**	.675
M10	Management is successful at ensuring safety policies are adhered to offshore	.401	**.718**	.676
M6	Management are honest when it comes to safety	.442	**.717**	.710
M3	I can trust management to do what they say they will do	.292	**.673**	.537
M9	Management are well qualified	.466	**.619**	.600
Cronbach $\alpha = 0.90$				
Eigenvalue		**8.19**	**1.07**	

Factor 1: Distrust of management

Factor 1 comprises 8 items, 7 of which relate to distrust of managers. The domain in which this attitude manifests is not specified by items as distrust with safety, *'Management lack the experience needed to know how to do a job safely'* and *'Management will overlook safety issues to advance their career'*, and distrust generally, *'I am not confident in management's skills'*, are both represented. In contrast to an attitude of distrust, item M15, *'I trust management on my installation'*, reflects an attitude of trust. Theoretically it is not clear why this item loaded on what is essentially a distrust factor, although methodologically it might be accounted for using the previous explanation of item embeddedness as M15 follows 4 distrust items. However, unlike factor one of the supervisors subscale, the evaluative process of influence here is attitude rather than domain. Factor one is therefore labelled, *'Distrust of management'*.

Factor 2: Trust in Managements Safety

Factor 2 comprises 6 items that collectively represent trust in offshore managers. Of these, 4 measure trust with safety (M1, M6, M8 and M10) and 2 measure general trust (M3 and M9). However, similar to workmates factors 1 and 2, it might be argued that item M9, *'Management are well qualified'*, also taps an attitude specific to safety. Most representative of the items in this factor is, *'Trust in managements safety'*.

7.5.4 Safety Personnel

PCA reduces the 10-item Safety personnel subscale into 2 factors, each with an eigenvalue greater than 1. Together these factors account for 59% of the total variance, with factor 1 explaining 45% and factor 2, 14%. An inspection of the factor structure, as shown in Table 7.6, indicates moderate communality values for most items except SP6, which has the low value of h^2 .37. Results also reveal item SP9 to load similarly on both factors (.54). Therefore this item was omitted from the interpretation and estimation of factors.

Factor 1: Trust in safety representatives

Factor 1 comprises 5 items that predominately reflect trust in safety representatives. Two items indicate slight inconsistencies in the underlying meaning of this factor. Item SP6, *'My safety representatives lack the experience required to represent the workforce on safety issues'*, is consistent with the theme of safety

Table 7.6: Two-factor structure of the safety personnel subscale

	Questionnaire Item	Factors 1	2	h²
SP3	I can trust my safety representative to listen to suggestion I might have about how safety can be improved	**.891**	-.061	.794
SP1	My safety representatives are open and honest	**.842**	.074	.714
SP5	Safety representatives have my best interests at heart	**.828**	.067	.690
SP2	I can trust my safety officer to give me feedback	**.660**	.360	.566
SP9	I trust my safety officers ability to do his job	.540	.535	.578
SP6	My safety representatives lack the experience required to represent the workforce on safety issue	**.490**	.354	.365
Cronbach $\alpha = 0.84$				
SP4	My safety officer rarely supports the workforce when they raise safety issues	.363	**.694**	.613
SP7	I see my safety officer as part of management	-.171	**.661**	.466
SP10	My safety officer is not open to suggestions I might have	.113	**.649**	.434
SP8	My safety officer lacks the interpersonal skills necessary to carry out his role	.552	**.581**	.642
Cronbach $\alpha = 0.64$				
Eigenvalues		**4.45**	**1.41**	

representatives but reflects distrust rather than trust, and item SP2 *'I can trust my safety officer to give me feedback'* is consistent with trust but relates to safety officers. A label most representative of items in factor one is, '*Trust in Safety Representatives*'.

Factor 2: Distrust of safety officers

Factor 2 comprises 4 items that reflect general distrust of safety officers, for example, *'My safety officer is not open to the suggestions I might have'* and *'My safety officer lacks the interpersonal skills necessary to carry out his role'*. Factor 2 is therefore labelled, *'Distrust of safety officers'*.

7.5.5 ***Operating Company***

PCA reduces the 10-item Operating company subscale into 2 factors, each with an eigenvalue greater than 1. Together these factors account for 63% of the total variance, with factor 1 explaining 50% and factor 2, 13%. An inspection of the factor structure, as shown in Table 7.7, indicates high communality values, thus suggesting the structure offers a good fit to the items.

Factor 1: Trust in the operating company with safety

Factor 1 comprises 6 items. Of these, 4 items (OC2, OC4, OC5, and OC6) represent specific trust in the operating company with safety (e.g., *'The company operates 'best' practice when it comes to safety'*), and 1 item measures general trust (OC7, *'I can trust the operating company to keep their promises'*). The remaining item, OC3, *'The operating company doesn't care about my safety, they care only about making profits,* is inconsistent with other items as it reflects distrust rather than trust. The reason why this item loaded on factor 1 rather than factor 2, where similar items are found (e.g., *The operating company are not sincere when they say safety is their number one priority'*), is unclear. With the exception of item OC3, the most representative label of factor one is, *'Trust in the operating company with safety'*.

Factor 2: Distrust of the operating company

Factor 2 comprises 4 items that reflect distrust of the operating company. The domain in which distrust manifests is not specified within the factor as items measuring general distrust (OC1 and OC10), safety-specific distrust (OC8), and distrust with maintenance (OC9), load together. Although item OC9, *'The operating company doesn't invest enough money on maintaining my installation'* was designed as an indirect measure of distrust with safety, the results presented here suggest it to be interpreted as a distinct domain that contributes to an overall attitude of distrust. Factor two is therefore labelled, *'Distrust of the operating company'*.

Table 7.7: Two-factor structure of the operating company subscale

		Factors		
	Questionnaire Item	**1**	**2**	**h²**
OC6	The company operate 'best' practice when it comes to safety	**.840**	.213	.750
OC4	The operating company are clear about what they want with respect to safety offshore	**.824**	.018	.679
OC5	With respect to safety, I can trust the operating company	**.768**	.264	.660
OC2	The operating company fully support the structures they have in place that allow me to work safely	**.717**	.251	.578
OC3	The operating company doesn't care about my safety, they care only about making profits	**.652**	.371	.563
OC7	I can trust the operating company to keep their promises	**.548**	.530	.580
Cronbach $\alpha = 0.87$				
OC9	The operating company doesn't invest enough money on maintaining my installation	-.014	**.796**	.634
OC1	A feeling of 'us' and 'them' exists between the workforce and the operating company	.181	**.722**	.554
OC10	I don't trust the operating company	.499	**.691**	.727
OC8	The operating company are not sincere when they say safety is their number one priority	.311	**.686**	.567
Cronbach $\alpha = 0.78$				
Eigenvalue		**5.01**	**1.28**	

7.5.6 Contractors

PCA reduces the 15-item Contractors subscale into 2 factors, each with an eigenvalue greater than 1. Together these factors account for 63% of the total variance, with factor 1 explaining 55% and factor 2, 8%. An inspection of the factor structure, as shown in Table 7.8, reveals high communality values for all items except C7 (h^2 .32). The structure is therefore indicated to offer a good fit to the items.

Factor 1: Contractor staff characteristics

Factor 1 comprises 12 items that collectively reflect attitudes towards contractor staffs' characteristics. The domain (general / specific) and type of attitude (trust / distrust) is not specified within the factor. Rather items show an ordering from trust (highest loading) to distrust (lowest loading). Factor one is therefore

Table 7.8: Two-factor structure of the contractor subscale

	Questionnaire Item	Factors 1	2	h²
C11	Based on past experience, I know I can trust contractors to act safely	**,830**	.257	.755
C10	Contractors are very capable at performing their job	**.801**	.111	.655
C13	I trust contractor's judgement in deciding whether a job is safe enough to carry out	**.795**	.158	.657
C1	I trust contractors to consider other people's safety when carrying out their work	**.793**	.305	.721
C15	Contractors would go out of their way to help me	**.784**	-.011	.615
C2	Contractors are open and honest about safety	**.760**	.298	.666
C6	Contractors are not professional in the way they carry out their work	**.731**	.260	.603
C4	Generally, I trust contractors	**.720**	**.408**	.685
C9	Contractors are only concerned with looking after themselves	**.694**	.312	.579
C8	Contractors are inconsistent in the way they carry out their work	**.641**	.360	.540
C12	Contractors would conceal mistakes they might make even if doing so might put others at risk	**.615**	.505	.633
C5	Contractors lack the training needed to carry out jobs in a safe way	**.610**	.434	.561
Cronbach $\alpha = 0.94$				
C14	I can't trust contractors when it comes to safety	-.091	**.814**	.671
C3	Contractors often take short-cuts to get the job done quickly even if it puts others at risk	.456	**.714**	.718
C7	Sound principles guide contractors behaviour	.349	**.441**	.316
Cronbach $\alpha = 0.59$				
Eigenvalue		**8.21**	**1.17**	

labelled, *'Contractor staff characteristics'*.

Factor 2: Distrust of contractor staffs' safety performance

Factor 2 comprises 3 items. Of these, 2 reflect specific distrust of contractors with safety (e.g., *'I can't trust contractors when it comes to safety'*, and *'Contractors often take short-cuts to get the job done quickly even if it puts others at risk'*), and 1 item reflects general trust, C7, *'Sound principles guide contractors behaviour'*. The reason why a general trust item loads on what is predominately a specific distrust factor is unclear, as no obvious link between the two exists. A label most representative of the items in this factor (and one based on the set criteria of .53 for item inclusion in this process) is, *'Distrust of contractor staffs' safety performance'*.

7.6 Discussion of the 14-Factor Structure[6]

The results of within-subscale analyses show that at an installation level, trust towards different occupational groups structure around the salient dimensions of attitude (trust and distrust) and in a limited number of groups - workmates and supervisors - domain (safety specific and general). However, in the case of safety personnel, the two-dimensional structure of trust and distrust is complicated by the poor design of items. Specifically, findings reveal trust items are predominately directed towards safety representatives and distrust items towards safety officers. Therefore, whether a trust / distrust divide is due to an attitude dimension or one that reflects differences between occupational roles is unclear.

The finding of two-dimensional structures on the Map installation shows that workers have distinct attitudes of trust and distrust towards others. This offers empirical support for two-factor type theories (Lewicki, McAllister, & Bies, 1998), which argue that these attitudes co-exist in a single relationship, and fails to support continuum-based approaches (cf. Rotter, 1967). While similar findings have been reported in other research (e.g., Clark & Payne, 1997; Omedei & McClennen, 2000), these tend to attribute two factor structures to the effects of measurement error caused by using positively and negatively worded items in the same questionnaire (see, Schmitt & Stults, 1985; Benson, 1987; Pilotte & Gable, 1990). For instance, in accounting for a distinction between trust and mistrust, Clark and Payne (1997) argue that the latter represents an artefact caused by negatively worded items. As research suggests, negative worded items may produce cognitive and affective biases in the way individuals respond (see Rosenberg, 1965; Warr, Barter, & Brownridge, 1983).

---

[6] The term '14-factor structure' is used for simplicity to refer to the factors collectively extracted from the different within-subscale analyses.

In the present study, two reasons exist to suggest that the structures extracted are minimally affected by error. First, cognitive biases associated with negatively worded items have been attributed to cognitive deficiencies in reading comprehension that are usually found when the sample population is children (Marsh, 1986). In this study, little reason exists to suggest that workers experience the cognitive underdevelopment experienced by young children. However, the age matched reading ability of some offshore workers that has been estimated at 11-13 years raises the potential for some workers responses to be affected by cognitive bias. This poses a potential limitation for the current study. The second suggestion that the structure is minimally affected by error is the established face validity of the TCSQ, which suggests that workers comprehend the meaning of questions. The dimensions of trust and distrust may therefore be regarded as valid constructs. Future surveys using the TCSQ will offer more insight into the validity of a two-dimensional structure by showing if it emerges on other installations.

As well as distinguishing between trust and distrust, attitudes towards workmates and supervisors were also differentiated by the domain of focus. Specifically, both structures suggest that attitudes of trust and distrust exist as distinct entities in a safety context, but generally they form a single entity. This supports the hypothesis that trust and distrust coexist in a relationship through compartmentalization (H^T6a) and offers quantitative support for a similar finding in the qualitative study (see Chapter 4). Specifically, that another person might be trusted with safety but distrusted in general because of their actions or decision on others job aspects. Collectively, the findings raise two questions. First, why a distinction between trust and distrust exists only in a specific context and; second, why a domain effect only emerged for attitudes towards workmates and supervisors.

A possible explanation for finding a single attitude in a general context compared to distinct attitudes of trust and distrust in a specific context relates to the scope of evaluation required when reporting a general attitude. Evaluating another in general terms requires consideration of a large and non-specific frame of reference. Reporting an aggregate level of trust and distrust (or the more dominant of the two) rather than specific levels of these attitudes in multiple domains eases the cognitive demands associated with this task. Thus in a general context, a single attitude is likely to be reported. In contrast, evaluating another in a specific context requires the individual to consider a smaller number of events that relate to some specific area of organizational functioning. In these cases, the frame of reference is smaller and so specific levels of each attitude may be reported with relative ease.

Regarding the specificity of a domain effect in attitudes towards workmates and supervisors, this may be accounted for by their direct involvement in everyday safety. For instance, the role of frontline workers and supervisors places them in a position where safety is highly salient and good safety performance is paramount. Unsafe acts at this level have immediate consequences for offshore workers. Therefore, specific trust in these groups with safety is crucial and one that must be differentiated from a general attitude. In contrast, managers and senior members of the operating company engage less in daily platform activities related to production and so have less opportunity to make mistakes and jeopardize worker safety. Consequently, their safety performance poses less of a salient threat to workers on an immediate basis. In these groups, trust with safety might be as important as trust with general and job related issues on a daily basis. Therefore, in these latter groups, trust with safety is unlikely to be distinguished from trust in general.

Another explanation for the specificity of a domain effect in some groups relates to frequency of interaction. The respondents of this study (predominately contractor staff holding frontline positions) interact with workmates and supervisors on a daily basis and in a variety of situations. The detailed knowledge of the other that this provides allows workers to differentiate their levels of trust and / or distrust in these groups depending on the domain in which the relationship is evaluated. In contrast, workers interact with offshore managers on a limited basis and so have little specific information relating to their behaviour in different contexts. Consequently, this causes workers to rely on a less precise general attitude. This logic might also indicate a domain effect in attitudes towards contractor's due to their role as frontline workers, and hence frequent interaction with respondents in the Map survey. However, this was not found. As a possible explanation it might be argued that attitudes towards this group are evaluated specifically with relation to transient rather than core contractors. The relatively short stay that this group have on a specific installation prevents knowledge of their trustworthiness with safety from developing and may create a reliance on stereotypes or company reputations (see Chapter 4).

While frequency of interaction explains a domain effect from an individual perspective, at an organizational level its *absence* may be accounted for with the suggestion that safety operates as part of a collective rather than as a single. As Lee and Harrison (2000) argue, the problem with much safety research is its failure to consider wider organizational domains that indirectly influence safety. These might include job satisfaction, stress, and promotion prospects. Therefore, just as an organization's culture influences safety culture, general trust is likely to influence (safety-) specific trust (Stetzer, Moregeson, & Anderson, 1997). The finding that specific and general attitudes form a single entity in some groups supports this conclusion and may be taken as indicative of the combined affect that both focuses of trust have in a safety context. This is also supported by the comment made by one worker interviewed who argued that trust applies to a relationship as a whole and is not pigeon holed to apply only to safety.

Although offshore workers distinguish between the attitudes of trust and distrust, they do not seem to differentiate the bases on which these attitudes develop. In contrast to research that identifies individual characteristics (Clark & Payne, 1997; Mayer & Davis, 1999), and the psychological foundations of cognition and affect (McAllister, 1995), as distinct underlying constructs of these attitudes, the structures extracted here failed to discriminate between individual qualities, and with the exception of workmates, rational and emotional forms of trust. Further, an inspection of the composition of these factors reveal (dis)trust and (un)trustworthiness to form single states. While this supports the strong relationship between these entities (Deutsch, 1958; Hardin, 2000; Costa, 2003) it fails to offer support for their existence as distinct constructs (Mayer & Davis, 1999; Davis, Schoorman, Mayer, & Tan, 2000).

As a possible explanation for the different findings reported in this study, it might be argued that the small number of items included within the TCSQ to measure these specific bases (e.g., ability, integrity, benevolence, trust and distrust) prevented their emergence as distinct dimensions. For instance, Mayer and Davis (1999) found distinct factors relating to trust and trustworthiness characteristics using a measure of general trust in supervisors. This is in contrast to the multi-faceted nature of the TCSQ, which provides a more detailed insight into trust but due to its multiple domains reduces the relative strength that individual characteristics have in defining factors. However, as factors with as few as three items were extracted in this study, this cannot be taken as an explanation per se. Rather, at this stage of understanding it might be concluded that when multiple dimensions are considered, those relating to the macro aspects of trust (i.e., attitude) will play a more salient role than those relating to its micro aspects (i.e., trustworthiness).

Finally, the failure to identify dimensions specific to cognition and affect-based trust might be attributed to their absence as an explicit facet in the mapping sentence that underlies the TCSQ. The finding that these psychological foundations do not emerge empirically (with the exception of the general affect based trust in workmates factor), suggests that the TCSQ might not distinguish between these foundations. In agreement with Bigley and Pearce (1998) it appears that using a measure in a way other than originally intended by its developers reduces it reliability and effectiveness as a tool. In this study, Mayer, Davis and Schoorman's (1995) cognitive indicators of integrity and benevolence were used to tap affect-based trust.

7.7 Summary

In this Chapter, the structure of trust at a macro-level was presented. This identified the relative importance of different groups in shaping trust and distrust attitudes offshore. However, it failed to provide an insight into how trust attitudes structure towards these groups. The results of a second set of within-subscale analyses designed to examine this revealed a two-dimensional structure based on the attitudes of trust and distrust to exist towards most groups offshore. Further, in some groups a domain (i.e., general or safety-specific) effect emerged. Using the results of these within-subscale analyses, the next Chapter will assess the psychometric properties of the TCSQ. Specifically, tests will be carried out that assess its validity and reliability. In doing this it will also be possible to explore a number of substantive issues such as the potential for trust subcultures offshore and the role of trust in offshore safety.

Chapter 8

Psychometric Properties of the Trust Climate and Safety Questionnaire: Tests of Reliability and Validity

In this Chapter, the results of a series of tests that examine the psychometric properties of the Trust Climate and Safety Questionnaire (TCSQ) are reported. Specifically, the Chapter discusses the scale's reliability and validity (construct, discriminate, and predictive), and in doing so shows the statistical robustness of the TCSQ. The test results also provide an insight into a number of substantive issues relating to trust subcultures and the role of trust in safety performance. These are discussed at the end of the Chapter.

8.1 Psychometric Properties: Within-Subscale Factor Structures

The psychometric properties of the TCSQ were assessed using the 14 factors extracted from the within-subscale exploratory factor analyses. Using the within-subscale factors rather than the 'primary' (six) factors had the advantage of localising good and poor psychometric properties to a subgroup of items. For instance, using the six-factor structure to test the properties of the TCSQ identified the senior management factor as the strongest predictor of accidents and incidents offshore. However, separate analysis of its sub-factors (management, operating company, and safety officers) identified the strongest predictor as management only (for a full copy of test results using the six factors see Appendix E, Tables, A2-A5). This shows that a more accurate understanding of trust and its role in offshore safety can be obtained using the within-subscale factor structures. Additional to the 14 factors, a non-factor based predisposition to trust (PT) measure was also included in the analysis. This was calculated from the eight items that make up the Generalized Others subscale of the TCSQ. Including this measure allowed for a full assessment of the role of personality in offshore trust climates.

8.2 Reliability: Estimates of Internal Consistency

Estimates of reliability show 12 of the 14 factors have moderate to good levels of internal consistency[7]. Highly reliable factors are Contractor staff characteristics, $\alpha = .94$, General supervisory characteristics, $\alpha = .93$, Trust in supervisors management of safety, $\alpha = .93$, Distrust of management, $\alpha = .91$, and Trust in managements safety, $\alpha = .90$. Factors with moderate estimates of internal consistency are Trust in workmates safety, $\alpha = .87$, Trust in the operating company with safety, $\alpha = .87$, Trust in safety representatives, $\alpha = .84$, Distrust of the operating company, $\alpha = .78$, Distrust of workmates safety, $\alpha = .77$, General (affect based) trust in workmates, $\alpha = .73$, and Distrust of supervisors safety, $\alpha = .70$. Of the 14 factors, two have poor reliability with estimates below .70 (Kline, 2000), Distrust of safety officers, $\alpha = .64$, and Distrust of contractor staffs' safety performance, $\alpha = .59$. The non-factor based PT measure also has poor reliability, $\alpha = .58$.

In large, these results suggest that most of the dimensions extracted from the Map installation are reliable measures of trust and distrust attitudes toward different groups offshore. However, three factors are identified that lack internal consistency. First, the Distrust of safety officers' poor reliability might be attributed to workers using different focal objects when evaluating their attitudes towards this group. For instance, some might use the offshore safety officer while others might relate their attitudes to the HSE officer based onshore. With different focal objects, the

[7] Reliability was estimated using items with significant factor loadings (.40).

consistency in responses between workers will reduce. Second, the poor reliability for the factor, Distrust of Contractors' safety performance, might be a result of conducting the survey during the Map installation's annual shutdown when a relatively larger number of transient contractors were on the platform than usual. Expressing attitudes towards a relatively new group is likely to result in large variation in the responses given. Finally, and as explained in the previous Chapter, the poor reliability of a PT measure is accounted for by its non-factor based nature (Wheeless, 1978).

8.3 Construct Validity: Inter-Correlations between Factor Scores

Examining the inter-correlations between factor scores and a PT measure assessed the construct validity of the TCSQ. Good performance on this property is indicated by significant correlations that are in a direction and to a magnitude that is consistent with previous research.

An inspection of the results from the Pearson correlation analyses, as show in Table 8.1, indicates strong associations between intra-group (i.e., factors extracted from the same subscale), and inter-group factors. Strong intra-group associations are indicated between Distrust of management and Trust in managements safety, $r = .79$, General supervisory characteristics and Distrust of supervisors safety, $r = .70$, and General supervisory characteristics and Trust in supervisors' management of safety, $r = .66$. Of slightly lower magnitude are intra-factor relationships between Trust in workmates safety and General (affect based) trust in workmates, $r = .63$, Trust in the operating company with safety and Distrust of the operating company, $r = .62$, and Contractor staff characteristics and Distrust of contractor staffs' safety performance, $r = .60$. The weakest intra-factor associations are between, Trust in supervisors'

Table 8.1: Inter-correlations between the 14 Map factor scores and a non-factor based predisposition to trust measure

		W1	W2	W3	S1	S2	S3	M1	M2	SP1	SP2	OC1	OC2	C1	C2
W1	Trust in workmates safety														
W2	Distrust of workmates safety	.59**													
W3	General (affect-based) trust in workmates	.63**	.49**												
S1	General supervisory characteristics	.59**	.43**	.46**											
S2	Trust in supervisors' management of safety	.58**	.29**	.49**	.66**										
S3	Distrust of supervisors safety	.41**	.41**	.43**	.70**	.55**									
M1	Distrust of management	.37**	.29**	.39**	.58**	.47**	.48**								
M2	Trust in managements safety	.50**	.33**	.39**	.56**	.48**	.45**	.79**							
SP1	Trust in safety representatives	.47**	.36**	.38**	.49**	.42**	.39**	.50**	.55**						
SP2	Distrust of safety officers	.20**	.18**	.21**	.42**	.26**	.35**	.58**	.45**	.54**					
OC1	Trust in the operating company with safety	.43**	.33**	.42**	.57**	.47**	.46**	.68**	.72**	.57**	.52**				
OC2	Distrust of the operating company	.27**	.23**	.39**	.45**	.33**	.38**	.74**	.62**	.44**	.45**	.62**			
C1	Contractor staff characteristics	.44**	.31**	.34**	.49**	.40**	.33**	.35**	.37**	.34**	.28**	.33**	.19**		
C2	Distrust of contractor staffs' safety performance	.41**	.36**	.41**	.46**	.36**	.38**	.45**	.39**	.39**	.35**	.45**	.43**	.60**	
PT	Predisposition to trust	.25**	.10	.34**	.24**	.20**	.27**	.31**	.34**	.32**	.18**	.30**	.30**	.23**	.22**

** Correlations significant at the 0.01 level

PT = non-factor based 'Predisposition to trust' measure calculated from the eight items in the 'generalized others' section of the TCSQ management of safety and Distrust of supervisors safety, *r* = .55, Trust in safety representatives and Distrust of safety officers, *r* = .54, and Distrust of workmates safety and General (affect based) trust in workmates, *r* = .49.

Strong inter-factor associations exist between, Distrust of management and Distrust of the operating company, *r* = .74, Trust in managements safety and Trust in the operating company with safety, *r* = .72, Distrust of management and Trust in the operating company with safety, *r* = .68, and Trust in managements safety and Distrust of the operating company, *r* = .62. The magnitude of these associations offer support to the prediction that a strong positive relationship exists between the level of trust in the operating company and the level of trust in management ($H^{T}1$). Distrust of management also has a moderate relationship with Distrust of safety officers, *r* = .58, and Trust in safety representatives, *r* = .50.

As well as several strong associations, an inspection of the correlation matrix reveals several weak relationships. Specifically, Trust in safety representatives shows a weak association with the factors; General (affect based) trust in workmates, *r* = .21, Trust in workmates safety, *r* = .20, and Distrust of workmates safety, *r* = .18. Similarly, Distrust in the operating company has a low magnitude relationship with Trust in workmates safety, *r* = .27, and Distrust of workmates safety, *r* = .23. Distrust of workmates safety also has a weak association with Distrust of management, *r* = .29, and Distrust of the operating company has a weak association with Contractor staff characteristics, *r* = .19. Finally, Trust in supervisors' management of safety has a low magnitude association with Distrust of safety officers, *r* = .26.

Of all of the correlations, the lowest magnitude relationships are found between pairs of factors were one represents PT. Results show PT to be weakly associated with Distrust of safety officers, *r* = .18 and Trust in supervisors' management of safety, $r = .20$. Of slightly higher magnitude are the associations PT has with General (affect based) trust in workmates, $r = .34$, Trust in managements safety, $r = .34$, Trust in safety representatives, $r = .32$, and Distrust of management, $r = .31$. Collectively these results support the hypothesis that propensity to trust has a minimal influence in determining levels of trust when strong situational factors exist (H^T3a).

8.4 Discriminate Validity: A Test of Group Differences

The discriminate validities of the factors were assessed through a series of one-way analysis of variance (ANOVA) comparisons between offshore groups. Group comparisons were identical to those carried out by Mearns et al. (1997), which offered support for the validity of conclusions reached here when similarities were found. The groups compared were; supervisors and non-supervisors, contractor and operator staff, offshore occupations ($n = 7$; see Table 7.1), groups based on working tenure offshore ($n = 4$), and groups based on the number of years they have worked on the Map installation ($n = 4$). Tukey's (1953) Honesty Significant Difference (HSD) test was used for post hoc pairwise comparisons between mean scores of groups ($n > 2$) on factors where a significant main effect was found. The critical level of $p. < .05$ was used to indicate significant differences between group means. Standardised factor scores were used to carry out the ANOVA comparisons, while non-standardised means and standard deviations are reported for significant differences on post hoc tests. Using non-standardized scores eases interpretation.

8.4.1 Supervisors versus non-supervisors[8]

Comparisons between supervisors and non-supervisors indicate a significant main effect on 1 of the 14 factors, Distrust of management, $F\,(1, 180) = 5.24, p < .05$, $\eta^2 = .03$. Comparisons between group means reveal supervisors have a lower level of distrust in management (M = 38.6, SD = 7.2) compared to non-supervisory staff (M = 35.3, SD = 8.2).[9]

8.4.2 Operator versus contractor staff

One-way ANOVA comparisons between operator and contractor staff reveal a significant main effect on 4 of the 14 factors. These are, Trust in the operating company with safety, $F\,(1, 184) = 7.80, p < .01$, $\eta^2 = .04$, Distrust of the operating company, $F\,(1, 184) = 4.73, p < .05$, $\eta^2 = .03$, Contractor staff characteristics, $F\,(1, 184) = 41.76, p < .01$, $\eta^2 = .19$, and Distrust of contractor staffs' safety performance, $F\,(1, 184) = 5.50, p < .05$, $\eta^2 = .03$. A marginal, but non-significant difference is also revealed for Distrust of safety officers, $F\,(1, 184) = 3.84, p = .056$.

An inspection of mean value differences between groups on each of these factors reveal operator staff to have relatively high levels of trust in the operating company with safety (M = 27.4, SD = 4.6), and low levels of distrust of them (M = 14.3, SD = 3.7). This is compared to contractor staff who report lower levels of trust in the operating company (M = 25.4, SD = 4.7), and higher levels of distrust towards them (M = 13.0, SD = 4.1). Contractor staff are indicated to have relatively positive attitudes of contractor staff characteristics and less distrust of contractors' safety performance (M = 58.0, SD = 9.3, and M = 13.4, SD = 2.7, respectively), compared

---

[8] These groups are based on the response to the question 'Are you a supervisor'? While managers might fall into either group depending on how they perceive their role, it is more likely that they will assign themselves to a supervisor group.
[9] Distrust items were reverse scored. A higher mean value indicates less distrust.

to operator staff who reported less positive attitudes of contractor staff characteristics (M = 48.8, SD = 9.2), and more distrust in their safety performance (M = 12.5, SD = 2.1).

8.4.3 Occupational groups

One-way ANOVA comparisons between different occupational groups show a significant main effect for 7 of the 14 factors. These are, Trust in supervisors management of safety, F (6, 184) = 2.29, p < .05, η^2 = .07, Distrust of management, F (6, 184) = 5.00, p < .01, η^2 = .14, Trust in managements safety, F (6, 184) = 3.21, p < .01, η^2 = .10, Trust in the operating company with safety, F (6, 184) = 3.80, p < .01, η^2 = .11, Distrust of the operating company, F (6, 184) = 3.73, p < .01, η^2 = .11, Distrust of safety officers, F (6, 184) = 2.26, p < .05, η^2 = .07, and Contractor staff characteristics, F (6, 184) = 4.66, p < .01, η^2 = .14.

Pairwise comparisons using Tukey's (1953) HSD test shows administrative and management staff[10] have significantly lower levels of distrust in management (M = 43.7, SD = 7.4) compared to construction (M = 34.6, SD = 7.6), production (M = 35.1, SD = 8.4), and maintenance workers (M = 34.7, SD = 7.4). Together with deck crew (M = 32.5, SD = 6.7), administrative and management staff also report significantly higher levels of trust in the operating company (M = 30.0, SD = 3.8) compared to construction workers who report lower levels (M = 24.7, SD = 4.9). Deck crew also hold significantly higher levels of trust in management (M = 32.8, SD = 8.5) compared to production workers (M = 23.9, SD = 5.7). A marginal, but non-significant difference (p = .06) is also indicated between the level of trust in management between production workers, and administrative and management staff.

[10] These occupations were grouped together in the OSQ, on which the demographic section of the TCSQ is based.

Specifically, the results indicate the latter group to have marginally higher levels of trust in management ($M = 29.9$, $SD = 4.5$) compared to production workers. Administrative and management staff are revealed as having lower levels of distrust in safety officers ($M = 19.4$, $SD = 2.4$) compared to production workers who report higher levels of distrust ($M = 16.3$, $SD = 3.4$). Finally, post hoc comparisons indicate that deck crew have more positive attitudes in contractor staff characteristics ($M = 74.5$, $SD = 3.8$) compared to administrative and management staff ($M = 52.2$, $SD = 9.1$), construction workers ($M = 57.9$, $SD = 11.0$), catering staff ($M = 56.2$, $SD = 4.8$), production workers ($M = 51.0$, $SD = 9.0$), and maintenance workers ($M = 52.8$, $SD = 10.0$). Other than those stated, post hoc comparisons revealed no other significant differences between occupational groups on any of these factors.

For the factors, Trust in supervisors' management of safety and Distrust in the operating company, Tukey's HSD tests were unable to locate significant differences at the $p. < .05$ level. Using the less stringent criteria of $p. < .10$, deck crew are revealed as having higher levels of trust in supervisors' management of safety ($M = 12.5$, $SD = 1.9$) compared to production workers who report lower levels of trust ($M = 9.0$, $SD = 1.7$). Regarding distrust in the operating company, construction workers are indicated as having higher levels ($M = 11.7$, $SD = 4.2$) compared to maintenance staff ($M = 13.7$, $SD = 3.7$). These trends are therefore likely to be responsible for the significant main effects that were found. No other differences between groups emerged at the $p. < .10$ level.

8.4.4 Differences according to offshore experience: Industry wide

One-way ANOVA comparisons were carried out between four groups that collectively represent working tenures offshore. These are; less than a year, 1-5 years, 6-10 years, and more than 10 years. Results of these comparisons show 1 of the 14 factors to have a significant main effect, Distrust in workmates safety, $F(3, 183) = 3.07, p < .05, \eta^2 = .05$. Tukey's HSD test indicates a significant difference between those with 6-10 years offshore experience and those with more than 10 years. Specifically, those working offshore for 6-10 years report significantly more distrust in workmates safety ($M = 22.8$, $SD = 5.3$) compared to those with a working tenure of more than ten years ($M = 25.6$, $SD = 4.4$). Post hoc comparisons reveal no other significant differences between groups on this factor.

8.4.5 Differences according to offshore experience: The Map installation

One-way ANOVA comparisons between groups based on the number of years they have worked on the Map installation (using the same time frames as above) indicate a significant main effect for the factor, Contractor staff characteristics, $F(3, 176) = 4.25, p < .01, \eta^2 = .07$. An inspection of the mean differences between groups indicate those with a working tenure of 1-5 years on the Map installation have more positive attitudes towards contractor staff characteristics ($M = 57.4$, $SD = 9.0$) compared to those with a working tenure of more than 10 years ($M = 51.2$, $SD = 11.1$). Post hoc comparisons reveal no other significant differences between groups on this factor.

Group differences

Results of group comparisons reveal a number of interesting differences in the trust and distrust attitudes held by different groups offshore and suggest the potential existence of trust subcultures. A full discussion of these findings and how they compare with other offshore research will be made near the end of the Chapter.

8.5 Predictive Validity: Accidents, Incidents and Near-Miss Involvement

The predictive validities of the factors and the PT measure are assessed for their ability to predict accidents / incidents offshore, accidents / incidents on the Map installation, and near-miss involvement. The present use of the term predictive is not to imply that the results based on past events (the type of information used here) will necessarily predict future accidents or incidents. To achieve this type of predictive success, research should adopt a longitudinal approach that maps workers attitudes before and after an accidents or incident to look for change. Rather the present use of the term 'predictive' fits with the notion that a tool's validity can be assessed by its ability to distinguish between a sample on some criterion of interest, which in this study is safety performance.

In the current study, the analyses are carried out over two stages. First, a direct logistic regression analysis is used to test each of the factors unique contribution to the prediction of each of the three safety measures. From the predictive factors found, a single model is produced (per safety measure) and tested using forward stepwise logistic regression analysis. The results of the second analysis indicate factor(s) that account for the most unique variance and therefore comprise the most predictive model(s) of safety.

Levels of safety

Self-reported safety data for the Map installation, as show in Table 8.2, shows 89 (47%) of the 203 respondents have experienced an accident or incident while working offshore and 53% (n = 42) have not. Of the 89 accident victims, 52% (n = 45) required medical attention. Most respondents (n = 164) have not experienced an accident or incident in the last six months, and those who have report no more than

Table 8.2: Self reported safety data for the Map Installation

	Categories	Frequency	Valid Percentage
Accidents/Incidents Offshore	No	101	53
	Yes	89	47
	Missing	13	-
Medical Attention	No	42	48
	Yes	45	52
	Missing	15	-
	N/A	101	-
Accidents/Incidents within last 6mths	0	163	95
	1	7	4
	2	2	1
	Missing	30	-
Accidents/Incidents on this installation	No	150	81
	Yes	36	19
	Missing	17	-
Accident/Incidents within last 6mths	0	173	97
	1	3	2
	2	2	1
	Missing	25	-
Person Responsible	Management	24	46
	Yourself	23	44
	Core Crew	3	6
	Contractor	2	4
	N/A	98	-
Near-miss involvement	No	108	59
	Yes	75	41
	Missing	20	-
Number of near-misses	1	14	21
	2	20	30
	3	6	9
	4	2	3
	5	2	3
	6	3	4.5
	7	5	8
	9	1	1.5
	10	7	11
	100+	6	9
	N/A	29	-
	Missing	108	-

two events (n = 9). Relative to the accident rates reported by the current sample for the offshore industry, the Map installation appears to have a safer work record with only 19% (n = 36) of respondents reporting an accident while working on this installation. The responsibility for these accidents is attributed equally to management (44%) and to oneself (46%), with respondents less likely to perceive core crew (6%), and contractor staff (4%), as responsible. Compared to accidents and incidents, near-miss involvement is more common on the Map installation with 75 (41%) of the 203 respondents reporting a near-miss event. Most of the respondents have experienced only one (21%) or two (30%) near-miss events, with 7 respondents reporting 10 near-miss events (11%) and 6 reporting in their terms, '100's'.

Logistic regression: A test of assumptions

Prior to the logistic regression analysis, data were checked for linearity in the logit (i.e., a linear relationship between predictors and the logit transform of the dependent variable), and the presence of multicollinearity. To test for linearity of the logit, interaction terms from each factors (IV's) natural logarithm were created and added to a single model with predictor factors and their significance were checked (Tabachnick & Fidell, 2001). A direct logistic regression analysis of this model reveals all interaction terms are non-significant. Linearity in the logit is therefore upheld by these data. With respect to multicollinearity, an inspection of the standard error for each factor reveals none to be exceptionally large. Exceedingly high correlations between factors are therefore not present in the data. These results indicate that the data are suitable for logistic regression analysis.

8.5.1 Accidents and incidents offshore

Separate direct logistic regression analyses of each of the 14 factors and the PT measure show 7 of the factors and the PT measure to predict accidents / incidents offshore. In order of decreasing contribution based on the Wald statistic these are, Distrust of management, $z = 7.84, p < .01$, Distrust of contractor staffs safety performance, $z = 7.12, p < .01$, Trust in managements safety, $z = 5.77, p < .05$, Trust in safety representatives, $z = 5.68, p < .05$, Trust in the operating company with safety, $z = 4.46, p < .05$, PT, $z = 4.41, p < .05$, Distrust of safety officers, $z = 4.20, p < .05$, and Trust in workmates safety, $z = 4.01, p < .05$. A forward stepwise logistic regression analysis of a single model containing these factors and the PT measure reveals Distrust of management, $z = 7.41, p < .01$, as the only significant predictor. The amount of variance accounted for by this factor (model) is estimated by Nagelkerke's R^2 as 6%. The predictive success of the model is fair with reliability for an accident group at 49% and for a non-accident group at 67%. Combined these give an overall success rate of 59%. The odds ratio for this factor is .94. Given that this is less than1.00, it suggests that a 6% decrease in the likelihood of accidents and / or incidents offshore can be achieved by a one-unit increase in this factor (see Chapter 6), which translates into a decrease of distrust in management.

8.5.2 Accidents and incidents on the Map installation

Separate direct logistic regression analyses of the 14 factors and the PT measure show 2 of the factors to significantly predict accidents / incidents on the Map installation. These are Distrust of contractor staffs safety performance, $z = 12.17, p < .01$, and Distrust of safety officers, $z = 5.09, p < .05$. A forward stepwise logistic regression analysis of a model containing the two variables shows Distrust of contractor staffs' safety performance is the only significant predictor, $z = 12.17, p < .01$. The amount of variance accounted for by this factor is estimated by Nagelkerke's R^2 as 12%. Prediction success for the non-occurrence of accidents / incidents on the Map installation is excellent at 99%, but poor for accident groups at 8%. Combined these give an overall success rate of 82%. The odds ratio for this factor is .71, which indicates that the likelihood of an accident / incident on the Map installation will reduce by 29% with a decrease of distrust in contractor staffs' safety performance.

8.5.3 Near-miss involvement

Separate direct logistic regression analyses of the 14 factors and the PT measure show 10 factors and the PT measure to significantly predict near-miss involvement. In order of decreasing contribution based on the Wald statistic these are Distrust of workmates safety, $z = 11.61, p < .01$, Trust of workmates safety, $z = 10.32, p < .01$, General (affect based) trust in workmates, $z = 10.13, p < .01$, Distrust of contractors staffs' safety performance, $z = 7.76, p < .01$, Trust in safety representatives, $z = 7.75, p < .01$, Trust in the operating company with safety, $z = 7.03, p < .01$, Distrust of safety officers, $z = 6.55, p < .01$, Trust in managements safety, $z = 5.83, p < .05$, Distrust of supervisors safety, $z = 4.22, p < .05$, Distrust of management, $z = 4.13, p < .05$, and PT, $z = 4.11, p < .05$. A forward stepwise logistic regression analysis of a model containing all of these factors reveal Distrust of workmates safety, $z = 9.15, p < .01$, and Distrust of safety officers, $z = 4.31, p < .05$ to each account for unique variance. Nagelkerke's R^2 shows a model containing these two factors to account for 12% of the variance. The predictive success for the non-occurrence of near-miss involvement is good with reliability at 81% and fair for the occurrence of near-miss involvement with reliability at 42%. Combined these give an overall success rate of 65%. The odds ratio for Distrust of workmates safety is .87, and for Distrust of safety officers is .89. As this is less than 1 it suggests that a 1 unit increase in each of these factors (i.e., a reduction in distrust) will reduce the likelihood of near-miss involvement by 13% and 11%, respectively.

8.6 Discussion

Psychometric testing of the TCSQ shows its situational basis to be a reliable and valid measure of trust climates in the offshore industry. Most of the situational (within-subscale) factors have high internal consistency and discriminate between groups offshore, as well as predict safety. In contrast, results for the non-factor based predisposition to trust (PT) measure indicate this to have a relatively low magnitude relationship with other factors, and to lack discriminate validity. The hypothesis that an individual's propensity to trust will have a weak influence in determining levels of interpersonal trust when strong situational factors exist (H^T3a), is therefore supported. However, the results indicate PT to predict accidents / incidents at an industry level and near-miss involvement on the Map installation, although this predictive success is lost when PT is combined in a single model with other factors. Therefore, the prediction that propensity to trust will fail to significantly predict accidents, incidents or near miss involvement offshore (H^T3b) is only partially supported.

An assessment of the TCSQ's construct validity indicates that all situational factors are associated to a magnitude and in a direction that is consistent with previous research. For instance, the strong associations that were found between management and the operating company has been documented by others (e.g., Creed & Miles, 1996; Tan & Tan, 2000), and supports the prediction that a strong positive relationship exists between trust levels in these two groups (H^T1). Further, the pattern of associations that emerged between factors indicates the potential for four distinct groups offshore. For instance, the strong associations that exist between managers and the operating company suggest that these are perceived and trusted as one global group, 'management'. These are separated from other groups, such as workmates, by their relatively weak relationship between trust levels. Based on the criterion of strong-weak relationships between trust / distrust levels, groups emerged that relate to management, supervisors, workmates and contractors. Further, the similar relationship found between the level of trust in supervisors and the levels of trust in workmates and management implicates them as a mediator between these two groups. This is consistent with previous research that identifies supervisors as a 'linchpin' between workers and management (e.g., Donald & Canter, 1993), and as a medium for communicating safety issues between these two groups (Hofmann & Morgeson, 1999).

Compared to situational factors, an individual's propensity to trust has a small to moderate influence in shaping trust climates offshore. The groups and the types of trust most affected by an individual's PT are general affect based trust in workmates, trust in management, and trust in safety representatives. The finding that propensity to trust has a strong influence in the development of trust in management is consistent with the findings of others (e.g., Payne & Clark, 2003), and can be accounted for by a lack of trustworthiness expectations about this group that results from limited interaction. As argued by Rotter (1967), the sense of interpersonal novelty that limited interaction creates produces the optimal conditions for predisposition to trust to have its effect. Applying a similar explanation to general affect based trust in workmates, the novelty implicated here is not caused through a lack of interaction directly, but through the relative absence of behaviours indicative of affect-based trust. Relationships in the offshore industry might therefore be defined primarily as cognitive rather than affect based.

Specific to a trust-distrust dynamic (see Chapter 3), the results reported here offer mixed support for both continuum and two-factor type approaches. The strong intra-group relationships that exist between trust / distrust within-subscale factors for some groups (e.g., supervisors and managers) suggest these to operate on a single dimension. As indicated by these results, and consistent continuum-based approaches, high levels of trust will be associated with low levels of distrust (and the same vice-versa). Conversely, other intra-factor associations, such as those between contractor and safety personnel, are indicated to have only a moderate to weak relationship. This implies that trust and distrust exist as distinct dimensions (as suggested by the EFA detailed in Chapter 7) that co-exist in a single relationship. The suggestion that working relationships are characterised by high levels of both trust and distrust (Lewicki, McAllister, & Bies, 1998), is therefore supported for some groups offshore.

As valid constructs, the factors were also able to discriminate between groups offshore with regards to the levels and type of trust they express. Specifically, the findings suggest that subgroups offshore are formed from organizational and social climate factors. Organizational factors are largely job related and include elements such as job security and perceived levels of risk exposure. Research typically shows those with positive organizational experiences to report more positive attitudes. For instance, operator staff, who hold stable positions offshore, have been identified to report more satisfaction with offshore management's commitment to safety and accident mitigation, and general feelings of safety with respect to occupational hazards (Mearns et al., 1997). They also experience greater job security, and associated with this, greater organizational trust (Bass & Mitchell, 1976; Armstrong-Strassen, 2001; Reisel & Banai, 2002). This is in contrast to the lower job status held by contractor staff and the associated finding that they hold unfavourable job attitudes (McLean Parks & Kidder, 1994; Rogers, 1995; Van Dyne & Ang, 1998; de

Gilder, 2003). As suggested by Mearns et al. (1997), these factors are likely to relate to the level of seniority that the individual holds offshore. As their analysis of the Offshore Safety Questionnaire (OSQ) indicated, senior positions such as supervisors and management typically express more positive (safety) attitudes, while less senior members such as construction and production workers express more negative (safety) attitudes. Based on this research it might be argued that low risk, stable positions will be associated with more trust and less distrust.

In the currant analysis, findings consistent with this, and also with the subgroups identified by Mearns et al. (1997), were found. Operator staff were typically shown to report more trust and less distrust towards the operating company and management, compared to contractor staff. Additionally, analyses looking at the differences between occupational groups also suggest an organizational influence. Specifically, deck crew were found to report higher levels of trust in the operating company and management compared to other 'frontline' groups such as construction and production workers. In comparison to other frontline groups, deck crew experience relatively good job security with a working tenure on the Map installation of over a decade.

Although organizational factors are able to account for some of the group differences that were found, they fail to take into account the complex social dynamics that can exist between groups within organizations. Of particular importance for trust and distrust development are issues surrounding sources of identification and the associated potential for in-group and out-group biases. In the current study, results were found which suggest that these are in operation in the offshore industry. Specifically groups are indicated to identify themselves with ether their parent company or their occupational role offshore. This is consistent with the factors that Mearns et al. (1997) argued are associated with 'seniority'. With respect to employing company identification, contractor staff were found to hold relatively positive attitudes towards other contractor staff compared to those employed by the operating company. This might be attributed to the perceived social similarity that contractor staff share with this group that is likely to promote a form of 'character-based' trust (Zucker, 1986). Alternatively, and indirectly related to the suggestion that differences in trust levels are due to employing company identification, is the short-term working tenures typically held by contractor staff on a particular installation. The limited membership this produces is likely to result in operator (stable) staff being less willing to place high levels of trust in these individuals (Moreland & Levine, 2002). Similarly, the higher levels of trust towards the operating company reported by operator staff compared to contractor staff may be attributed to their higher level of identification with the company.

However, while employing company has been documented as a source of identification for employees (Collinson, 1999), and has explained some of the findings reported here, it fails to account for others. For instance, results were found that suggest group identification takes place on a more local level. Specifically, deck crew were indicated to have higher levels of trust in the operating company (comparable to that expressed by management who have operator status), than other groups with a similar status offshore (e.g., frontline contractor staff). These findings therefore suggest that identification might be based on local influences such as intra-group membership. This is consistent with evidence suggesting that individuals place greater importance on the group in which they work than the organizations in which those groups are embedded (Zaccaro & Dobbins, 1989; Brewer, 1993), and is further supported by the notion that trust develops from repeated social exchange (Blau, 1964). The type and frequency of social exchange required for the development of trust is more likely between intra-group members than with members of a different group because in most cases these other groups operate at distal positions on an installation. As higher levels of trust transform a group of individuals into a team (Jones & George, 1998), and teams demonstrate more commitment to the organization (Arnold, Barling, & Kelloway, 2001), this might account for deck crew's higher levels of trust in the organization. This is further supported by the observation that commitment is an outcome of trust (Costigan, Ilter, & Berman, 1998).

In sum, the results of the tests of discriminate validity suggest that group differences offshore are due to factors that reside at both an organizational and social climate level. The levels of trust and distrust expressed by different groups offshore are likely to be a function of the person's job and more importantly the social climate in which individuals find themselves. In most cases it will be an interaction between the two that will shape an individual's trust and distrust attitudes. It may therefore be hypothesised that trust subcultures offshore will be based on an interaction between organizational and social climate factors (H^T8).

The final indication of the validity of situational factors was their ability to predict accidents and incidents in the industry and at an installation level, and their ability to predict near miss involvement. Further, and contrary to that hypothesised, PT was found to be a significant predictor of most of the safety measures studied. This supports the findings of other research that reports a significant effect for PT on some outcome variable (e.g., Schlenker, Helm, & Tedeschi, 1973; Goto, 1996) but fails to conclusively support the hypothesis that predisposition to trust will fail to predict accidents, incidents, or near-miss involvement (H^T3b). While this is supported for one safety outcome (accidents / incidents on the Map installation) it is not supported for the other two safety measures.

Regarding situational factors, the results reported here suggest that offshore, safety performance is determined by a combination of the proximity and degree of interaction with other groups, and the level at which safety performance is evaluated. Specifically, the findings indicate that frequent or local events (i.e., near-miss involvement at an installation level) are best predicted by attitudes of trust and distrust held towards proximal groups interacted with on a frequent basis such as workmates and contractors. However, less frequent events, such as accidents or incidents in the industry are predicted by the attitudes that workers hold towards more distal groups such as management. These findings are similar to the associations made in other research between management and an offshore industry culture, and workers with an installation climate (Mearns et al., 1997). Combined, these suggest that at a global level the attitudes held towards management will have a strong influence on behaviour, while at a local level the attitudes held towards workmates are more important. Based on the Theory of Planned Behavior (Ajzen, 1985), this suggests that daily safety performance is influenced by subjective norms that operate through trust at a workgroup level. Specifically, distrust of workmates decreases their influence in shaping an individual's intention to act safely, which in the present study is associated with unsafe behaviour (see Chapter 2).

Of particular interest is the finding that attitudes of distrust rather than low levels of trust are most predictive of safety. This is similar to the findings of Nananidou and Donald (2002) who reported a *lack* of management commitment as a better predictor of safety performance compared to a demonstration of management commitment. Combined these results suggest that negative rather than positive attitudes play a stronger role in safety performance and consequently accident rates. In the context of the present study it might be argued that compared to trust, which functions similar to apathy and has a minimal influence on safety performance, distrust is more 'active' and so leads to more negative safety. From a distrust perspective, poor safety performance may be attributed to competitiveness (Gurtman, 1992), poor interpersonal behaviour, poor work performance and / or poor psychological health (McKay, 1991; Reis, Wheeler, Kermis, Spiegel, & Nezlechoff, 1985), which have been identified as outcomes of negative (trust) attitudes. These findings therefore support the hypothesis that accident groups will report more negative trust attitudes compared to a non-accident group (H^S1). Also supported is the prediction that accident groups will report more negative trust attitudes towards managers (H^S2a) compared to a non-accident group. However, a prediction not supported is that accident groups will report more negative trust attitudes towards supervisors (H^S2b).

In contrast to others (e.g., Clarke, 1999; van Vuuren, 2000; Bentley & Haslam, 2001; Haines, Merrheim, & Roy, 2001; Zohar, 2002), the present study failed to support the importance attached to supervisors in predicting safety performance. As a possible explanation, and in combination with the assumption that safety performance is predicted by distrust rather than trust, it might be argued that supervisors' untrustworthy behaviour is attributed to contextual rather than person factors. For instance, supervisory actions with negative consequences for workers might be rationalised as a reaction to the demands placed on them by management and the operating company. As argued by Heider (1958), when this occurs behaviour is less likely to influence the judgements made about the individual's internal characteristics. Rather, it might be found that this behaviour is used as a way to strengthen distrust towards management or the operating company.

8.7 Summary

This Chapter reported on the existence of trust subcultures offshore that emerge from a fusion of organizational and social climate factors. It also showed safety at an industry level to be predicted by distrust of offshore management and at an installation level to be predicted by distrust of workmates. The prediction that trust in supervisors would influence safety performance was not supported, and only partial support emerged for the non-influential role assigned to PT. An individual's propensity to trust predicted near-miss events and accidents at an industry level, although this predictive success was lost when other factors were considered alongside PT. Regarding the psychometrics of the TCSQ, test results reveal it as a reliable and valid measure of trust climates in the offshore industry. Minor exceptions to this general conclusion are the factors distrust of safety officers, distrust of contractors' safety performance, and all supervisor factors. The first two factors lacked reliability, while the supervisor factors lacked discriminate and predictive validity. Based on this, some researchers might suggest that these scales should be deleted from the measure as they are largely unstable and in some cases fail to predict the outcome measure of interest. However, a more appropriate approach might be to delete individual items to improve the measure of these factors. In the following Chapter, these issues will be discussed together with details of the modifications that were made to the TCSQ.

Chapter 9

Modifications to the Trust Climate and Safety Questionnaire

In this Chapter, the modifications that were made to the original version of the Trust Climate and Safety Questionnaire (TCSQ) to improve its psychometric properties are discussed. In the first half of the Chapter, a number of expansions that were made to improve the questionnaire's measure of trust and distrust towards safety personnel, and its measure of affect based trust are outlined. In the second half of the Chapter, the results of an item analysis that identifies items with poor internal consistency are reported. A discussion of the theoretical composition of these items shows them to diverge from the main dimensions of the TCSQ in some major way and indicates them as suitable for deletion.

9.1 Item Expansion

9.1.1 Safety personnel subscale

In its original form, the safety personnel subscale was designed to measure trust and distrust in safety officers and safety representatives. Based on the assumption that both groups are perceived as a single entity, the full range of facet elements and hence trustworthiness characteristics were applied to the groups collectively, rather than each group separately. However, the results of the within-subscale EFA reported in Chapter 7 highlighted problems with this approach. Specifically, the factor structure indicated a bias in the way questionnaire items had been developed. Items tapping trust were predominately directed towards safety representatives, while those measuring distrust were aimed at safety officers. The failure to measure trust towards safety officers and distrust towards safety representatives prevented a test for the assumption that these groups are perceived as a single entity. Although the within-subscale factor structure reported in Chapter 7 indicated two distinct safety personnel groups, it is not clear if this is merely an artifact caused by the strong trust / distrust dimension that emerged for most subscales. However, other evidence exits that supports this group distinction.

Item SP9, '*I trust my safety officers ability to do his job*', measures an attitude of trust towards safety officers. The result of the factor analysis reported in Chapter 7 reveals this to have similar factor loadings on both the Trust in safety representatives and Distrust of safety officers factors. Item SP9's loading on the first factor can be accounted for by its reference to trust, while its loading on the second factor can be attributed to its reference to safety officers. Similarly, and somewhat more convincing of a group rather than attitude divide is item SP6, '*My safety representatives lack the interpersonal experience required to represent the workforce on safety issues*'. This emerged as having a stronger relationship with items relating to safety representatives than those referring to distrust. This suggests that within the safety personnel subscale, the role of an individual has a stronger effect on the structure of trust climates offshore, compared to the attitude of trust or distrust.

The results of the primary factor analysis that was carried out on the full 88-item TCSQ further support this conclusion. As indicated in Chapter 7, the levels of trust and distrust in safety officers had a stronger relationship with the levels of these attitudes towards senior management than towards safety representatives. This was indicated by the different factors on which safety officer and safety representative items load. In sum, these findings suggest that workers perceive safety officers and safety representatives as two distinct groups offshore.

To test the distinction between safety officers and safety representatives empirically, while also allowing for a full exploration of the psychological dimensions underlying trust and distrust within each of these groups, items were added to the safety personnel subscale. Specifically, these were aimed at measuring trust in safety officers and distrust of safety representatives, and were developed using the combination of facet elements that were not included in the original version of the TCSQ. For instance, a measure of general trust in safety representatives ability (a1b1c1d4) was absent from the original version of the questionnaire and was incorporated into the modified version with the item, '*My safety representatives are well qualified*'. Carrying out this procedure for all combinations of 'missing' facet elements resulted in the addition of 14 extra items to the TCSQ (for a copy of the modified version of the questionnaire see Appendix F).

9.1.2 Affect-based trust scale

An implicit assumption underlying the Characteristics facet of the mapping sentence is that it taps the psychological dimensions of cognition and affect-based trust. The facet element Ability was used to indicate the former, while Integrity and Benevolence were assumed to tap the latter (for support of this assumption, see Chapter 3). However, results from the within-subscale factor analyses failed to validate this distinction empirically, but revealed all indicators to form a single psychological dimension. This, combined with the findings that affect-based trust is highly prevalent within organizations (Costigan, Ilter, & Berman, 1998) and exists as a distinct construct to cognitive-based trust (McAllister, 1995), suggests that the TCSQ fails to measure both of these dimensions. Drawing on the work of Bigley and Pearce (1998) who caution against using a measure other than intended, it might be further argued that problems exist with the measure of affect-based trust, as Ability, Integrity and Benevolence were originally conceptualized as cognitive indicators (Mayer, Davis, & Schoorman, 1995).

To address this limitation, items were added to the TCSQ that were specifically designed and validated by McAllister (1995) as measures of affect-based trust. In the current study, 4 of McAllister's (1995) 5 items were incorporated into each interpersonal subscale ($n = 5$) of the questionnaire[11]. The decision was taken to exclude McAllister's (1995) item, *'We would both feel a sense of loss if one of us was transferred and we could no longer work together'*, because of its perceived inappropriateness for the offshore industry. Contractor staff who occupy the largest portion of offshore personnel, transfer on a regular basis. The remaining four items are,

> *'We have a sharing relationship. We can both freely share our ideas, feelings and hopes.'*
>
> *'I can talk freely to this individual about difficulties I am having at work and know that (s)he will want to listen.'*
>
> *'If I shared a problem with this person I know (s)he would respond constructively and caringly.'*
>
> *'I would have to say that we have both made considerable emotional investments in our working relationship.'*

These items were used in their original form or adapted to apply to a safety context. For instance the item, *'If I shared a problem with my workmates, I know they would respond constructively and caringly'*, was modified to refer to *'safety problems'*. Using a combination of 'general' and 'specific' affect trust measures maintained consistency within the TCSQ. This also allowed the assumption that affect-based

---

[11] In the Safety Personnel subscale, 4 items were directed towards safety officers and 4 items were directed towards safety representatives. This resulted in the addition of 8 items to this scale.

trust is free-floating and affects all aspects of a relationship (McAllister, 1995) to be validated empirically. For instance, the finding of a single factor containing both general and specific affect indicators would support this assumption. Further, finding this factor to operate independent of items included in the original version of the TCSQ would support Bigley and Pearce (1998) by suggesting that the original version of the TCSQ was a cognitive measure. In total, 23 items were added to the TCSQ to measure affect-based trust, and consistent with McAllister (1995), were phrased in a positive direction.

9.2 Item Deletion

Tests of the TCSQ's psychometric properties (Chapter 8) revealed poor reliability estimates for the factors, Distrust of safety officers and Distrust of contractors' safety performance. Further, the three supervisory factors: General supervisory characteristics, Trust in supervisors' management of safety and Distrust of supervisors safety, were indicated to lack discriminate and predictive validity. To resolve the challenges that these pose to the TCSQ's psychometric properties, one of two options could be taken; scale deletion or item reduction. The most appropriate approach is typically dependent on the objectives of the study and data characteristics.

In a study of safety in the nuclear industry, Lee (1998; Lee & Harrison, 2000) reported the reduction of a 172-item questionnaire to 81 items (while still retaining good psychometric properties) through the use of scale (factor) deletion. Specifically, factors that were not predictive of safety or that were considered inappropriate for replication were deleted. While some would argue that Lee's (1998) approach offers a reliable way to produce a shortened questionnaire that is representative of its fulllength version (e.g., Boone, 1991), others would argue that it fails to capture the full range of issues that affect the phenomenon of interest. Item-reduction theorists, for example, argue that more appropriate is to reduce the number of items within a poor scale (e.g., Satz & Mogel, 1962; Yudin, 1966; Silverstein, 1968; Nagle & Bell, 1994). In this way a more realistic understanding of some construct can be obtained (Silverstein, 1968) rather than a general understanding where specificity cannot be measured (Robiner, Dossa, & O'Dowd, 1988).

9.3 Item analysis

In the current study, item-reduction rather than factor deletion was used. This was motivated by two main observations. First, the small sample surveyed with the original version of the TCSQ ($N = 203$) revealed a preliminary structure of offshore trust climates that requires replication. This is in contrast to Lee (1998), whose use of factor deletion was based on a sample of 5,296. Second, deleting the factors that were indicated to lack reliability or validity would result in the omission of a measure of trust and distrust towards supervisors. As this group are identified as playing a key role in shaping both safety (e.g., Clarke, 1999), and trust attitudes (e.g., Pfeffer, 1992), it is important that they are retained within the questionnaire. For these reasons, factor deletion was not used.

9.3.1 Method

In accordance with item-reduction methods, the two related indexes of item-total correlation and inter-item correlations were used to identify items for deletion. Specifically, analyses indicated each items relative contribution to understanding offshore trust climates by revealing its relationship with other items individually and items collectively. To assess the relative impact that the removal of an item had on the scales reliability, changes to Cronbach alpha were inspected. As argued by Bradley (2001), sufficient grounds exist for item deletion if its omission does not produce any significant changes to the alpha coefficient. An item that does not contribute to the properties of a scale, or more importantly has a negative impact, is a prime target for deletion.

Item analysis was carried out on each set of subscale items (n = 6). The 'generalized others' subscale was not included in the analysis as its non-factor based nature makes low magnitude inter-item correlations almost inevitable (Wheeless, 1978). Further, the decision to analyse each subscale rather than each factor (n = 14), was due to concerns regarding the representativeness of the factor structure to other samples. For instance, in reviewing a number of studies attempting to replicate safety climate structures within industry, Flin et al. (2000) reported more differences than similarities (see also Chapter 2). Based on this it might be argued that the trust factors in the present study might not replicate. Therefore, to assume and subsequently analyse the factor structure detailed in Chapter 7 as applicable to all offshore installations, and indeed more globally to the industry, is premature. More appropriate at this stage is to improve the reliability of the subscales, which remain stable across contexts and samples due to their fixed status in the TCSQ, because it is from these that factors will be extracted in future research.

9.3.2 Results

Workmates Subscale

Results of the item analysis, as shown in Table 9.1, indicates that item W5 (*'I can't trust my workmates to maintain high levels of safety even when they say they will'*), has a low item-total correlation, $r = .33$ and the weakest relationship with other items in the subscale, which range between $r = .03$ to $r = .47$. The range of other items in the subscale is indicated as, $r = .18$ to $r = .71$ (for item-total correlations refer to Appendix G, Table A6). Estimates of reliability reveal no change to the scale's internal consistency ($\alpha = .89$) following the deletion of item W5. In contrast (and as applies in most subscales), reliability decreases with the removal of any other item.

Supervisors subscale

Item analysis of the supervisor subscale reveals that item S9 (*'I can't trust my supervisor with a job that impacts on my safety'*) has a relatively low item-total correlation, $r = .42$, compared to other items in the subscale. An inspection of inter-item correlations reveals this item as having a narrow range and lower magnitude relationships with other items, $r = .24$ to $r = .43$, compared to the range for other subscale items, $r = .36$ to $r = .86$. Similar to item W5, estimates of internal consistency remain stable ($\alpha = .93$) following the deletion of item S9.

Management subscale

Item analysis of the management subscale indicates item M7 (*'I have a good rapport with management'*) as having the lowest item-total correlation, $r = .48$ and relatively weak inter-item correlations, $r = .24$ to $r = .43$. The range of inter-item

Table 9.1: Item-total correlations and alpha values for each item calculated in its respective scale

Workmates			Supervisors			Managers			Contractors			Safety Personnel			Operating Company		
Item	*Item correlation with scale*[1]	*Scale α if item deleted*	Item	*Item correlation with scale*	*Scale α if item deleted*	*Item*	*Item correlation with scale*	*Scale α if item deleted*	Item	*Item correlation with scale*	*Scale α if item deleted*	*Item*	*Item correlation with scale*	*Scale α if item deleted*	Item	*Item correlation with scale*	*Scale α if item deleted*
W1	.65 *(.67)*	.88	S1	.72 *(.73)*	.92	M1	.61 *(.61)*	.94	C1	.80 *(.81)*	.93	Sp1	.63 *(.66)*	.82	Oc1	.52 *(.51)*	.87
W2	.61 *(.63)*	.88	S2	.65 *(.76)*	.93	M2	.61 *(.62)*	.94	C2	.76 *(.77)*	.93	Sp2	.64 *(.65)*	.82	Oc2	.61 *(.63)*	.87
W3	.56 *(.53)*	.88	S3	.66 *(.65)*	.92	M3	.63 *(.62)*	.94	C3	.69 *(.67)*	.93	Sp3	.61 *(.70)*	.82	Oc3	.65 *(.67)*	.86
W4	.49 *(.50)*	.88	S4	.71 *(.71)*	.92	M4	.63 *(.63)*	.94	C4	.79 *(.79)*	.93	Sp4	.59 *(.55)*	.82	Oc4	.53 *(.57)*	.87
W5	**.33** -	**.89**	S5	.75 *(.75)*	.92	M5	.77 *(.77)*	.93	C5	.70 *(.69)*	.93	Sp5	.60 *(.66)*	.82	Oc5	.66 *(.68)*	.86
W6	.65 *(.67)*	.88	S6	.79 *(.78)*	.92	M6	.78 *(.78)*	.93	C6	.72 *(.73)*	.93	Sp6	.51 *(.51)*	.82	Oc6	.68 *(.77)*	.86
W7	.59 *(.55)*	.88	S7	.74 *(.75)*	.92	**M7**	**.48** -	**.94**	C7	.46 *(.46)*	.94	**Sp7**	**.18** -	**.86**	Oc7	.68 *(.68)*	.86
W8	.67 *(.67)*	.88	S8	.76 *(.77)*	.92	M8	.76 *(.76)*	.93	C8	.69 *(.69)*	.93	Sp8	.68 *(.68)*	.82	Oc8	.61 *(.58)*	.87
W9	.71 *(.73)*	.88	**S9**	**.42** -	**.93**	M9	.72 *(.72)*	.93	C9	.72 *(.72)*	.93	Sp9	.64 *(.75)*	.82	**Oc9**	**.45** -	**.88**
W10	.51 *(.50)*	.88	S10	.72 *(.72)*	.92	M10	.74 *(.74)*	.93	C10	.71 *(.72)*	.93	**Sp10**	**.37** -	**.84**	Oc10	.78 *(.75)*	.85
W11	.57 *(.55)*	.88	S11	.66 *(.64)*	.92	M11	.71 *(.71)*	.93	C11	.81 *(.82)*	.93						
W12	.49 *(.50)*	.88	S12	.66 *(.67)*	.92	M12	.74 *(.74)*	.93	C12	.74 *(.74)*	.93						
W13	.45 *(.45)*	.88	S13	.56 *(.56)*	.93	M13	.63 *(.63)*	.94	C13	.73 *(.74)*	.93						
W14	.73 *(.75)*	.88	S14	.65 *(.65)*	.93	M14	.71 *(.71)*	.93	**C14**	**.26** -	**.94**						
W15	.53 *(.56)*	.88	S15	.61 *(.61)*	.93	M15	.81 *(.82)*	.93	C15	.64 *(.65)*	.93						
15 item scale α = .89			**15 item scale α = .93**			**15 item scale α = .94**			**15 item scale α = .94**			**10 item scale α = .84 *(.87)***			**10 item scale α = .88**		

[1] Figures in italics refer to item-total correlation values (or alpha coefficient) when items in bold have been deleted and scores recalculated.

correlations for other items in this subscale is, $r = .33$ to $r = .70$. Deletion of item M7is indicated to have no impact on the subscales internal consistency ($\alpha = .94$). Further evidence suggesting a poor fit of M7 within this subscale is the factor analysis reported in Chapter 7, which reveals this item to have a non-significant factor loading on the dimensions extracted.

Safety personnel subscale

The results indicate the most marked improvements to the TCSQ in terms of improved reliability, through modifications to the safety personnel subscale. Results reveal two items, SP7 (*'I see my safety officer as part of management'*), and SP10 (*'My safety officer is not open to suggestions I might have'*), to have low magnitude correlations, both at a total and inter-item level. Specifically, item SP7 has an item-total correlation of, $r = .18$, and inter-item correlations that range between, $r = .\text{-}05$ to $r = .22$. Item SP10 has an item-total correlation of, $r = .37$, and inter-item correlations of, $r = .12$ to $r = .39$. The range of inter-item correlations for the remaining items in this subscale is, $r = .26$ to $r = .73$. Results indicate *improvements* rather than decrements or stability to the subscales reliability when these items are removed. Combined, the deletion of item SP7 and SP10 increase the subscales reliability estimate from $\alpha = .84$ to $\alpha = .87$. However, the deletion of either item in isolation shows an improvement for item SP7 only. Deleting this item increases the scale's reliability to $\alpha = .86$. However, deleting item SP10 maintains internal consistency at $\alpha = .84$. It therefore appears that item SP7 is masking the poor fit of item SP10. When the former item is deleted an improvement in the scale's reliability can be further achieved by deleting item SP10.

Operating company subscale

Item analysis of the operating company subscale indicate item OC9 (*'The operating company doesn't invest enough money on maintaining my installation'*) to have a relatively low item-total correlation, $r = .45$, and relatively low inter-item correlations, $r = .11$ to $r = .45$. The range of other items in this subscale is, $r = .24$ to $r = .64$. Estimates of reliability reveal no change to the scale's internal consistency ($\alpha = .88$) when item OC9 is removed.

Contractors subscale

Item analysis of the contractor subscale indicates item C14 (*'I can't trust contractors when it comes to safety'*) to have a low item-total correlation, $r = .26$ and low inter-item correlations, $r = .10$ to $r = .37$. The range of inter-item correlations for the other items in this subscale is, $r = .30$ to $r = .73$. Results reveal no changes to the internal consistency of the scale when item C14 is removed ($\alpha = .94$).

9.3.3 Theoretical interpretations

The collective result from the item analyses identified a total of seven items for deletion from the TCSQ. These have no effect on the reliability, and in some cases validity (e.g., item M7), of the questionnaire. As well as being supported psychometrically, their deletion was also supported theoretically. All items were indicated to depart from the main dimensions of the questionnaire in some way.

The TCSQ was designed to measure general and safety specific attitudes of trust and distrust towards various workgroups offshore based on perceptions of their trustworthiness. Of the 7 items identified for deletion, 2 were indicated to diverge from these dimensions in one of two ways. First, item M7, *'I have a good rapport* *with my manager'*, departs from an assessment of another person's characteristics, and instead measures the quality of a relationship. The terms 'rapport' and 'with' for example, suggest a shared element belonging to some construct (i.e., a relationship) rather than an attribute specific to an individual. Second, item OC9, *'The operating company doesn't invest enough money on maintaining my installation'*, departs from a general or safety specific reference and measures attitudes specific to maintenance. The problem that this item might pose for the TCSQ was anticipated during its development. The results reported here have validated this caution.

Of the five remaining 'poor' items, those identified in the workmates, supervisor and contractor subscales may be accounted for by the different tense they use to measure attitudes of distrust. For instance, the results indicate a distinction between items that tap distrust with the phrase *"I can't"* and those that use the phrase *"I don't"*. Items using the latter phrase have a relatively good internal consistency within the TCSQ, while those beginning with, *"I can't"* (i.e., those identified here) do not. As a possible explanation it might be argued that as both phrases measure distrust and *"I can't"* items are not specific to one subscale, their poor fit is due to measuring *future* rather than current beliefs, which underlie other items in the TCSQ.

With respect to the remaining two items, *'I see my safety officer as part of management'* and, *'My safety officer is not open to suggestions I might have'*, it is not clear why these items emerged as poor measures. It might be argued that these results support the earlier conclusion that safety officers fit most comfortably with a senior management group, hence the items low internal inconsistency in a group with safety representatives. However, this does not explain why only a portion of the safety officer items was found to have poor reliability. Alternatively, and similar to the explanation given for item M7, it might be argued that the item *'I see my safety* *officer as part of management'* refers to a larger entity than the individual. The entity referred to here is not a relationship as with item M7, but a 'management group'. Regarding, *'My safety officer is not open to the suggestions I might have'*, no obvious reason can be found for its divergence from other items. The only tentative difference relates to its use of the term "not", which is more affirmative compared to the terms "often" and "lacks", which are used in other items.

9.4 Summary

In this Chapter, a number of modifications that were made to the original version of the TCSQ were outlined. This involved the expansion of the safety personnel subscale and the addition of a reliable measure of affect-based trust. It also involved the deletion of seven items that were indicated both statistically and theoretically as poor measures. The reasons attributed for the poor fit of these items included their deviation from measuring attitudes at an individual level and their measurement of future rather than current beliefs. In combination, these modifications increased the original 88-item TCSQ to a 118-item scale. Given that only minor modifications in terms of deleting items from the TCSQ were suggested, it may be concluded that overall the original version was a good measure of trust climates offshore. In the next Chapter, the results of a survey using the modified version of the TCSQ at an industry level and the structures extracted will be reported.

Chapter 10

The Structure of Trust in the Offshore Industry:

A Survey using the *Modified* Trust Climate and Safety Questionnaire

This Chapter explores the structure of trust attitudes at an industry level using survey data collected from the modified Trust Climate and Safety Questionnaire (TCSQ). Using principle components analysis, the Chapter analyses data from the full-scale TCSQ and data taken separately from each of the seven subscales. The similarities of these structures to those extracted from the Map installation are examined to determine whether or not the dimensions of trust attitudes are relatively stable across the industry or dependent on the context and sample surveyed.

10.1 Questionnaire Distribution and Response Rate

Three sources of offshore workers were used to survey the modified version of the TCSQ. These were, union members (drawn from two independent organizations representing offshore workers operating on the UKCS), workers on an offshore gas installation (GI) and workers on an offshore oil installation (OI). Using a mixture of sources provided a good cross-section of the industry as collectively they represented union and non-union members, platforms operating in the North Sea and other parts of UK waters, and platforms specialising in either oil or gas production. Potential biases associated with any one source are also reduced.

Union members were recruited from two independent organizations following a letter that was sent out to head offices outlining the nature of the project. In response to this, union offices' provided the postal details of UK members that were appropriate for the study and who had agreed to take part in the survey or were most likely to. Access to survey the GI was achieved through a snowballing process where the offshore safety and environment officer from the Map installation provided the contact details of another interested safety officer operating on a different installation. This safety officer was contacted and arrangements were made to survey the GI. Finally, and similar to the Map installation survey, access to the OI was arranged by a safety representative who was interviewed in the first stage of the study (Chapter 4).

To distribute the questionnaires, a different method was used for union members and installation workers. For union members, questionnaires were delivered to their home addresses with an accompanying letter outlining the nature of the survey, their union's support of the project and instructions on how to complete the questionnaire (refer to Appendix F). A freepost return envelope was also provided addressed to the Safety Research Unit at The University of Liverpool. Regarding offshore installations, a copy of the questionnaire and a freepost return envelope was hand-distributed to all workers by a safety representative. Some workers received the questionnaire in the same way as those operating on the Map installation – at the end of safety meetings, while others received questionnaires in departure lounges or at times convenient for operations on the installation. The mixture of ways that questionnaires were distributed on the two installations and the absence of allotted time for completion increased the voluntary nature of participating. This produced a similar condition to that in the postal survey where participation was based on self-selection. It was therefore considered appropriate to combine the data from the three sources. This decision was further motivated by the statistical necessity of sample sizes ≥ 200 for factor analysis (see Chapter 5). In isolation, the installation-based samples were too small to be factor analysed.

1,619 questionnaires were sent to union members' home addresses, of which 471 were returned (29% response rate). This response rate is consistent with rates reported in similar surveys carried out on an industry-wide level (Mearns, Whitaker, & Flin, 2003). Of the 471 questionnaires returned, 69 were excluded due to the respondent being retired (*n* = 27), an onshore worker (*n* = 22), or because the questionnaire was incomplete (*n* = 20). On the OI and GI, 150 and 100 questionnaires were distributed, respectively. Of the 150 questionnaires, 62 were returned (41% response rate), 2 of which were excluded due to large amounts of missing data. From the GI, 40 questionnaires were returned (40% response rate), and again 2 were excluded due to large amounts of missing data. Based on other survey results (see Chapter 7), these represent good response rates. In total 500 questionnaires were available to be factor analysed. Collectively, these were taken to represent an offshore industry sample.

10.2 Sample Characteristics

The industry sample covered 113 installations, 38 Operating companies and 50 Contracting companies. As Table 10.1shows, 99% (*n* = 490) of the 500 respondents are male and 1% (*n* = 3) is female. A total of 31% (*n* = 141) hold a supervisory position, and 69% (*n* = 318) are non-supervisory staff. Of the respondents, 55% (*n* = 272) are employed directly by the operating company, while 45% (*n* = 218) are employees of contracting companies. The ratio of 5.5:4.5 operator to contractor staff this represents departs substantially from the average 1.5:8.5 ratio that is typical for the UKCS (UKOOA, 2004). This suggests that the results might have limited generalizability to contractor staff and to installations with typical ratios of workers.

Table 10.1: Demographic details for the offshore industry sample

	Categories	Frequency	Valid Percentage
Gender	Male	490	99
	Female	3	1
	Missing	7	-
Job Category	Production	188	39
	Maintenance	145	30
	Admin/Management	40	8
	Drilling/Well service	23	5
	Construction	21	4
	Catering	14	3
	Deck crew	11	2
	Medic	6	1
	Other	41	8
	Missing	10	-
Employer Type	Operator Company	272	55
	Contractor Company	218	45
	Missing	10	-
Shift Pattern	Half days/half nights	227	48
	All days	183	38
	24 hour call	42	9
	All nights	6	1
	Other	20	4
	Missing	22	-
Rotation	2 on/2 off	297	61
	2on/2off, 2on/3off	69	14
	2on/3off	28	6
	3on/3off	21	4
	1 on/1 off	3	1
	Other	70	14
	Missing	12	-
Supervisor Status	Non supervisor	318	69
	Supervisor	141	31
	Missing	41	-
Number of installations worked on	1-5	283	57
	6-10	114	23
	More than 10	98	20
	Missing	5	-
Years worked on current installation	Less than 1 year	49	10
	1-2 years	56	12
	3-5 years	86	18
	6-10 years	111	23
	11-20 years	152	31
	More than 20 years	31	6
	Missing	15	-
Years worked offshore	Less than 1 year	5	1
	1-2 years	11	2
	3-5 years	19	4
	6-10 years	44	9
	11-20 years	233	47
	More than 20 years	182	37
	Missing	6	-

Eight occupations are represented by the respondents with production workers occupying the largest group (39%), followed by maintenance (30%), and administrative / management staff (8%). The most common rotation worked is 2 weeks onshore - 2 weeks offshore (61%), followed by 2 weeks onshore - 2 weeks offshore - 2 weeks onshore - 3 weeks offshore (14%). Of those working 'other' rotations (n = 70), 'even six' (i.e., 2 weeks offshore - 2 weeks onshore - 2 weeks offshore - 2 weeks onshore - 2 weeks offshore - 6 weeks onshore) is reported with the highest frequency (n = 16). Most respondents (48%) work a shift pattern of one week of days and one week of nights. Of the remaining 273 respondents, 183 (38%) work all days, and 42 (9%) are on 24-hour call. The majority of respondents have good offshore experience, with 84% (n = 415) reporting offshore working tenures of more than 10 years. A similar pattern is found for the number of years worked on the current installation, with 152 of the 500 respondents (31%) reporting tenures of 11-20 years. This extensive offshore experience is consistent with over half of the sample being directly employed by the operating company. This is also reflected by over half of the respondents working on less than 5 installations (57%). In contrast, the frequent basis by which contractor staff change installations suggests that they are likely to represent the 43% of respondents reporting work experience on more than 5 installations.

10.3 Data Screening

The data were screened for missing values, multivariate normality and linearity. Of the 500 cases, 85 (17%) have missing values. Most cases (n = 69) have less than 5% missing data, and of these, 53 cases have a single missing value. In all cases missing data are randomly distributed throughout the data set and pose minimum problems for subsequent analysis. Further, the deletion of variables (items) to control for the problem of missing values was indicated as ineffective because each item has less than 3% missing data. Of the 118 items, 93 have less than 1%, 19 have less than 2%, and 2 items (M1 and SP1) have 2% and 2.4%, respectively. Consistent with the data collected from the Map survey, estimated mean scores was used to replace missing data in these 69 cases.

The remaining 16 of the 85 cases have missing data in excess of 5%. They display a non-random pattern and are specific to certain subscales of the TCSQ. Specifically, subscales (and the number of cases failing to complete these sections) are, safety officers (n = 6), safety representatives (n = 1), supervisors (n = 3), offshore management (n = 4), workmates (n = 1), and contractors and generalized others subscales combined (n = 1). Missing values for each of these subscales are, 9.3%, 11.9%, 13.6%, 14.4%, 15.3%, 16.1%, and 22%, respectively (per case). With the exception of one case (respondent 53), all missing values are accounted for by one of two reasons. Either an occupational role such as a safety officer does not exist on a particular installation, or the respondent occupies the role that items are directed (e.g., offshore manager or supervisor). In cases where valid reasons were given for the failure to complete subscales, they were retained in the data set and missing values were replaced with estimated mean scores. With respect to case 53, both contractor and generalized others subscales were left incomplete and no valid reason was provided for their omission. This combined with the 22% of missing data that it represents resulted in its exclusion from subsequent analysis. The total sample was reduced from 500 to 499.

Screening data for multivariate normality and linearity revealed 4 of the 118 items to have negatively skewed distributions that are marginally higher than the acceptable ± 1.00 range. These are, W7 (-1.05), W11 (-1.22), W14 (-1.44) and C4 (-1.07). The direction of skewness for these items is consistent with 106 of the remaining items that also reveal slight but non-significant negatively skewed distributions. The remaining eight items are positively skewed; therefore a check for curvilinearity was carried out.[12] Inspections of pairwise scatterplots of items with the strongest negative and strongest positive skewed distributions[13] indicate departures from linearity but no evidence of curvilinearity. Transformation of items is therefore unnecessary and inappropriate.

Of greatest concern are the large number of items (n = 44) indicated to have kurtosis values greater than ± 1.00. Of these, 37 have kurtosis values greater than 1.00 but less than 2.00, 6 have values above 2.00 but below 3.00, and 1 item (W14), has a kurtosis value of 3.37. Inspections of scatterplots for pairs of items with the most extreme kurtosis values (e.g., S13 and W14) reveal only slight departures from linearity. Based on this, and in support of the non-transformation of skewed items, all items including those with relatively high kurtosis values were retained in their original form. In such circumstances this has been shown not to significantly influence the outcome of the results (Tabachnick & Fidell, 2001).

Finally, estimates of reliability reveal the full 118-item TCSQ to have high internal consistency, $\alpha = .98$. This exceeds the minimum criteria of $r > .70$ (Kline, 2000), and satisfies the level of $r = .90$ for a tool to be regarded as a good and accurate measure of a particular construct (Guildford & Fruchter, 1978; Salvia & Ysseldyke, 1988; Gregory, 1999). Based on the high degree of internal consistency, the TCSQ as a complete scale may be taken a reliable measure of trust climates in the offshore industry.

---

[12] Curvilinearity poses a problem when a set of variables contains a mixture in skewness.
[13] In all cases, positively skewed distributions were below 1.00, with the furthest departure from 0 being GO4 with a value of 0.39.

10.4 Exploratory Factor Analysis

Although a structure of trust was extracted from the Map installation, it was considered inappropriate to directly test for this structure in the industry-wide data because modifications were made to the TCSQ between surveys. This modification involved the deletion of items (n = 7), the addition of an affect-based trust measure, and the expansion of the safety personnel subscale to give a better measure of trust and distrust attitudes in both safety representatives and safety officers. While the deletion of items posed minimal problems for testing the existing structure, the addition of items (n = 37) created a need to explore how the dimensions these represented (e.g., affect-based trust) interacted with the existing dimensions found on the Map installation. For example, it may be the case that affect-based trust items form a distinct factor, load with cognitive based items, or form a factor that incorporates measures of Benevolence. To distinguish among these possibilities, and also the structure of trust and distrust attitudes towards safety personnel, exploratory factor analysis using principle component analysis (PCA) was used. This approach had the advantage of allowing an analysis of the interrelationship between the new affect-based items and the existing TCSQ structure, while also providing data that could be compared for similarity to the extracted structure from the Map installation. The greater the similarity in structure between the Map and industry-wide data, the more robust a measure of trust climates the TCSQ can be argued to be.

This type of approach has been used successfully in the past. For instance, Glendon and Litherland (2001) adopted a similar approach in their study of safety attitudes using a revised version of the Safety Climate Questionnaire (SCQ; Glendon et al., 1994). Based on the changes made to their scale, which involved the rewording of some items for simplification and the deletion of others (n = 18) that were considered irrelevant for the new sample, they argued that confirmatory factor analysis was inappropriate for testing the structure of safety attitudes and that PCA should be used. As the modifications made to the SCQ are significantly less than that applied to the TCSQ, it supports the use of PCA here.

10.5 Full-scale Analysis

To assess the suitability of the data for factor analysis, checks for the factorability of *R* were carried out. Kaiser-Meyer-Okin's measure of sampling adequacy exceeds the minimum value of .60 at .96, and Bartlett's test of sphericity is significant at the stringent $p < .01$ level, χ^2 (6903) = 45568.81. An inspection of the anti-image correlation matrix also indicates small values on the off-diagonal, which together with other findings suggests the data to be suitable for factor analysis. Based on a sample size of 499, the structure extracted can be taken as a "very good" (Comrey & Lee, 1992) representation of the underlying dimensions of trust climates of the offshore industry.

PCA using varimax rotation[14] reduces the 118-item scale into 7 factors, each with an eigenvalue greater than 1. An inspection of the factor structure, as shown in Table 10.2, reveals high communality values for most items, which suggests that the factor structure offers a good fit to the data. This is supported by high factor loadings and the presence of marker variables within the structure. High internal consistency is indicated for most factors, with Cronbach alpha values generally greater than .90. One exception is factor 7, with an estimated $\alpha = .53$. The poor reliability estimate of this factor may be accounted for by its overwhelming reference to generalized others,

---

[14] Test results reveal that factors share less than 10% overlap in variance ($r < .32$). Varimax rotation was therefore supported.

Table 10.2: Seven-factor structure of Trust Climates for the Offshore Industry

	Questionnaire Item	Factors 1	2	3	4	5	6	7	h²
OC8	The operating company are not sincere when they say safety is their number one priority	**.788**	.104	.206	.100	.132	.119	.051	.716
OC5	With respect to safety, I can trust the operating company	**.777**	.213	.202	.152	.176	.104	-.050	.758
OC9	I don't trust the operating company	**.768**	.086	.173	.107	.202	.092	.053	.691
OC3	The operating company cares about profit more than safety	**.761**	.063	.165	.117	.121	.129	-.026	.656
M14	I am suspicious of the motives behind management's actions	**.752**	.114	.075	.116	.212	.071	.204	.689
M10	I can trust management to make sure the installation is run in a safe way	**.751**	.206	.115	.227	.272	.144	-.037	.769
M8	Management are honest when it comes to safety	**.741**	.142	.058	.194	.184	.144	.027	.665
OC7	I can trust the operating company to keep their promises	**.729**	.141	.168	.059	.113	.025	.147	.619
M18	I trust management on my installation	**.715**	.167	.135	.166	.238	.061	.060	.648
OC6	The operating company operate 'best practice' when it comes to safety	**.710**	.173	.203	.131	.129	.131	-.058	.630
M15	Management are vague when answering questions the workforce have about issues which affect them	**.704**	.109	.084	.011	.189	.045	.234	.608
M13	Management lie about safety standards offshore to create a favourable picture	**.702**	.067	.213	.165	.235	.143	-.035	.646
OC2	The operating company fully support the structures they have in place which allow me to work safely	**.685**	.231	.152	.182	.117	.134	-.122	.626
M12	Management is successful at ensuring safety policies are adhered to offshore	**.672**	.278	.151	.217	.232	.166	-.104	.691
M6	Management will overlook safety issues to advance their career	**.667**	.198	.100	.170	.228	.101	-.078	.586
M3	Management like to blame people when mistakes are made	**.646**	.073	.038	.120	.052	.083	.183	.483
M9	My manager would respond constructively and caringly if I were to share a safety problem with him	**.644**	.217	.149	.254	.291	.215	.089	.687
M4	I can trust management to do what they say they will do	**.632**	.124	.152	-.014	.215	.200	.141	.544
OC1	A feeling of 'us' and 'them' exists between the workforce and the operating company	**.629**	.027	.095	.056	.054	.011	.072	.417
M11	Management are well qualified	**.616**	.234	.013	.110	.148	.138	.085	.495
M17	Management lack the experience needed to know how to do a job safely	**.609**	.050	.013	.186	.170	.194	.014	
M7	My manager and I share our ideas, feelings and hopes about safety with each other	**.585**	.155	.189	.074	.291	.170	.229	.574
M1	Management frequently demonstrate their commitment to safety	**.568**	.221	.116	.171	.232	.236	-.139	.543
OC4	The operating company are clear about what they want with respect to safety offshore	**.566**	.176	.060	.191	.055	.265	-.135	.482
M2	I know that my managers wants to listen to the problems I might be having at work	**.526**	.207	.209	.256	.351	.131	.103	.580
M5	I am not confident in management's skills	**.499**	.051	-.087	.159	.168	-.037	.162	.331
M16	Considerable emotional investments have been made by my manager and myself in our relationship	**.472**	.116	.149	.032	.336	.086	.429	.564
Cronbach $\alpha = 0.97$									
C13	Based on past experience, I know I can trust contractors to act safely	.154	**.821**	.116	.164	.063	.115	.023	.757
C1	I can trust contractors to consider other peoples' safety when carrying out their work	.120	**.752**	.145	.162	.101	.070	.096	.651
C2	Contractors are open and honest about safety	.114	**.735**	.156	.131	.039	.082	.102	.614
C16	I trust contractor's judgement in deciding whether a job is safe enough to carry out	.204	**.729**	.024	.136	.082	.104	.088	.618
C4	Generally, I trust contractors	.190	**.717**	.125	.118	.075	.085	.094	.602
C12	Contractors are very capable at performing their job	.166	**.702**	-.025	.203	.098	.168	-.041	.601
C17	Contractors would go out of their way to help me	.116	**.699**	.132	.145	.195	.067	.102	.594

C9	Contractors are inconsistent in the way they carry out their work	.102	**.698**	.079	.170	.057	.051	.052	.535
C10	Contractors are only concerned with looking after themselves	.146	**.688**	.097	.215	.105	.104	.030	.573
C18	Contractors would respond caringly if I shared a safety problem with them	.157	**.663**	.215	.115	.178	.170	.104	.595
C7	Contractors are not professional in the way they carry out their work	.125	**.644**	-.011	.140	.064	.062	.019	.459
C11	Contractors are happy to listen to difficulties I might have with safety at work	.179	**.644**	.227	.175	.163	.121	.113	.583
C3	Contractors often take short-cuts to get a job done quickly even if it puts others at risk	.186	**.642**	.169	.054	.096	.084	.010	.495
C5	Contractors lack the training needed to carry out jobs in a safe way	.133	**.626**	.014	.155	.062	.024	.039	.440
C14	Contractors would conceal mistakes they might make even if doing so would put others at risk	.153	**.622**	.055	.196	.107	.104	.043	.476
C15	My relationship with contractors involves sharing of ideas and feelings	.106	**.574**	.204	.064	.221	.027	.298	.524
C8	Sound principles guide contractors behaviour	.255	**.526**	.054	.196	.114	.132	.104	.424
Cronbach $\alpha = 0.95$									
SP30	I trust my safety representatives ability to represent me on safety issues	.198	.086	**.819**	.164	.096	.117	-.024	.769
SP16	Safety representatives have my best interests at heart	.152	.065	**.791**	.133	.105	.155	.096	.715
SP19	I can share any difficulties I am having at work with my safety representative	.109	.049	**.782**	.102	.110	.090	.050	.656
SP21	My safety representative takes a constructive approach to solve safety problems I might have	.008	.178	**.780**	.139	.079	.221	.040	.725
SP2	I can trust my safety representative to do what he says he will do	.136	.113	**.772**	.207	.093	.144	-.024	.700
SP1	My safety representatives are open and honest	.162	.090	**.751**	.210	.084	.166	-.041	.679
SP7	My safety representatives and I freely share our ideas, feelings and hopes regarding safety	.166	.031	**.745**	.129	.156	.136	.137	.662
SP9	I can trust my safety representative to listen to suggestions I might have about how safety can be improved	.102	.146	**.736**	.197	.094	.208	-.095	.673
SP28	Safety representatives are not interested in my concerns	.132	.107	**.710**	.193	.147	.204	.075	.639
SP23	There is a strong emotional connection between me and my safety representative	.005	.071	**.658**	.071	.173	.066	.435	.670
SP14	My safety representatives are well qualified	.171	.150	**.653**	.063	.014	.101	.029	.494
SP25	Safety representatives are not consistent in the way they deal with safety issues	.168	.161	**.639**	.137	.147	.171	.092	.532
SP18	My safety representatives lack the expertise required to represent the workforce on safety issues	.165	.106	**.574**	.081	.129	.205	.018	.434
SP12	My safety representative lacks the skills needed to fulfil this role	.193	.163	**.559**	.108	.088	.234	-.058	.453
Cronbach $\alpha = 0.95$									
W2	My workmates can be trusted to support me if I had a complaint about safety	.193	.167	.143	**.720**	.151	.135	-.026	.647
W10	I can trust my workmates to tell the truth	.178	.137	.199	**.719**	.188	.068	.108	.659
W15	I have a sharing relationship with my workmates. We can both talk freely about our feelings regarding safety	.134	.140	.148	**.680**	.147	.140	-.040	.565
W16	I trust the people I work with to carry out jobs safely	.270	.257	.103	**.677**	.157	.178	-.008	.670
W5	I can talk freely to my workmates about difficulties I have at work and know that they want to listen	.134	.087	.167	**.667**	.185	.076	.180	.570
W6	I can trust my workmates to be open and honest when it comes to mistakes they might have made	.195	.212	.217	**.655**	.165	-.019	.164	.614
W4	My workmates are kind and thoughtful	.138	.146	.184	**.649**	.154	.036	.165	.547
W17	If I shared a safety problem with my workmates, I know they would respond constructively and caringly	.265	.181	.143	**.628**	.204	.177	-.055	.593
W1	I trust my workmates to be competent in their own area	.166	.187	.035	**.623**	.159	.127	-.036	.494
W18	My workmates are not afraid to stop a job if they think it is unsafe	.231	.156	.159	**.612**	.150	.151	-.101	.533
W3	Generally, I don't trust my workmates	.135	.122	.071	**.593**	.034	.163	-.016	.418

W8	The people I work with know the difference between having a laugh and doing a job safely	.092	.232	.087	**.583**	.141	.136	-.058	.452
W7	My workmates lack the ability to decide if a job is safe to carry out	.196	.133	.081	**.580**	.110	.117	.012	.425
W13	My workmates would disclose to others information that I hold told them in confidence	.040	.118	.193	**.562**	.142	-.015	.138	.407
W12	The people I work with would take credit for something they haven't done	.138	.127	.070	**.546**	.170	.022	.142	.388
W9	My workmates and I have made considerable emotional investments in our working relationship	.092	-.041	.136	**.503**	.162	.041	.330	.415
W14	My workmates don't care about my safety	.031	.217	.094	**.481**	.109	.173	-.073	.336
W11	My workmates are not experienced offshore workers	.039	.149	.022	**.473**	.053	.131	-.016	.268
Cronbach $\alpha = 0.93$									
S6	My supervisor would go out of his way to help me	.225	.167	.152	.270	**.738**	.148	.058	.745
S10	I can talk to my supervisor and know that he will want to listen	.307	.126	.162	.279	**.722**	.149	.047	.760
S11	My supervisor keeps the promises that he makes	.337	.110	.164	.206	**.679**	.126	.093	.681
S16	I trust my supervisors ability to do his job	.344	.207	.129	.210	**.676**	.126	-.126	.711
S9	I trust my supervisor to make decisions that affect me	.354	.149	.172	.229	**.653**	.170	.060	.688
S2	My supervisor and I have made strong emotional investments in our relationship	.217	.066	.135	.273	**.647**	.030	.349	.687
S3	I can trust my supervisors judgement when it comes to safety	.400	.203	.134	.274	**.641**	.183	-.015	.740
S7	My supervisor would respond constructively and caringly if I were to have a safety problem	.342	.204	.150	.351	**.609**	.242	.033	.734
S17	My supervisor is afraid of upsetting management	.328	.102	.113	.133	**.600**	.109	.053	.521
S13	I am free to share my ideas and hopes about safety with my supervisor	.299	.200	.180	.275	**.595**	.252	-.038	.656
S1	I can trust my supervisor to be fair in the way he deals with safety incidents	.371	.175	.148	.317	**.591**	.214	-.054	.689
S5	I often find what my supervisor says is untrue	.337	.126	.122	.308	**.580**	.160	-.044	.603
S12	My supervisor often emphasises safety publicly but then cuts corners when carrying out his job	.451	.179	.125	.201	**.571**	.187	-.074	.658
S15	My supervisor is incompetent when it comes to managing his team	.251	-.087	.135	.048	**.566**	.064	-.099	.419
S8	My supervisor is not willing to listen to concerns I might have about safety	.206	.189	.124	.216	**.560**	.194	-.104	.502
S4	I don't trust my supervisor's ability to make sure jobs are carried out in a safe way	.242	.190	.046	.193	**.467**	.147	-.049	.376
S14	My supervisor wants a job done safely even if it means extra time or extra cost	.397	.129	.142	.254	**.464**	.188	-.136	.528
SP5	I can't trust safety representatives to tell me the truth	.010	.053	.072	.027	.118	-.063	-.042	.023
Cronbach $\alpha = 0.96$									
SP22	I trust my safety officer's ability to do his job	.231	.185	.291	.165	.101	**.724**	.049	.736
SP13	My safety officer is not fair in the way he deals with safety	.261	.123	.216	.184	.203	**.664**	.100	.656
SP29	I can trust my safety officer to do what he says he will do where safety is concerned	.287	.190	.296	.214	.149	**.656**	.016	.705
SP24	If I shared a problem with my safety officer, I know he would respond caringly	.288	.134	.312	.163	.157	**.647**	.128	.685
SP20	My safety officer lacks the interpersonal skills necessary to carry out his role	.148	.090	.200	.115	.131	**.645**	.110	.528
SP26	My safety officer is incompetent when it comes to ensuring safety is adhered to	.251	.104	.110	.107	.126	**.639**	.015	.522
SP27	I can trust my safety officer's ability to ensure safety is followed on this platform	.287	.171	.284	.232	.201	**.613**	.015	.663
SP6	I trust my safety officer is concerned about my safety	.339	.193	.349	.212	.176	**.604**	.033	.717
SP10	I know my safety officer wants to listen to difficulties I might have at work	.235	.145	.426	.180	.178	**.600**	.079	.688
SP4	My safety officer cares about me	.225	.105	.397	.164	.254	**.583**	.147	.672
SP11	My safety officer rarely supports the workforce when they raise safety issues	.297	.187	.180	.183	.132	**.571**	.057	.536
SP8	I can trust my safety officer to give me feedback	.237	.167	.391	.160	.226	**.568**	.066	.641

SP17	My safety officer often shares his feelings and ideas with me about safety, and I share mine with him	.170	.066	.407	.097	.186	**.495**	.385	.636
GO8	Most adults are competent at their jobs	-.035	.212	.046	.122	.087	.274	.192	.183
GO7	Most people answer public opinion polls honestly	-.077	.197	.065	.067	-.049	.224	.196	.145
SP3	I can't trust safety representatives to support me in my concerns about safety	.046	-.051	-.113	-.076	.101	-.152	.063	.058
Cronbach $\alpha = 0.95$									
SP15	Both my safety officer and myself have made considerable emotional investments in our relationship	.206	.092	.302	.053	.177	.388	**.537**	.615
C6	I have a strong emotional connection with contractors on my installation	-.015	.402	.197	.079	.140	-.018	**.490**	.467
GO6	Most repair people will not overcharge people who are ignorant of their speciality	-.034	.056	-.014	-.045	-.096	-.022	**.431**	.200
GO5	Most salespeople are honest in describing their products	.224	.137	.045	-.028	-.036	.083	**.419**	.247
GO4	These days, you must be alert or someone will take advantage of you	.100	.036	-.063	.016	-.076	.062	**.405**	.184
GO3	Most people can be counted on to do what they say they will do	.167	.216	.091	.097	.019	.230	**.396**	.302
GO2	Most experts tell the truth about limits of their knowledge	.152	.163	.128	.077	-.132	.104	.334	.211
GO1	One should be very cautious with strangers	-.116	.023	-.059	.048	-.181	.050	.321	.159
Cronbach $\alpha = 0.53$									
Eigenvalues		**38.51**	**6.99**	**6.36**	**4.87**	**3.05**	**2.94**	**2.66**	

Note: Figures in bold indicate items with significant factor loadings ($\geq$.40) and also indicate the factor to which they were assigned (and subsequently used to calculate its factor score). Items with significant cross-loadings on more than one factor were assigned to the factor that they loaded on the highest.

which as explained in Chapter 7, represents a non-factor based measure (Wheeless, 1978).

Items load according to occupational group. Specifically, the factors relate to: 1. *Senior Management*, 2. *Contractors*, 3. *Safety Representatives,* 4. *Workmates,* 5. *Supervisors,* 6. *Safety Officers*, and 7. *Generalized others.* Together the factors account for 55% of the total variance, with factor 1 explaining 33%. Of the 7 factors, those relating to workmates, supervisors, safety officers and generalized others are relatively weak, each accounting for less than 5% of the total variance (4.1%, 2.6%, 2.5%, and 2.3%, respectively). Based on explained variance, attitudes of trust and distrust towards senior management (33%), contractors (6%), and safety representatives (5.4%) have the greatest influence in shaping trust climates offshore. An inspection of the factor structure reveals differences in the degree of construct validity between factors. Senior management, contractors, safety representatives, and workmates have good construct validity with the items comprised by each factor relating to a common theme. However, the factors, supervisors, safety officers and generalized others comprise items that are inconsistent with the theme of the factor, or which show significant cross-loadings (i.e., factor loadings above the set criteria of .40 on more than one factor).

The supervisor factor comprises item SP5, '*I can't trust safety representatives to tell me the truth*', which represents a theoretical outlier in the factor due to its measurement of attitudes towards safety representatives. However, at a statistical level, this inconsistency poses no problems as item SP5's low factor loading (.12) excludes it from calculation of the factor score and its labelling. Greater inconsistency is found for the safety officers factor. This factor comprises 16 items, 13 of which relate to safety officers. Of the 3 'misfit' items, 2 relate to generalized others (GO7 and GO8) and 1 relates to safety representatives (SP3). While the safety representative item SP3, '*I can't trust my safety representatives to support me in my concerns about safety*', can be accounted for by its shared reference to safety personnel, it is not clear why the other items load as they do. A common link between item GO7, '*Most people answer public opinions honestly*', and GO8, '*Most adults are competent at their jobs*', is their reference to trust in generalized others. The first item relates to trust in the general public and the second taps trust in employed adults. Similar to the inconsistency found within the supervisor factor, these three items fail to satisfy the criteria set for factor loadings to be significant ($\geq$ .40). These items were therefore excluded from the safety officer factor and statistical consistency was maintained. The factor score for safety officers is specific to this group.

Of the 13 theoretically consistent items in the safety officer factor, 2 (SP10 and SP17) have significant cross-loadings on the safety representative factor[15]. These two items reflect 'affect-based' trust in safety officers, (SP10), *'I know my safety officer wants to listen to the difficulties I might have at work'*, and (SP17), *'My safety officer often shares his feelings and ideas with me about safety, and I share mine with him*. Together with the observation that item SP3, which measures distrust (*'I can't trust safety representatives to support me in my concerns about safety'*), fails to load significantly on the safety representatives factor, it might be argued that attitudes towards safety representatives are primarily ones of trust. For instance, the omission of item SP3 and the addition of items SP10 and SP17 to the safety representatives factor creates an asymmetry between trust and distrust with the former outweighing the latter.

The greatest inconsistency is revealed for factor 7. This comprises 8 items, 6 of which have significant factor loadings of .40 or above. Of these 6 items, 4 relate to trust in generalized others (as do the two items with non-significant factor loadings), and 2 relate to affect-based trust in safety officers and contractors. Factor 7 therefore represents 3 groups (generalized others, safety officers and contractors) and 2 types of trust (generalised and emotional). The result of this diversity is a lowering of the factors reliability ($\alpha = .53$), and an uncertainty about the most representative label for these items. For instance, the criteria of $\geq .53$ for an item to be included in setting the theme of a factor (see Chapter 6) suggests the label *'Affect trust of safety officers'* should be used. However, this fails to reflect the nature of most of the items within the factor that relate to generalized others and suggests that an emotional connection

---

[15] Items with significant cross-loadings on more than one factor were used only to estimate the factor score of the factor that it contributed to the most.

with contractors and safety officers does not apply offshore. Based on this, factor 7 was labelled 'Generalized others'.

10.5.1 Discussion of 7-factor structure

Despite the modifications that were made to the original version of the TCSQ, a factor structure similar to that found for the Map installation (see Chapter 7), emerged. Of the 7 factors identified at an industry level, 5 mapped onto those extracted at an installation level. These were senior management, contractors, supervisors, workmates, and safety representatives. The hypothesis that the full 118-item TCSQ would reveal an underlying structure related to occupational group (H^T7) is therefore supported. In both structures trust and distrust attitudes towards senior management was indicated to have a strong influence on the structure of trust offshore. Secondary influence are contractors, supervisors, and workmates. However, in contrast to the 6-factor (Map) structure, the industry-wide structure reveals workmates as a more influential role (i.e., explaining a larger percentage of the overall variance) compared to supervisors. Further, the results validated the suggestion made in Chapter 9 that a safety personnel collective comprises two distinct groups - safety officers and safety representatives. Specifically, these groups emerged as two separate factors within the structure, which accounts for the additional factor in the industry compared to the 6-factor (Map) structure.

Similar to the 6-factor (Map) structure, the industry data revealed a strong relationship between attitudes of trust and distrust held towards offshore management and those towards the operating company. This supports prediction H^T1. Further, attitudes towards this 'collective' group were indicated as having the greatest influence in shaping trust climates offshore. This is consistent with safety research where management are routinely identified as the main group shaping safety cultures and climates (e.g., Cohen, 1977; Zohar, 1980; Donald & Canter, 1993), and with trust research that implicates this group as the main determinant of trust levels within an organization (e.g., Whitener et al., 1997). Further, the finding that management play a strong role in shaping offshore trust climates, together with the finding that generalized trust has a minimal influence, suggests that trust structures are largely 'situation-based' and determined by perceptions of another person's trustworthiness. In agreement with previous research (e.g., Scott, 1980; Mayer & Davis, 1999; Payne & Clark, 2003) and with H^T3a, it appears that in situations were strong contextual factors exist, an individual's disposition to trust has a weak influence in shaping trust and distrust attitudes.

The similarities between the 7-factor industry structure and the 6-factor Map installation structure support the construct validity of the TCSQ. They reveal the TCSQ subscales as robust across contexts and at two levels of the industry (installation and industry-wide). To gain a further insight into how trust attitudes structure towards different groups (i.e., within subscales), a second set of within-subscale analyses were carried out.

10.6 Within-Subscale EFA

Consistent with the analysis of data collected from the Map installation, each subscale of the TCSQ was factor analysed separately. This gave an indication of whether attitudes of trust held towards one group structured in the same way as attitudes towards another group, which was not possible to deduce from the previous analysis. Subscales relate to, workmates, supervisors, offshore management, safety officers, safety representatives, contractors, and the operating company. Although offshore management and operating company subscales were indicated by the full scale EFA to form a single factor they were analysed separately here because they measure different types of trust (interpersonal and organizational, respectively). Also, the generalized others subscale was omitted from further analysis due to its non-factor based nature, which was expected to result in a meaningless structure if analyzed further.

Measures of the factorability of R reveal all subscales as suitable for factor analysis. KMO measures of each subscale are above .60, with Workmates .95, Supervisors .97, Offshore management .97, Safety officers .96, Safety representatives .95, Contractors .95, and the Operating company .93. An inspection of the anti-image correlation matrices for each subscale also indicates small values on the off diagonal. In contrast to the full-scale EFA, Bartlett's test of sphericity was not used to assess the suitability of data for factor analysis, as all subscales exceeded the criteria of 5:1 case to variable ratio. The ratio for Workmates, Offshore management and Contractors is, 28:1, Supervisors, 29:1, Safety representatives, 31:1, Safety officers, 36:1, and the Operating company 55:1. Finally, estimates of reliability show all subscales to have high internal consistency; Workmates, $\alpha = .93$, Supervisors, $\alpha = .96$, Offshore management, $\alpha = .95$, Safety officers, $\alpha = .95$, Safety representatives, $\alpha = .92$, Contractors, $\alpha = .95$, and the Operating company, $\alpha = .93$. Subscales are therefore reliable measures of trust and distrust for their respective groups.

10.6.1 Workmates

PCA reduces the 18-item Workmates subscale into 3 factors, each with an eigenvalue greater than 1. Together the factors account for 61% of the total variance, with factor 1 explaining 48%, factor 2, 7% and factor 3, 6%. Preliminary analysis using oblique rotation reveals all factors to share more than 10% overlap in variance ($r > .32$), thus suggesting varimax (orthogonal) rotation as unsuitable. However, a comparison between structures extracted using both types of rotation reveals no differences. Consistent with the main goal of the analysis, which is to extract independent factors for further tests, varimax rotation was used. An inspection of the factor structure, as shown in Table 10.3, indicates high communality values for all items, which suggests that the structure offers a good fit to the data.

Factor 1: Trust in workmates safety

Factor 1 comprises 8 items, 6 of which measure specific trust of workmates with safety. The level of trust is not specified within the factor, as items relate to the two psychological foundations of cognition (W8, W16 and W18) and affect (W2, W15 and W17). In contrast to this specific attitude is item W1, *'I trust my workmates to be competent in their own areas'*, which relates to a general trust of workmates ability. As suggested in Chapter 7, trust in another's job ability is likely to be interpreted within a safety context and hence will impact on the level of specific trust in another. An individual perceived to be competent at their job is also likely to be trusted to carry out tasks with minimal error.

The final item in this factor with the lowest loading is W3, '*Generally I don't trust my workmates'*. In contrast to other items, this reflects a different attitude (e.g., distrust rather than trust), and a different domain (e.g., general rather than safety-specific). It is not clear why this item loads on factor one, although it does support the theoretical notion that both trust and distrust can exist in the same relationship by means of compartmentalization (see Chapters 3 and 4). Specifically, factor one

Table 10.3: Three factor structure of workmates subscale

	Questionnaire Item	Factors 1	2	3	h^2
W17	If I shared a safety problem with my workmates, I know they would respond constructively and caringly	**.796**	.274	.110	.721
W16	I trust the people I work with to carry out jobs safely	**.792**	.257	.240	.751
W15	I have a sharing relationship with my workmates. We can both talk freely about our feelings regarding safety	**.746**	.276	.164	.659
W18	My workmates are not afraid to stop a job if they think it is unsafe	**.723**	.197	.228	.614
W2	My workmates can be trusted to support me if I had a complaint about safety	**.688**	.369	.280	.677
W8	The people I work with know the difference between having a laugh and doing a job safely	**.644**	.196	.213	.499
W1	I trust my workmates to be competent in their own area	**.597**	.284	.277	.514
W3	Generally, I don't trust my workmates	**.451**	.269	.373	.415
Cronbach α = 0.90					
W4	My workmates are kind and thoughtful	.348	**.699**	.169	.638
W10	I can trust my workmates to tell the truth	.453	**.677**	.230	.717
W6	I can trust my workmates to be open and honest when it comes to mistakes they might have made	.429	**.664**	.177	.657
W9	My workmates and I have made considerable emotional investments in our working relationship	.245	**.657**	.018	.492
W12	The people I work with would take credit for something they haven't done	.086	**.632**	.426	.588
W5	I can talk freely to my workmates about difficulties I have at work and know that they want to listen	.462	**.630**	.120	.624
W13	My workmates would disclose to others information that I told them in confidence	.110	**.621**	.409	.565
Cronbach α = 0.87					
W11	My workmates are not experienced offshore workers	.146	.147	**.732**	.579
W14	My workmates don't care about my safety	.285	.106	**.699**	.582
W7	My workmates lack the ability to decide if a job is safe to carry out	.335	.224	**.677**	.621
Cronbach α = 0.70					
Eigenvalue		**8.54**	**1.23**	**1.14**	

suggests that workmates may be trusted with safety but distrusted generally. The factor loading of item W3 is below the set criteria of $\geq .53$ for defining a factor, therefore it was not included in this process. The label assigned to factor one is, '*Trust in workmates safety*'.

Factor 2: General (affect-based) trust in workmates

Factor 2 comprises 7 items, 5 of which relate to general trust in workmates (e.g., *'My workmates are kind and thoughtful'*, and *'I can trust my workmates to tell the truth')*. Of the 5 items, 1 (W4) measures benevolence, 2 (W10 and W6) measure integrity, and 2 (W5 and W9) are direct measures of affect-based trust. Although tentative, it may be argued and contrary to the caution raised by Bigley and Pearce (1998; see Chapter 9), that integrity and benevolence tap affect rather than cognitive-based trust (see also Chapter 3).

The two remaining items found in factor 2 (W12 and W13) reflect general distrust of workmates, and as indicated by their significant cross-loadings on factor 3, would be expected to load with other distrust items (their inclusion in factor 2 is based on their higher loadings on this factor). However, while these items reflect a different attitude (e.g., distrust rather than trust), they conform to the 'affective' (emotional) theme of factor 2. Item W12, '*The people I work with would take credit for something they haven't done*' measures violations of integrity, while item W13, *'My workmates would disclose to others information that I told to them in confidence'* indicates a violation of benevolence. The affect-theme plus the asymmetry between trust and distrust supports the label of, *'General (affect-based) trust in workmates'*.

Factor 3: Distrust of workmates safety

The 3 items comprised by factor 3 reflect distrust of workmates. Of these, 2 items are specific to safety (W14 and W7), and 1 (W11) applies generally to another's ability. Applying the same logic as with factor one, it is argued that distrust of another's 'general' ability is likely to promote a sense of specific distrust in them with safety. Factor three is therefore labelled, *'Distrust of workmates safety'*.

10.6.2 Supervisors

PCA of the 18-item Supervisor subscale extracts a single factor with an eigenvalue greater than 1 (10.36). This factor accounts for 61% of the total variance, and high communality values are indicated for most items that range between h^2 .49 to h^2 .76. Minor exceptions are found for 2 items, S4 and S15, which have slightly lower communality values of, h^2 .37 and h^2 .36, respectively. All items significantly load on the factor (>.40), with exact loadings ranging between .60 - .87 (refer to Appendix H, Table A7).

An inspection of the component matrix reveals an ordering of items from those tapping trust (with the highest factor loadings), to those directed towards distrust. Of further interest is the division that is revealed between the four items adapted from McAllister's (1995) affect-based trust measure. Specifically, item S10, *'I can talk to my supervisor and know that he will want to listen'*, and item S7, *'My supervisor would respond constructively and caringly if I were to have a safety problem'*, load among trust items, while item S13, *'I am free to share my ideas and hopes about safety with my supervisor'*, and item S2, *'My supervisor and I have made considerable emotional investments in our relationship'*, load with distrust items. This division may be attributed to the perceived applicability of each 'emotional' indicator to worker-supervisor relationships. For instance, 'emotional investments' and 'hopes' may be perceived to have relatively little applicability in defining the relationship, compared to 'constructive' responses to safety problems and 'listening'.

While a single factor structure appears to work well for most items, it is not clear why more factors did not emerge. On the Map installation a three-factor structure was extracted that distinguished between attitude (trust / distrust) and domain (general / safety). At least one of these dimensions might be expected to emerge from the industry-wide data, which due to its salience in most of the Map subscale structures would relate to attitude. The fact that this did not emerge might be due to the large number of supervisors covered in the industry-wide survey compared to the relatively few on the Map installation. This is likely to result in a reduced consensus in agreement to items and prevent the extraction of more than one factor. The label assigned to the single factor is, *'Supervisors'*.

10.6.3 Offshore Managers

PCA of the 18-item Offshore managers subscale extracts a single factor with an eigenvalue greater than 1 (10.31). This factor accounts for 57% of the total variance and reveals moderate communality values for all items. The communality values are generally higher when two factors are extracted, although this structure is not supported by the criteria of eigenvalue $\geq$ 1.00 (.96) or an examination of the scree plot. All items significantly load on the factor (>.40), with exact loadings ranging between .57 - .87 (refer to Appendix H, Table A8).

An inspection of the component matrix reveals no ordering of items with general and safety specific trust and distrust measures occupying random positions. However, when two factors are extracted, items load according to trust and distrust, which parallels the structure found on the Map installation. As with the supervisor structure, the failure to extract more than one factor might be attributed to the large number of managers evaluated in the survey. However, unlike the supervisor structure, the closeness of extracting two distinct dimensions within the management subscale suggests that offshore workers hold similar attitudes towards all managers regardless of installation, and that these attitudes are distinguished by trust or distrust. The single factor retained is labelled, '*Offshore management*'.

10.6.4 Safety Officers

PCA of the 14-item safety officer subscale extracts a single factor with an eigenvalue greater than 1 (8.59). This factor accounts for 61% of the total variance, with high communality values suggesting that the structure offers a good fit to the subscale items. All items significantly load on the factor (>.40), with exact loadings ranging between .65 - .85 (refer to Appendix H, Table A9). Similar to the supervisor subscale, an inspection of the component matrix reveals an ordering of items from trust to distrust. Moreover, the same division in McAllister's (1995) affect-based items is revealed. Item SP24, *'If I shared a safety problem with my safety officer, I know he would respond caringly'*, and item SP10, *'I know my safety officer wants to listen to the difficulties I might have at work'*, load with trust items, while item SP17, *'My safety officer often shares his feelings and ideas with me about safety, and I share mine with him'*, and item SP15, *'Both my safety officer and I have made considerable emotional investments in our relationship'*, load among distrust items.

Unlike other subscales, a structure of trust attitudes towards safety officers was not extracted from the Map installation from which the results reported here can be compared. However, based on the number of dimensions underlying each subscale (refer to Chapter 5) more than one factor might be expected to emerge. As with the supervisor and management subscale, a single factor structure might be attributed to respondents relating their attitudes to a number of different safety officers. The single factor is labelled, *'Safety officers'*.

10.6.5 Safety Representatives

PCA reduces the 16-item Safety representative subscale into 3 factors, each with an eigenvalue greater than 1. Together these factors account for 69% of the total variance, with factor 1 explaining 53%, factor 2, 9% and factor 3, 7%. An inspection of the factor structure, as shown in Table 10.4, indicates high communality values for all items, which suggests that the structure offers a good fit to the data.

Factor 1: Trust of safety representatives

Factor 1 comprises 10 items, 9 of which relate to an attitude of trust. While the domain in which safety representatives are trusted (e.g., general or safety-specific) is not discernable from the items, it might be argued rather tentatively that the nature of a safety representatives role leads workers to interpret general items in a safety context. Items where this implicit interpretation is likely to be most applicable are, *'I can trust my safety representative to do what he says he will do'* (SP2) and *'Safety representatives have my best interests at heart'* (SP16). The remaining item, SP28, *'Safety representatives are not interested in my concerns'* reflects an attitude of distrust based on the perceived potential for, or actual violation of benevolence. The reason why this item loads on what is essentially a trust factor is unclear, as no obvious link between the two exists other than they both relate to safety representatives. Most reflective of factor one is the label, *'Trust of safety representatives'*.

Table 10.4: Three-factor structure of safety representatives subscale

	Questionnaire Item	Factors 1	2	3	h^2
SP9	I can trust my safety representatives to listen to suggestions I might have about how safety can be improved	**.839**	.170	-.003	.733
SP2	I can trust my safety representative to do what he says he will do	**.808**	.278	.019	.731
SP16	Safety representatives have my best interests at heart	**.805**	.286	-.050	.733
SP7	My safety representative and I freely share our ideas, feelings and hopes regarding safety	**.798**	.212	-.132	.699
SP1	My safety representatives are open and honest	**.790**	.279	.012	.702
SP19	I can share any difficulties I am having at work with my safety representative	**.782**	.240	.013	.669
SP21	My safety representative takes a constructive approach to solve safety problems I might have	**.769**	.360	.000	.721
SP30	I trust my safety representatives ability to represent me on safety issues	**.735**	.437	-.003	.758
SP28	Safety representatives are not interested in my concerns	**.706**	.407	.087	.672
SP23	There is a strong emotional connection between me and my safety representative	**.634**	.304	-.041	.496
Cronbach $\alpha = 0.93$					
SP18	My safety representative lacks the expertise required to represent the workforce on safety issues	.267	**.853**	.013	.799
SP12	My safety representative lacks the skills needed to fulfil this role	.313	**.776**	-.022	.701
SP14	My safety representatives are well qualified	.369	**.739**	-.053	.685
SP25	Safety representatives are not consistent in the way they deal with safety issues	.519	**.557**	-.040	.580
Cronbach $\alpha = 0.84$					
SP5	I can't trust safety representatives to tell me the truth	.085	-.041	**.845**	.723
SP3	I can't trust safety representatives to support me in my concerns about safety	-.116	.014	**.832**	.705
Cronbach $\alpha = 0.59$					
Eigenvalue		**8.54**	**1.44**	**1.13**	

Factor 2: Distrust of safety representatives ability

Factor 2 comprises 4 items that relate to the ability of safety representatives (SP14), an attitude of distrust (SP25), or both (SP12 and SP18). The items that reflect only one of the two dominant dimensions introduce slight inconsistencies within the underlying theme of factor two. Item SP14, *'My safety representatives are well qualified'*, is consistent with an ability dimension but reflects trust rather than distrust, and item SP25, *'Safety representatives are not consistent in the way they* *deal with safety issues'*, is consistent with a distrust dimension, but reflects integrity rather than ability. Item SP25 is also indicated to have a significant cross-loading on factor one (.52), which may be accounted for by its reference to a safety domain. This latter finding suggests that factor two reflects a general attitude, and supports the earlier suggestion that factor one might be indicative of (safety) specific, rather than general trust. Based on the two dominant themes in factor two, it is labelled, *'Distrust of safety representatives ability'*.

Factor 3: Distrust intentions

Factor 3 comprises 2 items that relate to distrust of safety representatives based on a perceived breach to benevolence. Where these items differ from those in factor two, which also reflect distrust, is in their use of the phrase *'I can't'*. As the results of the item analysis reported in Chapter 9 indicate, these items measure a different dimension of distrust because they focus on future rather than current beliefs. The results reported here support this conclusion and suggest that factor three might represent a theoretical outlier in the structure. This is further indicated by its two-item composition (Tabachnick & Fidell, 2001), and by the results of the preliminary EFA that reveals items SP3 and SP5 to have non-significant factor loadings. To validate this conclusion, it is necessary to retain factor three for further psychometric testing. To distinguish this factor from the items in factor two, the label, *'Distrust intentions'* is used.

10.6.6 Operating Company

PCA of the 9-item operating company subscale extracts a single factor with an eigenvalue greater than 1 (5.99). This factor accounts for 67% of the total variance, with high communality values suggesting the structure works well for the data. All items significantly load on the factor (>.40), with exact loadings ranging between .67 - .90 (refer to Appendix H, Table A10). An inspection of the component matrix reveals no obvious ordering of the items.

Although a single factor offers a good fit to the data, it contrasts with the two-factor structure that was extracted from the Map installation. As a possible explanation, and similar to that offered for the other single factor structures, it might be argued that the number of operating companies represented (n = 38) reduces consistency in responses, and hence the emergence of more than one factor. The single factor is labelled, *'Operating company'*.

10.6.7 Contractors

PCA reduces the 18-item Contractor subscale into 2 factors, each with an eigenvalue greater than 1. Together these factors account for 59% of the total variance, with factor 1 explaining 53% and factor 2, 6%. Similar to the workmates subscale, a preliminary analysis using oblique rotation indicated factors to share more than 10% shared variance, thus suggesting varimax rotation as unsuitable. However, a comparison between factor structures extracted from each type of rotation reveals no differences. Varimax rotation was therefore used. An inspection of the factor structure, as shown in Table 10.5, indicates reasonable communality values, which suggest the factor structure offers a fair fit to the items.

Factor 1: Contractor staff characteristics

Factor 1 comprises 13 items that collectively reflect general and specific attitudes of trust and distrust towards contractors. While a single underlying

Table 10.5: Two-factor structure of contractors subscale

	Questionnaire Item	Factors 1	2	h^2
C13	Based on past experience, I know I can trust contractors to act safely	**.756**	.416	.657
C9	Contractors are inconsistent in the way they carry out their work	**.746**	.179	.609
C1	I can trust contractors to consider other peoples' safety when carrying out their work	**.723**	.385	.525
C10	Contractors are only concerned with looking after themselves	**.708**	.312	.602
C3	Contractors often take short-cuts to get a job done quickly even if it puts others at risk	**.695**	.205	.495
C5	Contractors lack the training needed to carry out jobs in a safe way	**.689**	.143	.617
C16	I trust contractor's judgement in deciding whether a job is safe enough to carry out	**.679**	.380	.482
C2	Contractors are open and honest about safety	**.665**	.409	.415
C7	Contractors are not professional in the way they carry out their work	**.660**	.214	.589
C14	Contractors would conceal mistakes they might make even if doing so would put others at risk	**.657**	.252	.599
C4	Generally, I trust contractors	**.652**	.421	.652
C12	Contractors are very capable at performing their job	**.633**	.395	.556
C8	Sound principles guide contractors behaviour	**.574**	.292	.745
Cronbach $\alpha = 0.93$				
C6	I have a strong emotional connection with contractors on my installation	.072	**.782**	.495
C15	My relationship with contractors involves sharing of ideas and feelings	.282	**.776**	.682
C18	Contractors would respond caringly if I shared a safety problem with them	.460	**.684**	.605
C11	Contractors are happy to listen to difficulties I might have with safety at work	.469	**.658**	.644
C17	Contractors would go out of their way to help me	.497	**.630**	.680
Cronbach $\alpha = 0.85$				
Eigenvalue		**9.51**	**1.14**	

dimension is not evident in this factor, the relatively higher factor loadings of 'safety' items suggest that this might be a dominant theme. This is supported by the significant cross-loadings of items C11 and C18 on factors 1, which both relate to a safety-specific attitude. Because this speculation is only tentative, the label ascribed to factor one is, '*Contractor staff characteristics*'.

Factor 2: Affect-based trust in contractor staff

Factor 2 comprises 5 items that reflect affect-based trust in contractors. Four of the 5 items are taken from McAllister's (1995) affect-based trust measure and the remaining item measures trust based on perceptions of contractors' benevolence. Factor two is therefore labelled, *'Affect-based trust in contractor staff'*.

10.7 Discussion of subscale structures

The within-subscale factor analyses resulted in a total of twelve factors. These include a single dimension for supervisors, offshore managers, safety officers, and the operating company, a two dimensional structure for contractors, and a three dimensional structure for workmates and safety representatives. With respect to the Workmates and Contractor's structures, strong support emerged for their construct validity by their close similarity to the dimensions extracted on the Map installation. Slight variation, however, exists within the workmate subscale between an installation and industry level with regards to the relative importance (i.e., the amount of explained variance) of trust dimensions. At an installation level, distrust of workmates safety was a more important component of trust than the level of general affect-based trust, which is indicated at an industry level as the more important of the two. Both dimensions, however, are identified as important in defining trust climates in the offshore industry.

In contrast to the relatively stable trust structure that emerged for workmates and contractors subscales, differences were found in the trust dimensions identified for senior roles offshore. At an industry level, the structure of trust in supervisors, managers, and the operating company manifested as a single factor, while at an installation level they organized around two or three dimensions. Two possible explanations might be offered to account for this. First, at a practical level this difference might be due to the sample being drawn from several different environments where various management styles will be represented (McDonald &

Ryan, 1992; Cheyne, Oliver, Tomás, & Cox, 2002). This will reduce the likelihood of finding patterns of correlations and hence more than one factor. In contrast, workmates and contractors typically operate in groups and consequently their trustworthiness is evaluated on aggregate rather than at a dyadic level as with management (Whitener, 1997). The structure of trust towards these groups will therefore be minimally affected by the diverse sample studied. Second, at a statistical level, it might be argued that the difference relates to the variation in sample size between surveys because factors are typically less stable in small samples and break into a larger number. This may explain why more factors emerged with the installation sample.

One of the modifications that was made to the original version of the TCSQ was the addition of a validated affect-based trust measure to each interpersonal trust subscale. This was motivated by the failure to extract dimensions specific to cognitive and affect-based trust when data collected from the original TCSQ was factor analysed (see Chapter 7) and the conclusion that the problem resided with the affective element (see Chapter 9). The results of the factor analyses reported here supported the finding in Chapter 7, but failed to support the conclusion that the problem resides with affect-based items. Specifically, factors specific to the affect-based trust items that were added to the TCSQ did not emerge, but rather formed factors with items from the original version of the questionnaire. This supports the implicit assumption that underlies the Characteristics facet, that the TCSQ taps both cognitive and affect-based trust. Therefore, the caution raised by Bigley and Pearce (1998; see Chapter 9), which suggests that Mayer, Davis and Schoorman's (1995) cognitive indicators should not be used to test affect-based trust, was not supported. Both cognitive and affective indicators loaded on the same factor, which suggests some form of overlap. It further suggests that a problem might exist with Mayer, Davis and Schoorman's (1995) original conceptualisation of Ability, Integrity and Benevolence as cognitively based (see Tinsley, 1995; and also Chapter 3). In sum, as suggested in Chapter 7, the failure of cognitive and affect dimensions to emerge as distinct factors might be attributed to their relative lack of salience within the TCSQ. Alternatively, it might be argued that the inclusion of emotional items in a questionnaires has a rationalising effect, where intended affect constructs are turned into cognitive constructs (Mollering, Bachman, & Hee Lee, 2004).

Together, the results of the industry and Map survey identified three sets of dimensions to account for trust climates offshore. These relate to a single, two, and three factor structure. The lack of consistency this reflects is similar to the theoretical confusion that currently exists within trust writings regarding a trust / distrust dynamic. For instance, a single dimension supports the notion that trust and distrust are bipolar opposites on a single continuum, while the two and three-dimensional structures suggest these attitudes exist as distinct constructs within a relationship. The three-dimensional structure also indicates a distinction between general and specific attitudes. It therefore appears that trust attitudes offshore are based on the nature of the relationship with another, and cannot be reduced to a situation of whether another is trusted or not trusted. While independently each of these structures can be accounted for with existing research, collectively a theoretical model that integrates all dynamics does not exist. The explanations provided in Chapter 8 and the Integrative Model discussed in Chapter 4 offer the first accounts of these findings.

From the installation and industry-wide surveys, a number of factors were identified that had the potential to affect the structures extracted. These related to statistical biases in sample size and the methodological problem of item-wording effects (see Chapter 8). To control for these biases, a rigorous exploration of the TCSQ's dimensionality other than that offered by EFA is required. One method that allows for this control while also allowing the theoretical underpinning of a structure to be explored is structural equation modelling (SEM). In Chapter 12, the results of analyses using this approach will be reported. Prior to this, the psychometric properties of the revised TCSQ need to be established.

10.8 Summary

In this Chapter, the results from a survey of trust climates at an industry-wide level were reported. The findings revealed the same structure of trust *between* groups as that found on the Map installation, but differences for *within* group structures (i.e., trust attitudes towards different occupational roles offshore). While the structure of trust in 'frontline' workers such as workmates and contractors replicated between installation and industry, structures relating to senior positions such as supervisor and managers, did not. At an industry level, trust in senior groups manifested as a single dimension as opposed to two or three, which was found at an installation level. It also emerged that the social distance between individuals (i.e., their degree of interaction) influenced the structures extracted. As the frequency of interaction increases, trust attitudes typically become more refined and specific. Finally, because the variation in structures might be a result of statistical rather than theoretical reasons, it was concluded that further analysis is needed using structural equation modelling. However, preceding this will be an analysis of the psychometric properties of the revised version of the TCSQ, which will be reported in the following Chapter.

Chapter 11

Psychometric Properties of the *Modified* Trust Climate and Safety Questionnaire: Tests of Reliability and Validity

This Chapter tests the psychometric properties of the modified Trust Climate and Safety Questionnaire (TCSQ). Specifically, the reliability and validity of the twelve factors outlined in the previous Chapter, together with a non-factor based predisposition to trust measure, are examined. The implications of these findings with regards to trust subcultures and predictors of safety are also discussed, and these are compared to similar findings reported for the Map installation. These comparisons extend the analysis of the Map data by examining the dynamics and role of trust in safety at an industry wide level, while also testing the robustness of the TCSQ.

11.1 Psychometric Properties: Within-Subscale Factor Structures

Consistent with the analysis of data collected from the Map survey, the psychometric properties of the modified TCSQ were assessed using the twelve within-subscale factors. This allowed for reliable comparisons with results extracted from the Map data, and showed if the nature and role of trust in safety at an installation level replicated at an industry level. That is, if homogenous trust subcultures exist in the industry that generalise to specific installations, and if the prediction of safety performance remains constant across all workers regardless of the level of analysis. This provides a more detailed understanding of trust offshore and highlights any potential variations.

The use of within-subscale factors, rather than those extracted from the full scale EFA, was further supported by their greater predictive and discriminate validity. For instance, comparisons between the psychometric results obtained from the 7-factor structure (see Appendix I, Tables A11-A14) and the 12 within subscale factors revealed a non-discriminating primary factor differentiated between groups when only a subset of its items (represented as a within-subscale factor) was used. Additional to the 12 factors, a non-factor based predisposition to trust measure (PT) was also included in the analysis to allow for a full exploration of the relative impact of personality, compared to situational factors, in shaping trust offshore. The PT measure was calculated from the eight items comprised by the 'Generalized others' subscale of the TCSQ. This is consistent with other trust research that uses the same shortened version of the ITS to measure the relative importance of personality compared to situational factors in trust development (e.g., Mayer & Davis, 1999).

11.2 Reliability: Estimates of Internal Consistency

Estimates of reliability show 11 of the 12 factors have good internal consistency. The most reliable factors are Trust in supervisors, $\alpha = .96$, Trust in management, $\alpha = .95$, Trust in safety officers, $\alpha = .95$, Trust in the operating company, $\alpha = .93$, Contractor staff characteristics, $\alpha = .93$, and Trust in workmates safety, $\alpha = .90$. Factors with moderate reliability are General (affect-based) trust in workmates, $\alpha = .87$, (Affect-based) trust in contractor staff, $\alpha = .85$, Distrust of safety representatives ability, $\alpha = .84$, and Distrust of workmates safety, $\alpha = .70$. Finally, estimates reveal poor internal consistency for the factor Distrust intentions, $\alpha = .59$ and the non-factor based PT measure, $\alpha = .67$.

The estimates revealed most of the factors as reliable measures of trust and distrust attitudes offshore. The poor internal consistency found for the Distrust intentions factor might be accounted for in one of two ways. First, Distrust intentions only comprises two items, which due to the item dependency of alpha will result in a low estimate. Second, and drawing on the suggestion in Chapter 10, this factor might be argued to represent a theoretical outlier in the safety personnel structure because it measures future (can't) rather than present (don't) beliefs. This is supported by the non-significant factor loadings of these items when the TCSQ was analysed as a full scale. Finally, the poor reliability of the PT measure may be attributed to its non-factor based nature (Wheeless, 1978).

11.3 Construct Validity: Inter-Correlations between Factor Scores

Inspecting the inter-correlations between factor scores and a PT measure assessed the construct validity of the modified TCSQ. Results of a series of Pearson correlation analyses, as shown in Table 11.1, indicates several strong associations between intra-group factors (i.e., factors extracted from the same subscale) and inter-group factors. Strong intra-group associations exist between Trust in safety representatives and Distrust of safety representatives ability, $r = .73$, Contractor staff characteristics and (Affect-based) trust in contractor staff, $r = .76$, and Trust in workmates safety and General (affect-based) trust in workmates, $r = .74$. Of slightly weaker magnitude is the relationship that Distrust of workmates safety has with Trust in workmates safety, $r = .60$, and General (affect-based) trust in workmates, $r = .56$. A similar pattern of low magnitude intra-group associations is indicated for Distrust intentions, which shows a non-significant weak association with Trust in safety representatives, $r = -.04$, and Distrust of safety representatives ability, $r = -.04$. The

Table 11.1: Inter-correlations between the 12 industry factor scores and a non-factor based predisposition to trust measure

		W1	W2	W3	S	M	SO	SR1	SR2	SR3	C1	C2	OC
W1	Trust in Workmates safety												
W2	General (affect-based) trust in Workmates	.74**											
W3	Distrust of Workmates safety	.60**	.56**										
S	Trust in Supervisors	.61**	.56**	.43**									
M	Trust in Management	.52**	.46**	.34**	.72**								
S0	Trust in Safety Officers	.52**	.47**	.38**	.61**	.61**							
SR1	Trust in Safety Representatives	.42**	.44**	.30**	.46**	.42**	.63**						
SR2	Distrust of Safety Representatives ability	.35**	.37**	.30**	.43**	.42**	.59**	.73**					
SR3	Distrust intentions	-.02	-.01	.02	.05	.05	-.06	-.04	-.04				
C1	Contractor staff characteristics	.48**	.42**	.40**	.46**	.48**	.44**	.31**	.35**	.02			
C2	(Affect-based) trust in Contractor staff	.43**	.42**	.29**	.46**	.44**	.48**	.41**	.35**	.01	.76**		
OC	Trust in the Operating Company	.45**	.39**	.28**	.64**	.85**	.56**	.41**	.40**	.00	.42**	.38**	
PT	Predisposition to Trust	.15**	.17**	.15**	.14**	.20**	.27**	.20**	.16**	-.01	.30**	.27**	.18**

** Correlations significant at the p. 0.01 level

PT = non-factor based 'Predisposition to trust' composite score calculated from the eight 'generalized others' items

Distrust intentions factor is also indicated to have non-significant weak associations with all inter-group factors in the analysis. Consistent with the conclusion made in Chapter 10 and in the earlier reliability section, the Distrust intentions factor appears to be a theoretical outliner within the TCSQ.

Regarding inter-group factor relationships, Trust in supervisors has a strong association with Trust in management, $r = .72$, Trust in the operating company, $r = .64$, Trust in safety officers, $r = .61$, and Trust in workmates safety, $r = .61$. Similarly, and of slightly higher magnitude are the relationships that Trust in management has with Trust in the operating company, $r = .85$, and Trust in safety officers, $r = .61$. This supports the prediction of a strong positive relationship between trust in the organization and trust in management (H^T1). However, unlike the Trust in supervisors factor, Trust in management has a moderate association with Trust in workmates safety, $r = .52$. Finally, a relatively strong association exists between Trust in safety officers and Trust in safety representatives, $r = .63$.

As well as several strong associations, the analysis also reveals several weak relationships. Trust in the operating company has a weak association with General (affect-based) trust in workmates, $r = .39$ and (Affect-based) trust in contractor staff, $r = .38$. Also of low magnitude is the relationship between Contractor staff characteristics and Trust in safety representatives, $r = .31$. Distrust of safety representatives ability also has a weak association with Trust in workmates safety, $r = .35$, General (affect-based) trust in workmates, $r = .37$, and (Affect-based) trust in contractor staff, $r = .35$. Finally, Distrust in workmates safety has the weakest although significant associations with all other situational factors. The correlations between this factor and others are, Trust in safety officers, $r = .38$, Trust in management, $r = .34$, Trust in safety representatives, $r = .30$, Distrust of safety representatives ability, $r = .30$, (Affect-based) trust of contractor staff, $r = .29$, and Trust in the operating company, $r = .28$. These findings suggest that the Distrust in workmates safety factor has poor construct validity.

Similar to the findings reported from the correlation analysis of the Map installation data (see Chapter 8), the lowest magnitude associations exist between the PT measure and situational factors (i.e., those extracted from the subscales). As indicated in Table 11.1, PT has relatively weak associations with Trust in supervisors, $r = .14$, Trust in workmates safety, $r = .15$, and Distrust of workmates safety, $r = .15$. Of slightly higher magnitude are the relationships between PT and Contractor staff characteristics, $r = .30$, (Affect-based) trust in contractor staff, $r = .27$, and Trust in safety officers, $r = .27$. In sum, the relatively low magnitude associations between PT and the situational factors, compared to the magnitude of associations between inter-situational factors, supports the hypothesis that propensity to trust will have minimal influence in determining the levels of trust in contexts where strong situational factors exist (H^T3a).

11.4 Discriminate Validity: A Test of Group Differences

The discriminate validity of the modified TCSQ was assessed through a series of one-way analysis of variance (ANOVA) comparisons between different groups offshore. To maintain consistency with the analysis of Map data, the same group comparisons were carried out. Specifically, comparisons were between supervisors and non-supervisors, contractor and operator staff, offshore occupations ($N = 9$; see Table 10.1), groups based on working tenure offshore ($N = 6$; less than 1 year, 1-2 years, 3-5 years, 6-10 years, 11-20 years, 20 years+), and groups based on the number of years they have worked on the current installation ($N = 6$; same time frames as above). Additionally, a set of comparisons was carried out between different employing companies represented by the sample. These were Company A ($n = 93$), Company B ($n = 93$), Company C ($n = 125$), and Company D ($n = 163$). Company A-C represented a single operator employer and Company D represented an aggregate score of number of contracting companies that were not included in any of the three other groups. Tukey's (1953) Honesty Significant Difference (HSD) test was used for pairwise comparisons of the mean scores of groups ($n > 2$) for factors with a main effect. The critical level of $p < .05$ was used to indicate significant differences between groups. Similar to the results reported for the Map installation in Chapter 8, standardized factor scores were used to carry out the ANOVA comparisons and non-standardized means and standard deviations are reported for factors with a significant main effect.

11.4.1 Supervisors versus non-supervisors[16]

One-way ANOVA comparisons between supervisors and non-supervisors reveal a significant main effect on 4 of the 13 factors. These are Trust in management, F (1, 457) = 6.02, $p < .05$, $\eta^2 = .01$, General (affect-based) trust in workmates, F (1, 457) = 4.73, $p < .05$, $\eta^2 = .01$, Trust in supervisors, F (1, 457) = 8.24, $p < .01$, $\eta^2 = .02$, and Trust in safety officers, F (1, 457) = 10.48, $p < .01$, $\eta^2 = .02$. An inspection of mean group differences on each of these factors indicates supervisors as having higher levels of trust in management ($M = 80.5$, $SD = 18.1$) compared to non-supervisors ($M = 76.3$, $SD = 16.0$), and to have higher levels of general (affect-based) trust in workmates ($M = 32.4$, $SD = 5.4$) compared to non-

[16] Similar to the Map installation, these groups are based on the response to the question, 'Are you a supervisor'? While managers might fall into either group, it is more likely that they will assign themselves to a supervisor group.

supervisors ($M = 31.2$, $SD = 5.9$). For the remaining two factors, supervisors report more trust in supervisors ($M = 84.7$, $SD = 16.4$) and safety officers ($M = 68.6$, $SD = 11.9$), compared to non-supervisors who report less trust in these groups ($M = 80.1$, $SD = 15.6$, and $M = 64.8$, $SD = 11.4$, respectively).

11.4.2 Operator versus contractor staff

One-way ANOVA comparisons between operator and contractor staff reveal a significant main effect on 7 of the 13 factors. These are Trust in management, $F\,(1, 488) = 6.82, p < .01, \eta^2 = .01$, Trust in the operating company, $F\,(1, 488) = 21.47, p < .01, \eta^2 = .04$, Trust in safety representatives, $F\,(1, 488) = 9.40, p < .01, \eta^2 = .02$, Distrust of safety representatives ability, $F\,(1, 488) = 4.56, p < .05, \eta^2 = .01$, Trust in workmates safety, $F\,(1, 488) = 7.27, p < .01, \eta^2 = .01$, Trust in supervisors, $F\,(1, 488) = 7.37, p < .01, \eta^2 = .01$, and Trust in safety officers, $F\,(1, 488) = 8.90, p < .01, \eta^2 = .02$.

A comparison of mean scores between groups on each of these factors indicates operator staff to hold more positive attitudes compared to contractor staff. Specifically, operator staff report higher levels of trust in management ($M = 79.1$, $SD = 16.8$) and higher levels of trust in the operating company ($M = 39.7$, $SD = 9.4$), compared to contractor staff who report lower levels of trust in management ($M = 74.9$, $SD = 17.7$) and lower levels of trust in the operating company ($M = 35.4$, $SD = 10.2$). Operator staff also report higher levels of trust in safety representatives ($M = 39.4$, $SD = 6.7$) and less distrust of their ability ($M = 18.4$, $SD = 3.5$). They also report higher levels of trust in workmates safety ($M = 31.8$, $SD = 5.5$), higher levels of trust in supervisors ($M = 82.9$, $SD = 15.6$) and finally, higher levels of trust in safety officers ($M = 67.2$, $SD = 11.4$). These are in contrast to contractor staff who report lower levels of trust in safety representatives ($M = 37.4$, $SD = 7.4$), more distrust of their ability ($M = 17.6$, $SD = 4.1$),[17] lower levels of trust in supervisors ($M = 78.9$, $SD = 16.8$), and lower levels of trust in safety officers ($M = 64.0$, $SD = 12.1$).

11.4.3 Occupational groups

One-way ANOVA comparisons between the occupational groups represented by the sample (see Table 10.1) reveal a main effect on 5 of the 13 factors. These are Trust in management, F (8, 487) = 3.70, $p < .01$, $\eta^2 = .06$, Trust in the operating company, F (8, 487) = 3.81, $p < .01$, $\eta^2 = .06$, Distrust intentions, F (8, 487) = 2.32, $p < .05$, $\eta^2 = .04$, General (affect-based) trust of workmates, F (8, 487) = 2.19, $p < .05$, $\eta^2 = .04$, and Trust in safety officers, F (8, 487) = 2.13, $p < .05$, $\eta^2 = .03$.

Pairwise comparisons using Tukey's (1953) HSD test reveals administrative and management staff[18] hold significantly higher levels of trust in management ($M = 89.6$, $SD = 14.4$) compared to construction workers ($M = 72.9$, $SD = 17.6$), drilling and well service crew ($M = 71.0$, $SD = 16.0$), production workers ($M = 78.3$, $SD = 16.4$), and maintenance staff ($M = 75.2$, $SD = 17.0$). Administrative and management staff also report higher levels of trust in the operating company ($M = 43.0$, $SD = 10.0$) compared to maintenance staff ($M = 36.7$, $SD = 10.1$) and construction workers ($M = 31.9$, $SD = 11.3$). A significant difference in the level of trust in the operating company is also revealed between construction and production workers, with production workers reporting higher levels of trust ($M = 39.3$, $SD = 9.1$). These differences indicate that administrative, management, and production workers hold similar levels of trust in the operating company. A likely explanation for this relates

[17] Distrust factors are reverse coded; therefore lower values indicate higher levels of this attitude.
[18] These occupations were grouped together in the OSQ, on which the demographic section of the TCSQ is based.

to the majority of the production workers (69%), and administrative and management staff (80%) in this sample being employed directly by operating companies. The greater job security and shared identity with the company that these groups experience relative to contractor staff is likely to promote higher levels of trust. Post hoc comparisons reveal no other significant differences between occupational groups on these two factors.

Administrative and management staff are indicated to have higher levels of trust in safety officers ($M = 70.1$, $SD = 9.1$), compared to drilling and well service crew who report lower levels of trust ($M = 59.6$, $SD = 14.3$). For the distrust intentions factor, comparisons reveal a significant difference in the levels expressed by medics, deck crew and catering staff. Specifically, medics have higher levels of distrust intentions ($M = 5.3$, $SD = 2.4$) compared to deck crew ($M = 9.8$, $SD = 2.2$) and catering staff ($M = 9.2$, $SD = 2.3$). Post hoc tests revealed no other significant differences between occupational groups on these two factors.

With respect to general (affect-based) trust in workmates, post hoc comparisons were unable to locate significant differences at the $p < .05$ level. Using the less stringent criteria of $p < .10$, deck crew are revealed to have lower levels of general (affect-based) trust in workmates ($M = 26.9$, $SD = 8.8$) compared to administrative and management staff ($M = 32.7$, $SD = 4.2$) and production workers ($M = 32.2$, $SD = 5.0$). It is therefore likely that these trends are responsible for the significant main effect that was found for the general (affect-based) trust in workmates factor.

11.4.4 Differences according to offshore experience: Industry wide

One-way ANOVA comparisons between groups based on the number of years they have worked offshore revealed no significant differences. This contrasts with the findings from the qualitative interviews with offshore workers (Chapter 4), where history was indicated as important in trust development (see also Blau, 1964). It also contrasts with the findings from the Map installation, which showed a difference in levels of trust towards contractors between those with 1-5 years and those with over 10 years offshore work experience. Based on the Map installation results and existing research (e.g., Blau, 1964), a differences in trust levels would be expected between workers depending on how long they have worked in the offshore industry. A possible reason as to why this did not emerge might relate to the majority of workers in the current sample holding over 11 years offshore experience (n = 415), which is likely to result in a consensus regarding the trustworthiness of others.

11.4.5 Differences according to offshore experience: Current installation

One-way ANOVA comparisons between groups based on the number of years they have worked on their current installation reveals a significant main effect for Trust in management, $F(5, 483) = 3.40, p < .01, \eta^2 = .03$. Pairwise comparisons indicate those with a working tenure of 11-20 years have lower levels of trust in management ($M = 73.1$, $SD = 17.9$) compared to those with 1-2 years ($M = 81.6$, $SD = 18.6$) or 6-10 years ($M = 79.8$, $SD = 16.0$). The negative attitudes expressed by those with a longer working tenure offshore might be attributed to their experience of extensive restructuring and down-sizing, which as suggested during the interviews with offshore workers, reduces the level of trust in management and the operating company.

11.4.6 Company differences

One-way ANOVA comparisons between operating companies reveals a significant main effect for 5 of the 13 factors. These factors are Trust in management, F (3, 473) = 10.59, $p < .01$, $\eta^2 = .06$, Trust in the operating company, F (3, 473) = 10.05, $p < .01$, $\eta^2 = .06$, Distrust of workmates safety, F (3, 473) = 2.91, $p < .05$, $\eta^2 = .02$, Trust in supervisors, F (3, 473) = 3.94, $p < .01$, $\eta^2 = .03$, and Trust in safety officers, F (3, 473) = 3.15, $p < .05$, $\eta^2 = .02$.

Tukey's HSD test reveals Company B has higher levels of trust in management (M = 85.5, SD = 13.8) compared to Company A (M = 75.4, SD = 16.7), Company C (M = 73.2, SD = 18.8), and Company D (M = 78.0, SD = 17.0). Similar results emerge for levels of trust in the operating company. Company B report higher levels of trust in the operating company (M = 41.7, SD = 8.7) compared to Company A (M = 36.3, SD = 9.6), and Company C (M = 34.8, SD = 10.2). Company C is also indicated to have significantly lower levels of trust in the operating company compared to Company D (M = 38.8, SD = 10.2). Regarding, trust in supervisors, Company B has significantly higher levels of trust in supervisors (M = 86.6, SD = 12.7) compared to Company A (M = 80.1, SD = 16.1), Company C (M = 79.6, SD = 17.6), and Company D (M = 80.8, SD = 16.8) who all report lower levels of trust in supervisors. Results also reveal Company B has significantly higher levels of trust in safety officers (M = 69.1, SD = 11.3) compared to Company C (M = 64.4, SD = 12.6). Finally, comparisons reveal Company A to have significantly lower levels of distrust in workmates safety (M = 16.1, SD = 2.5) compared to Company D (M = 15.0, SD = 2.8). Post hoc tests reveal no other significant differences between groups on these factors. In sum, Company B is indicated to have the most positive trust climate of those compared.

Group differences

Results of the various group comparisons indicate most factors to have good discriminate validity. These findings also suggest the potential existence of trust subcultures offshore that share similarities with those extracted from the Map installation. These will be discussed near the end of the Chapter.

11.5 Predictive Validity: Accidents, Incidents and Near-Miss Involvement

The predictive validities of the 12 factors and the PT measure are assessed for their ability to predict accidents / incidents offshore, accidents / incidents on the workers current installation, and near-miss involvement. Analyses are carried out over two stages. First, a direct logistic regression analysis is used to test each of the factors unique contribution to the prediction of each of the three safety measures. From the predictive factors found, a single model is produced (per safety measure) and tested using forward stepwise logistic regression analysis. The results of the second analysis indicate factor(s) that account for the most unique variance and therefore comprise the most predictive model(s) of safety.

Levels of safety

An inspection of the self-reported safety information from the industry sample, as shown in Table 11.2, reveals 286 (58%) of the 499 respondents have experienced an accident while working offshore. Of these, 87% (n = 247) were reportable accidents and 46% (n = 131) required medical attention. This contrasts to safety on the Map installation, where fewer workers reported an accident while working offshore (47%), although more of these events required medical attention (52%). Of the industry sample, 110 (23%) respondents report an accident on their

Table 11.2: Self-report safety information from the industry sample

	Categories	Frequency	Valid Percentage
Accidents/Incidents Offshore	No	207	42
	Yes	286	58
	Missing	6	-
Reportable Accident/Incident	No	38	13
	Yes	247	87
	Missing	7	-
	N/A	207	-
Medical Attention	No	155	54
	Yes	131	46
	Missing	6	-
	N/A	207	-
Accidents/Incidents within last 6mths	0	460	94
	1	17	4
	2	5	1
	3	2	.4
	4	2	.4
	5	1	.2
	Missing	11	-
Accidents/Incidents on this installation	No	373	77
	Yes	110	23
	Missing	16	-
Accident/Incidents within last 6mths	0	459	95.8
	1	8	2
	2	6	1
	3	1	.2
	4	2	.4
	5	2	.4
	8	1	.2
	Missing	19	-
Person Responsible	Management	54	28
	Yourself	77	39
	Core Crew	23	12
	Contractor	17	8
	> 1 person	25	13
	N/A	195	-
Near-miss involvement	No	307	64
	Yes	176	36
	Missing	16	-
Number of near-misses	0	270	57.2
	1	54	11.6
	2	58	12
	3	23	5
	4	11	2
	5	11	2
	6	7	2
	7	8	2
	9	2	.4
	10	11	2
	11-99	4	.8
	100+	15	3

current installation, while 373 (77%) do not. Most respondents have not experienced an accident in the last 6 months, either at an industry (94%) or installation level (96%). Those that have, report these as single events (4% and 2%, respectively). These figures are similar to the 95% of workers on the Map installation who also report no experience of an accident in the last 6 months. In the industry sample, responsibility for accidents is attributed to the 'victim' (39%) or to management (28%). Of the 25 respondents who attribute responsibility to more than 1 person, 6 identify a combination of management and themselves as responsible. In contrast to accidents, and somewhat surprising, is the relatively low numbers of reported near-miss events. Of the 499 respondents, 307 (64%) have not experienced a near miss compared to the 176 (36%) that have. This contrasts to the Map installation where near miss involvement emerged as noticeably more frequent than accidents (see Chapter 8), and may be accounted for by different reporting cultures on specific installations.

Logistic regression: A test of assumptions

Prior to testing each factor's predictive validity, checks for linearity in the logit and multicollinearity were carried out. Linearity in the logit was tested by creating interaction terms from each factor's natural logarithm and adding them to a single model with predictor factors. A test of this model shows the interaction terms are non-significant, which suggests that linearity in the logit is upheld by the data. With respect to multicollinearity, an inspection of the error value of each factor reveals none to be exceptionally large. This indicates that exceedingly high correlations between factors are not present in the data. The satisfaction of these main assumptions indicates the data as suitable for logistic regression analysis.

11.5.1 Accidents and incidents offshore

Separate direct logistic regression analyses of each factor reveals 9 of the 12 predict accidents and incidents offshore. In order of decreasing contribution based on the Wald statistic these are Trust in supervisors, $z = 15.33, p < .01$, Trust in management, $z = 15.13, p < .01$, Trust in workmates safety, $z = 14.41, p < .01$, Trust in the operating company, $z = 11.15, p < .01$, General (affect-based) trust in workmates, $z = 8.67, p < .01$, Trust in safety representatives, $z = 7.57, p < .01$, Distrust of safety representatives ability, $z = 6.37, p < 05$, Trust in safety officers, $z = 5.96, p < .05$, and Distrust of workmates safety, $z = 4.03, p < .05$. A forward stepwise logistic regression analysis of a single model containing these 9 factors reveals Trust in supervisors, $z = 15.33, p < .01$ as the only significant predictor. The amount of variance accounted for by this factor is estimated by Nagelkerke's R^2 as 4%. Its predictive success for an accident groups is good at 85%, but poor for non-accident groups at 23%. Combined these values give an overall success rate of 59%. The odds ratio for this factor is .97. Given that this is less than 1.00 it suggests that a 1 unit increase of trust in supervisors will reduce the likelihood of accidents and incident offshore by 3% (see Chapter 6).

11.5.2 Accident and incidents at an Installation level

Separate direct logistic regression analyses of each factor reveals 8 of the 12 predict accident and incidents at an installation level (i.e., the installation that the worker currently operates on). In order of decreasing contribution based on the Wald statistic these are Trust in the operating company, $z = 16.23, p < .01$, Trust in management, $z = 14.01, p < .01$, Distrust of safety representatives ability, $z = 11.00$, $p < .01$, Trust in supervisors, $z = 10.82, p < .01$, Trust in workmates safety, $z = 6.14$,

$p < .05$, Trust in safety officers, $z = 5.61$, $p < .05$, Trust in safety representatives, $z = 4.19$, $p < .05$, and Contractor staff characteristics, $z = 4.20$, $p < .05$. A forward stepwise logistic regression analysis of a single model containing these 8 factors indicates Trust in the operating company, $z = 9.38$, $p < .01$, and Distrust of safety representatives ability, $z = 4.00$, $p < .05$, to each account for unique variance. Combined these factors are estimated by Nagelkerke's R^2 to explain 6% of the variance. The prediction success of this model for a non-accident group is excellent at 100% but extremely poor for an accident group at 3%. Combined these give an average success rate of 78%. The odds ratio for trust in the operating company is .95 and for distrust of safety representatives ability is .93. Given that these are less than 1.00, it suggests that a 1 unit increase of trust in the operating company will reduce the likelihood of accidents and incidents at an installation level by 5%, and a 1 unit reduction in distrust of safety representatives ability will reduce this likelihood by 7%.

11.5.3 Near-miss involvement

Separate direct logistic regression analyses of each factor reveals 9 of the 12 predict near miss involvement. In order of decreasing contribution based on the Wald statistic these are Trust in management, $z = 21.03$, $p < .01$, Trust in the operating company, $z = 18.59$, $p < .01$, Contractor staff characteristics, $z = 10.14$, $p < .01$, Trust in workmates safety, $z = 8.00$, $p < .01$, Trust in supervisors, $z = 7.62$, $p < .01$, Distrust of safety representatives ability, $z = 6.18$, $p < .01$, (Affect-based) trust in contractor staff, $z = 6.17$, $p < .05$, Trust in safety representatives, $z = 5.92$, $p < .05$, and Trust in safety officers, $z = 4.50$, $p < .05$. A forward stepwise logistic regression analysis of a single model containing these 9 factors reveals Trust in management as the only significant predictor, $z = 21.03, p < .01$. This factor is estimated by Nagelkerke's R^2 to account for 6% of the variance, and its predictive success for the non-occurrence of near miss events is excellent at 94%, but poor for the prediction of near miss occurrence at 13%. Combined these give an overall success rate of 64%. The odds ratio for this factor is .97. As this is less than 1.00 it suggests that a 1 unit increase of trust in management will reduce the likelihood of a near miss event by 3%.

11.6 Discussion

The psychometric tests carried out on the twelve industry factors revealed most as reliable and valid constructs of trust climates in the offshore industry. With the exception of three factors, all had good predictive and discriminate validity, and estimates of internal consistency revealed most factors to be stable and reliable. In contrast to situational factors, the PT measure performed poorly. This measure was significantly related to 11 of the 12 factors, but the magnitude of these relationships was relatively low compared to the relationships found between situational factors. The prediction that an individual's propensity to trust will have a weak influence in determining levels of interpersonal trust when strong situational factors exist (H^T3a) was therefore supported. Also supported was the hypothesis that propensity to trust will fail to significantly predict accidents, incidents or near miss involvement (H^T3b). In all of the tests carried out, PT failed to predict any of the safety measures examined.

The finding that situational factors are associated to a magnitude and in a direction that is consistent with previous research supports the construct validity of the TCSQ. For instance, the strong relationship between trust in management and trust in the organization is well documented in the literature (e.g., Zaheer, McEvily, & Perrone, 1998) and was replicated here. This supports H^T1. The results also support the conclusion made in Chapter 8 that distinct groups exist offshore. Specifically, the pattern of strong-weak associations between levels of trust in different occupational roles that emerged from the industry survey suggests four distinct groups offshore. These relate to management, workmates, contractors, and safety representatives, and with the exception of the latter group, replicate those identified at an installation level. In contrast to groups that exist at both an installation and industry level (managements, workmates, and contractors), supervisors and safety representatives are specific to one level only. For instance, at an installation level, findings suggest that workers discriminate between trust in supervisors and trust in managers. However, at an industry level these two 'subgroups' are perceived as one global group that relates to 'management'. Further, the strong associations revealed between managers, safety officers and the operating company suggests that in addition to supervisors, these other groups are also perceived as 'management'. One possible explanation for this grouping relates to seniority, as all groups hold senior positions offshore.

While seniority accounts for the perceived similarity and hence strong associations of trust between these 'senior' groups, it fails to account for the distinct groupings of workmates, contractors and safety representatives that all hold 'low status' positions offshore. Rather than seniority, it might be argued that distinct groupings within low-status employees are based on the factors of employing company (that functions to create in-groups and out-groups, Tajfel, 1982) or degree of impartiality. For instance, trust in contractors emerged as having a similar magnitude association with trust in workmates and trust in management. One factor that merges these latter two groups, while also separating them from contractors is employing company. In contrast to contractor staff, management and workmates (in the industry survey) are employed directly by an operating company. The suggestion of a contractor / operator divide is supported by similar findings reported by Collinson (1999) in his study of surveillance on offshore rigs. However, it contrasts to findings from the qualitative study (Chapter 4), where it emerged that trust depends more on individual trustworthiness than a worker's employing company. Based on the results reported here, it appears that employing company might play a stronger role in determining trust levels than is indicated by the analysis of interview data.

Although employing company accounts for some of the associations found, it fails to explain the relationship between the levels of trust in contractors and safety representatives. For instance, despite the safety representatives selected by the workforce holding an operator status, the relationship that they have with contractors in terms of levels of trust is weaker than the relationship between contractors and other operator groups. It is here that the factor of impartiality may play an active role.

In the offshore industry, safety representatives act as an impartial group that offer a vehicle for workers to communicate their safety concerns to management. They do not influence the performance of groups through official means such as bonuses or disciplinary action, and they do not determine the 'type' of worker that is employed offshore. In contrast, supervisors, managers and workmates have a direct influence on contractor staff performance and so are associated with them in some way. For instance, a contractor who performs in an unsafe manner is likely to draw attention to management for allowing this 'type' of worker to operate on the installation, and to the supervisor for not monitoring their performance. A reduction of trust in the contractor will therefore be associated with a reduction of trust in management and supervisors. However, the lack of shared company identity that safety representatives have with contractor staff, together with their impartial status offshore reduces the likelihood of strong associations. Therefore, a change in the level of trust in contractor staff will be minimally related to a change in the level of trust in safety representatives. In the main, the results suggest that the levels of trust offshore are influenced by an individual's perceived group membership (Brewer, 1979), which is based on their seniority, employing company and degree of impartiality.

Similar to the good construct validity of the TCSQ's situational basis, the personality element (PT) was also indicated to perform in a way that is consistent with previous research. Its relatively weak influence in shaping trust climates offshore when compared to situational factors is consistent with established findings (Kee & Knox, 1970; Butler, 1983) and supports H^T3a. Consistent with its original conceptualisation (Rotter, 1967), PT was indicated to have its greatest influence in 'novel' situations. For instance, the relatively strong relationship between PT and trust in safety officers may be attributed to a novelty created by the stationing of safety officers onshore and their infrequent visits offshore. With respect to the PT-contractor relationship, the novelty created here stems from the limited interaction between contractor and operator staff (the majority of respondents) due to differences in occupational roles. While contractor staff typically hold frontline positions, operator staff work in more senior positions such as management. With limited interaction and opportunity to form trustworthiness expectations, trust in these groups (safety officers and contractors) will be influenced to some extent by a default mechanism such as PT.

As valid constructs, most factors were able to discriminate between groups offshore. This was most evident for management, supervisors, safety officers, and the operating company factors, which discriminated between all groups compared. Further, an examination of the differences on these factors identified the existence of two trust subcultures offshore – 'Management / operator staff' and 'Frontline workers / contractor staff' – which are based on a fusion of seniority and employing company factors. These groupings are the same as those identified on the Map installation, which suggests they are robust in the offshore industry. For safety professionals, this suggests that attention should be paid to understanding cultural differentiation (Pidgeon, 1991; Hofmann & Stetzer, 1996; Richter & Koch, 2004) rather than seeking to identify a collective culture that comprises shared attitudes, perceptions and beliefs (e.g., Zohar, 1980; CBI, 1990).

Consistent with the findings from the Map installation, the levels of trust in the Management / Operator subculture are relatively higher than in the Frontline / Contractor subculture. For instance, management staff and operators report relatively high levels of trust in management groups and higher levels of affect-based trust in workmates, compared to non-supervisors, frontline groups and contractors who reported lower levels of trust. As a possible explanation it may be argued that those in senior positions experience greater organizational benefits (McLean Parks & Kidder, 1994; de Gilder, 2003) and perceive less exposure to risk (Mearns et al., 1997), which leads them to express more positive attitudes compared to those in a less senior positions (for support see Chapter 8). Compared to less senior positions, those in authority are also likely to have more accurate knowledge of the reasons for various actions of management and the operating company because of their closer proximity (Kiesler & Cummings, 2002). As found in the qualitative study (Chapter

4), and in previous research (Butler, 1991; Whitener et al., 1998), knowledge about decisions through openness and sharing of information is a strong promoter of trust. In its absence, actions may be misinterpreted, which can lead workers to perceive management as career driven and consequently lower the level of trust placed in them (Tyler & Kramer, 1996). Alternatively, and in addition to this, it might be argued that the long-term employment of management and operators on an installation allows the frequency and type of interaction that is required for high levels of trust to develop (McAllister, 1995).

In sum, organizational and social climates factors are indicated as robust factors that influence offshore group formation and trust levels at both an installation and industry level. This supports the prediction that subgroups offshore will develop from a combination of organizational and social climate factors (H^T8).

Of all of the comparisons, of most interest were the differences that emerged between the companies compared. The findings indicated Company B as having the highest levels of trust in management, supervisors and the operating company, and hence the most positive trust climate of those compared. A preliminary inspection of Company B's safety also revealed it to have the safest self-report levels, with accidents, incidents and near-miss events occurring with relatively low frequency. One implication of this finding is that positive trust climates are associated with good safety performance. This complements the findings of other research that reports an association between positive safety attitudes and good safety performance (Donald & Canter, 1993; Lee & Harrison, 2000) and supports the prediction that negative trust attitudes will be associated with higher accident rates (H^S1).

The main difference that emerged between Company B and the other companies related to the level of trust in management. The importance of management in shaping trust climates and hence safety performance was also indicated in comparisons between Company C and D. Specifically, Company C reported lower levels of trust in the operating company compared to Company D, and also reported higher rates of accidents and incidents. The central role of management that these findings suggest is consistent with previous research into trust (e.g., Whitener et al., 1998), and safety (e.g., Zohar, 1980; Nananidou & Donald, 2002), which both identify management as the main influence in attitude formation. The prediction that accident groups will report more negative trust attitudes towards senior management and supervisors ($H^{S}2a$, $H^{S}2b$), compared to non-accident groups is supported. Also supporting these predictions is the finding that attitudes towards 'management' are most predictive of safety. Specifically, trust in supervisors was identified as important for reducing accidents offshore and trust in management and the operating company were revealed as important for reducing accidents and near-miss involvement on a specific installation.

Trust of management is likely to reduce accidents and near miss events through social influence and open communication. Drawing on the Theory of Planned Behavior (Ajzen, 1985), it might be argued that trust in management increases their influence on safety performance through their effects on intentions. Management that are committed to safety (e.g., emphasise and follow safety standards) are likely to produce a workforce that is also committed to safety (for support see Zohar, 2002). Trust also stimulates the sharing of safety information and the free-flow of communication, which has been identified as a factor important for reducing accident rates (Hofmann & Morgeson, 1999). Open communication also enables learning from past mistakes and allows organizations to take a proactive approach to safety (Cullen, 1990; Pidgeon, 1991).

The finding that trust in supervisors is the best predictor of accidents and incidents offshore lends support to the suggestion that supervisors play a major role in safety (Clarke, 1999; van Vuuren, 2000), and exist as a distinct group to managers (Haines, Merrheim, & Roy 2001). However, on a specific installation, results indicated trust in senior groups such as the operating company and managers as more important. The pairing of, 'Industry - Supervisor' and 'Installation - Senior management', which these findings suggest, are somewhat counter-intuitive and are contrary to findings reported from other research conducted offshore. For instance, in a study of offshore safety attitudes, Mearns et al. (1997) identified a differences between attitudes held at an installation level and those of the industry, which they attributed to the type of influence that workers are exposed to. Specifically, industry level safety attitudes were argued to be a function of senior management and the operating company, whereas those at an installation level were shaped by local influences from workmates and supervisors. However, the results reported here suggest that local influences (i.e., trust in supervisors) operate at an industry level and senior groups at an installation level.

Finding trust in supervisors to influence safety at a global offshore level might be attributed to workers rating their level of trust towards supervisors in the industry rather than their specific supervisor. Clark and Payne's (1997) finding that workers differentiate between trust at a general macro level (e.g., supervisor group) and a specific micro level (e.g., personal supervisor) supports this suggestion. However, applying this macro-micro division to management has minimal influence on levels of trust and consequently their role in safety performance at different levels of industry. As suggested by the results in the previous Chapter, attitudes towards management appear to be relatively robust and consistent whether applied to a specific installation manager or a management group in general. Their emergence as a strong predictor of safety at either level (installation or industry) is therefore likely to be dependent on their relative importance compared to other predicting factors in the analysis.

With respect to accidents and incidents on a specific installation, trust in the operating company and distrust of safety representatives ability were the most predictive factors. Of the two, a greater reduction in the likelihood of accidents or incidents on a specific installation was indicated by a reduction in the level of distrust of safety representatives ability. As safety representatives offer in many cases the only route for workers to raise their concerns with management, it is crucial that they are perceived as competent in this role. Additionally, and with occupational role aside, this finding suggests that distrust has a greater impact on safety performance than trust. This is similar to the conclusion made from the results of the Map data were distrust factors were typically found to be more predictive of safety compared to trust factors. The conclusion that negative attitudes are more predictive of safety compared to positive attitudes (see also Nananidou & Donald, 2002) is therefore supported in this case.

Factors with poor psychometric properties

Of the 12 factors examined, 3 were indicated to have poor psychometric properties. These were Distrust intentions, Distrust of workmates safety and (Affect-based) trust in contractor staff. With regards to Distrust intentions, this emerged as unreliable and as lacking construct validity. As a possible explanation it might be argued that these poor properties are due to its composition of *'I can't'* items, which as indicated by the item analysis detailed in Chapter 9, have poor internal consistency within the TCSQ. The inclusion of these items in the modified version of the questionnaire tested this conclusion and as shown here, has supported the suggestion that they measure a different dimension to that of the TCSQ.

The lack of validity found for the factor (Affect-based) trust in contractor staff may be accounted for by its measurement of a type of trust that does not apply to this offshore group. Contractor staff are typically employed on installations for short periods of time and therefore have limited opportunity to engage in the types or frequencies of interaction that are needed to develop affect-based trust. Trust in this group is therefore likely to reside at a cognitive level.

Finally, the reason for the poor properties of the Distrust of workmates safety factor is unclear, as theoretically it does not deviate from the other factors in any major way. Although tentative, two explanations may be offered. First, it might be argued that in the current sample, attitudes of distrust towards workmates safety do not apply with much salience. This may be attributed to most respondents being operator staff and associated with this, the finding that they report relatively positive attitudes. Second, it might be argued that this factor's poor qualities are due to its weak structural composition of only three items.

Primary structure versus the within-subscale structures

The use of the within-subscale factors to test the TCSQ's psychometric properties rather than the 7 primary factors provides greater insight into the structure and role of trust in safety. For instance, while the primary factor of senior management was indicated to have good predictive validity, analysis using the within-subscale factors located these good properties to either operating company *or* manager sub-factors, depending on the safety measure examined. For instance, an increase of trust in the organization was suggested to reduce accidents and incidents on an installation, while an increase of trust in management was suggested to reduce near miss events. The senior management factor, however, fails to capture this diversity. As well as identifying aspects of the primary factors that have good psychometric properties, the within-subscale factors also allowed for the identification of factors with poor properties. As indicated previously, the results of the within-subscale analyses identified three potential factors for removal. However, when these were analysed in their primary form (i.e., with other items from their respective subscales), they were identified as good measures. It therefore appears that when analysing primary factors, the good psychometric properties of some items disguise the less than adequate qualities of others. One way to overcome this is to use within-subscale factors.

11.7 Summary

The psychometric tests of the industry factors indicated strong similarities to the results obtained from the Map installation, which together suggest the TCSQ as a reliable and valid tool. Specifically, results indicated two broad groups to exist offshore that relate to 'management / operator staff' and 'frontline / contractor staff'. In the former group high levels of trust emerge, which may be accounted for by the opportunity that these group members have to develop and foster long-term relationships. In the latter group this opportunity does not exist, as interaction is limited to a short period of time. With respect to offshore safety, trust in 'management', together with a lack of distrust of safety representatives ability were identified as important for reducing accidents, incidence and near miss events. In the next Chapter, an examination of the structure of trust based on CFA is reported.

Chapter 12

Dimensionality of Trust Climates Offshore

This Chapter examines the structure of trust offshore using confirmatory factor analysis. First, it seeks to confirm the structures of trust identified from earlier exploratory methods using criteria based on 'model' fit. Second, it compares a number of alternate structures to see if they offer a better representation of the dimensionality of trust climates offshore. This Chapter contributes to the thesis by providing a rigorous test of previous results and of the construct validity of the Trust Climate and Safety Questionnaire (TCSQ). Further, using a formal set of criteria to evaluate models allows the structure of trust extracted from this Chapter to be tested and supported in future industry samples.

12.1 Exploratory and Confirmatory Factor Analysis

In Chapters 7 and 10, the results of exploratory factor analyses (EFA) detailing the structure of trust at an installation and industry level were reported. An exploratory approach was appropriate for the first quantitative stage of the study (Chapter 7) due to the absence of empirical work on trust in high-risk contexts from which theory could be taken and confirmed. Further, as the Trust Climate and Safety Questionnaire (TCSQ) is the first tool to measure a number of different facets of trust, it was unknown which of these would be most salient. Conducting EFA had the advantage of identifying the number of salient dimensions and provided a model to test using confirmatory factor analysis (CFA). Further, EFA revealed if any of the items loaded on non-hypothesised factors, which cannot be achieved when CFA is the first choice of approach (Kelloway, 1995). While a structure of trust was extracted from the installation survey it was not possible to confirm this in the second quantitative stage of the study, the industry survey, as a modified version of the questionnaire was used. Because of this, EFA was the test of choice (see Chapter 10 for a full justification).

Although EFA is attractive as an initial approach to understanding a phenomenon, it is limited by its exploratory basis. That is, it does not have clear criteria for assessing the 'goodness' or 'correctness' of the structure and the relationship between factors cannot be assessed. CFA overcomes these limitations and is argued by some to be the necessary next step to EFA to allow for theory development (Hurley, Scandura, Schriesham, Brannick, Seers, Vandenberg, & Williams, 1997). CFA allows the relationship between factors to be specified and tested, but also allows for a mixture of orthogonal and oblique relationships between factors in the same structure. In EFA, the same relationship is applied to all factors (Hurley et al., 1997). Basically, CFA allows the definition of a measurement model of the relationship between multivariate observed and underlying factors that can be tested using formal and statistical criteria. For this reason, it is generally taken as a better test of a structure compared to EFA.

Studies comparing models extracted from EFA and CFA have revealed mixed results. Some report consistencies across analyses (e.g., Gerbing & Hamilton, 1996), while others have found different structures to emerge (e.g., Bollen, 1986). One likely reason for the latter finding is the different criteria used by these approaches to extract factors. Specifically, EFA places a great emphasis on the eigenvalue-greater-than-one criterion as an indication of dimensionality, while CFA emphasises model fit. Because the latter goodness of fit approach takes into account model misfit and cross-loadings, it is a more rigorous test of a structure and for this reason produces more reliable results. Further, the use of eigenvalues has been found to under-extract (Humphreys, 1964; Cattell & Vogelman, 1977; Cliff, 1988) or over-extract factors (Horn, 1965; Browne, 1968; Lee & Comrey, 1979; Zwick & Velicer, 1982). This research therefore suggests the need for CFA in the present study.

Based on the importance of confirming a factor structure using some objective and standard criteria, and because of the potential for EFA techniques to suffer from extraction problems, this Chapter had two main objectives:

1. *To confirm the installation and industry within-subscale structures of trust extracted from the EFA,* and;

2. *To identify the best structure of trust offshore from a number of alternate models.*

The first objective tests how well the within-subscale structures extracted from the EFA fit the data based on formal criteria. As well as providing potential support for the 'goodness' of these structures and allowing for theory development supported by both approaches, it provides a further test of the TCSQ's construct validity.

The second objective tests for the possibility that the optimal number of factors were not extracted from the exploratory analyses. In the current study, the problem associated with extraction based on eigenvalues was minimised by using a number of criteria to decide on the number of factors. These included the interpretability of the structure and the subjective scree plot, which has been found to result in an accurate determinant of the number of factors (Cattell & Vogelman, 1977; Tzeng, 1992). However, comparisons of the structures extracted from the installation and industry data suggest that 'extraction' might be a problem. For instance, a single factor at an industry level represented the same set of items that manifested as two-factors at an installation level. Based on this it might be argued that analysis of the industry data under-extracted factors or that analysis of the installation data over-extracted factors. However, it is equally likely that problems do not exist with the extraction technique and that the differences between structures represent genuine variations in the way that trust attitudes structure between levels of industry (installation versus industry). Basically, a general industry model might exist and each installation might have its own structure within this.

To test the second objective, a number of trust models that represent a 'cleaned up' version of the structures collectively identified from the EFA's were compared. Specifically, the models represent a single dimension, two dimensions (trust and distrust) or three dimensions (specific trust, specific distrust, general (dis)trust). For completeness, a fourth model was added to the analysis that represents the four dimensions of specific trust, specific distrust, general trust, and general distrust. The distinction between the attitudes of trust and distrust in a specific domain suggested that this division might also apply in a general context. To test these models in a way that would allow for reliable comparisons between samples, only items common to both versions of the TCSQ were used. In this way it was possible to see how a general structure of trust for the industry manifested at a local, installation level.

In the following sections, details specific to the methods of structural equation modelling and their application in the current study will be outlined. Following this, the results of model comparisons and a discussion of the implications of these findings for the offshore industry will be given.

12.2 Structural Equation Modelling (SEM)

Structural equation modelling (SEM) was used to confirm the installation and industry structures of trust extracted from the EFA and to compare these with alternate models. Subsumed under the general heading of covariance latent analysis, SEM takes a confirmatory approach to testing structural representations (models) of theoretical constructs. Its main advantage is that it allows both observed and unobserved variables to be measured and linked together in a 'causal' way, while also taking into account error or residual variance. Comparing a theoretical model, which reflects the presumed relations among the observed and unobserved variables, with the sample data to determine the fit of the hypothesised model, it provides an indication of the appropriateness of the theoretical structure.

SEM frameworks usually comprise a measurement model and a structural equation model. In measurement models (i.e., CFA), observed (measured) variables are related to unmeasured latent factors through specification and estimation. Unlike the common factor model (i.e., EFA), which requires that all measured variables load on to all latent factors, factor loadings are restricted so that each measured variable only loads on to the latent factor that it is hypothesized to represent. One variable for each latent factor is identified as a reference variable and its parameter is fixed to unity. The selection of this variable is arbitrary and it does not influence model fit for the variance accounted for by each of the variables as all are freely estimated. Reference variables are important, first to identify the model, and second to set the metric or the scale for the factors. To represent structural models with their observed and unobserved variables, path diagrams are used. Observed variables are represented by squares, which have connecting circles for their error variance. Latent factors are represented by ovals, with any correlations between them represented by curved lines with arrows at both ends. This signifies that one latent factor is not considered to be a cause of the other.

The measurement models tested in the current study were 'nested'. All were hierarchically related to one another in that the same set of parameter places existed, but each model had different specified values and a different number of estimated parameters. For instance, one model might have parameter estimates fixed to zero, while another model allows parameters to be freely estimated (see, Bentler & Chou, 1987). Of importance is that the same measured variables are used in all of the models that are compared.

12.3 Model Fit

12.3.1 Fit indices

To assess the fit of each model to the data, two groups of fit indices, absolute (exact-fit) and incremental (close-fit) were used. Absolute fit indices determine how well the proposed model reproduces the correlation matrix perfectly for manifest variables, and incremental fit indices judge "proportionate improvement in fit", which is achieved by matching the hypothesized model with a nested baseline model (Hu & Bentler, 1995). As these groups of indices evaluate different aspects of a model (e.g., parsimony, variance, etc.), it is common for researchers to use a combination when assessing model fit rather than relying on one index exclusively (Bollen & Lang, 1993).

The most common absolute goodness-of-fit index is the chi-square (χ^2) test (Hoyle & Panter, 1995). In contrast to traditional significance testing, a non-significant value indicates a good model fit. As large χ^2 values indicate greater deviation from the correlation matrix for manifest variables, a smaller value is desirable. However, the limitations associated with this test have resulted in its gradual decline as the main test of model fit. Most problematic is this test's sensitivity to sample size and model complexity. For instance, in small samples a model with poor fit is often indicated to produce a non-significant χ^2, whereas better fitting models with larger samples typically result in significant χ^2 estimates. Further, in large complex models, such as those with many variables and degrees of freedom, the observed χ^2 is generally found to be statistically significant even when there is a reasonably good fit to the data (Marsh & Hocevar, 1985). As models are designed as approximations of reality rather than fully representative of all of the complexity observed in the data (Cudeck & Browne, 1983), a significant χ^2 would be expected.

Although χ^2 is generally not used as the main test of model fit, it is useful for comparing a series of models to determine if their fit to the data is significantly different (Bollen & Medrano, 1998). This is achieved by comparing differences in χ^2 values ($\Delta\chi^2$) between models. Serving a similar function is Akaike's (1987) information criterion (AIC). This is used to select between nested models, with a good fit to the hypothesized model indicated by small AIC values (Hu & Bentler, 1995).

Alternatives to the χ^2 test for estimating model fit include the χ^2/degrees of freedom ratio, goodness-of-fit index (GFI), and adjusted goodness-of-fit index (AGFI). Although these initially offered an attractive alternate test, they have since been identified to have a number of problems. For instance, the GFI and AGFI are both influenced by sample size and in some cases are found to be negative (Fan, Thompson, & Wang, 1999). As an alternative, Hu and Bentler (1998) argue that the standardized root mean residual (SRMR) should be used. This estimate represents the average value across standardized residuals derived from fitting the variance-covariance matrix for the observed model to that of the sample data. Ranging from zero to unity, a value of .05 or less is generally taken to indicate good model fit (Byrne, 2001). When sample sizes are less than 250, it has been suggested that the SRMR should be combined with the Tucker-Lewis index (TLI, Tucker & Lewis, 1973), comparative fit index (CFI), or gamma hat (Holbert & Stephenson, 2002). The TLI and CFI both belong to the same group of incremental fit indices and range from zero to unity. Working in reverse to the SRMR, higher values indicate better model fit, with a cut-off value of .95 recommended (Hu & Bentler, 1999).

In samples greater than 250, Holbert and Stephenson (2002) suggest that the SRMR might be reported in combination with the root mean squared error of approximation (RMSEA). The RMSEA takes into account the error of approximation in the population and sees how well the chosen parameters fit its covariance matrix (Browne & Cudeck, 1993). While variation exists over the interpretation of cut-off values, it is generally accepted that a value of .05 indicates a good fit, .051 to .08 indicates acceptable fit, .081 to .10 indicates adequate fit, and values greater than .10 indicate poor model fit (Browne & Cudeck, 1993; Jöreskog & Sorbom, 1996). For a detailed discussion of fit indices see; Gerbing and Anderson (1993); Tanaka (1993), and; Hu and Bentler (1999).

12.3.2 Residuals

Model (mis)fit is also indicated by discrepancies in the residual covariance matrix. This estimates the degree of fit between the covariance matrix implied by the hypothesised model and the sample covariance matrix. As the fitted residuals are typically dependent on the unit of measurement applied, standardized residual covariances are used because of their ease in interpretation. Representing the number of standard deviations the observed residual is from zero, standardized residual estimates greater than 2.58 are used as an indication of model misfit (Jöreskog & Sorbom, 1988).

12.4 Data: Screening and General Issues

Data from the installation and industry survey were analysed separately. This was done for a number of reasons. First, an objective of the analysis was to confirm the installation and industry structures extracted from the EFA, which would not be possible if data were combined. Second, analysing the data separately allowed for comparisons between the structures of trust at both levels of industry. This revealed whether the structure of trust for industry replicated at a specific installation level, or whether some variation emerged. Third, combining the data would have biased results towards the attitudes expressed at an installation level. Because of this it would be impossible to refer to the structure as an industry model or an installation model. Overall, this would reduce the practical appeal and application of the findings.

12.4.1 Measured (observed) variables

In the present study, the observed variables are items belonging to the workmate, supervisor, management, contractors, and operating company subscales of the TCSQ. Consistent with the EFA, variables were modelled separately for each subscale. Models for the interpersonal subscales comprise 14 observed variables and the model for the operating company subscale comprises 9. The subscales, 'Safety personnel' and 'Generalized others' were not modelled because of the problems with each that were shown earlier (Chapter 7 and 10). For instance, the original safety personnel subscale was poorly designed with positively worded items directed towards safety representatives and negatively worded items directed towards safety officers. The substantial modifications that were made to correct for this served to reduce the number of common items to both versions of the TCSQ. Regarding the 'generalized others' subscale, items were indicated to have a non-factor based structure. It was therefore considered inappropriate to model them in a factor structure.

12.4.2 Missing data

To estimate model fit, a full data set is required. To achieve this in the present study, missing data were controlled for through deletion. Although a number of alternative approaches are available that estimate scores for imputation (e.g., mean imputation, regression procedures, or full information estimation), these have a number of limitations. For instance, mean imputation and regression procedures typically reduce the variance of scores as they become centralised. Consequently, the strength of correlations between variables is reduced, which biases standard errors and any other statistics computed (Brown, 1994; Byrne, 2001). While mean imputation was used in the EFA, this was motivated by sample size requirements and was suggested to have minimal effects due to the small number of missing cases and the random pattern they displayed throughout the data set (Tabachnik & Fidell, 2001). However, with CFA the importance of large sample sizes is emphasised less, with numbers lower than 200 commonly reported. Further, this Chapter was designed to offer a more rigorous test of the structure of trust offshore. Therefore, any potential bias on the results was removed.

Regarding full information estimation, this is calculated by the software used in the current study – Amos 4.0 (Arbuckle, 1999), and has been found to produce biased fit indices. For instance, as its baseline model, Amos 4.0 constrains all measured variables to have zero correlations. However, when missing data exists it also constrains the model to have zero means. Consequently, a model that works well for means, even if not adequately explaining covariances, results in an inflated estimation of certain fit indices (e.g., GFI, AGFI, TLI, CFI, etc.). Based on inflated fit indices, a poor fitting model would be misinterpreted as providing a good fit to the data.

The method used in the present analysis was deletion of missing values (< 10%). The pattern of missing data was 'missing completely at random' (MCAR), and so listwise deletion was used (Arbuckle, 1996). This involved removing cases that had missing values on any of the observed variables used in each model. Rather than applying this procedure to the observed variables collectively (N = 65; 14 variables in the 4 interpersonal subscale models and 9 in the operating company subscale), listwise deletion was applied to each set (i.e., model) of subscale items separately. Therefore, a case that might be deleted from the analysis of management models may be retained and used in an analysis of workmate models. Carrying out deletion in this way had the advantage of retaining the optimal number of cases in each set of subscale models tested.

The number of cases deleted from each subscale in the installation data were, workmates, $n = 9$, supervisors, $n = 1$, offshore management, $n = 1$, contractors, $n = 1$, and the operating company, $n = 3$. From the industry data, the number of deleted cases were, workmates, $n = 18$, supervisors, $n = 9$, offshore management, $n = 25$, and the operating company, $n = 7$ (the final sample sizes used to test each model can be found in Table 12.1).

12.4.3 Normality and linearity

Consistent with data specifications for SEM, all variables were screened for multivariate normality and linearity. Results revealed slightly skewed and peaked distributions for some of the variables in each data set. However, given their minor departures from the acceptable range of $\pm$ 1.00 (e.g., +1.00 to 3.37), and the absence of curvilinearity, variables were not transformed. Rather than replicate the full set of results for the installation and industry variables here, the reader is directed to Chapters 7 and 10, respectively.

12.4.4 Categorical data

The observed variables were measured using an ordinal scale. It is therefore generally suggested that polychoric correlations should be generated and weighted least squares (WLS) applied to the inverted asymptotic covariance matrix (Jöreskog, 2001). However, applying this approach is quiet demanding on sample size. As suggested by Jöreskog (2001), at least 400 cases should be used for just six indicators and one dimension. As well as the issue of sample size, the use of WLS also restricts analysis to 25 variables (Bentler & Chou, 1987) and assumes that underlying each observed variable is an unobserved latent variable with a continuous scale. Because of these restrictions, a vast majority of psychological studies have applied the most commonly used maximum likelihood estimation procedures (MLE; Bollen, 1989).

Although analysing ordinal data as continuous can have a number of problems such as lowering Pearson correlation coefficients (West, Finch, & Curran,

1995) and producing worse model fit indices compared to WLS (Coursey & Pandey, 2004), these are generally restricted to a two-category response format (Green, Akey, Fleming, Hershberger, & Marquis, 1997). When the number of categories increases above four, analysing variables as though they are continuous poses minimal problems (Bentler & Chou, 1987). As the number of categories used to measure the observed variables in the current study was seven, the MLE procedure was used (for support see Byrne, 2001).

12.5 Nested Measurement Models

Four theoretical models, as shown in Figure 12.1, were developed from previous exploratory analyses and tested. *Model 1* represents a one-factor model that corresponds to the hypothesis that trust and distrust, specific and general attitudes exist as a single factor with all dimensions perfectly correlated. It specifies that all observed variables (14 in interpersonal subscale models and 9 in the operating company subscale model) are measures of a trust climate. *Model 2* represents a two-factor model that specifies trust and distrust as two related but distinct constructs. Each indicator measures either trust or distrust, with the number of indicators for trust being, on average, two greater than for distrust. *Model 3* operates as a second order model. This specifies that specific trust (i.e., trust in another with safety), specific distrust (i.e., distrust of another with safety), and general trust-distrust are part of a higher order construct, trust climate. Each item is used to indicate only one of the first order latent variables. Similar to Model 3, *Model 4* is a second order model with four first order latent variables that relate to specific trust, specific distrust, general trust, and general distrust. The first order latent factors are modelled as part of a higher order structure, trust climate. Each item acts as an indicator of

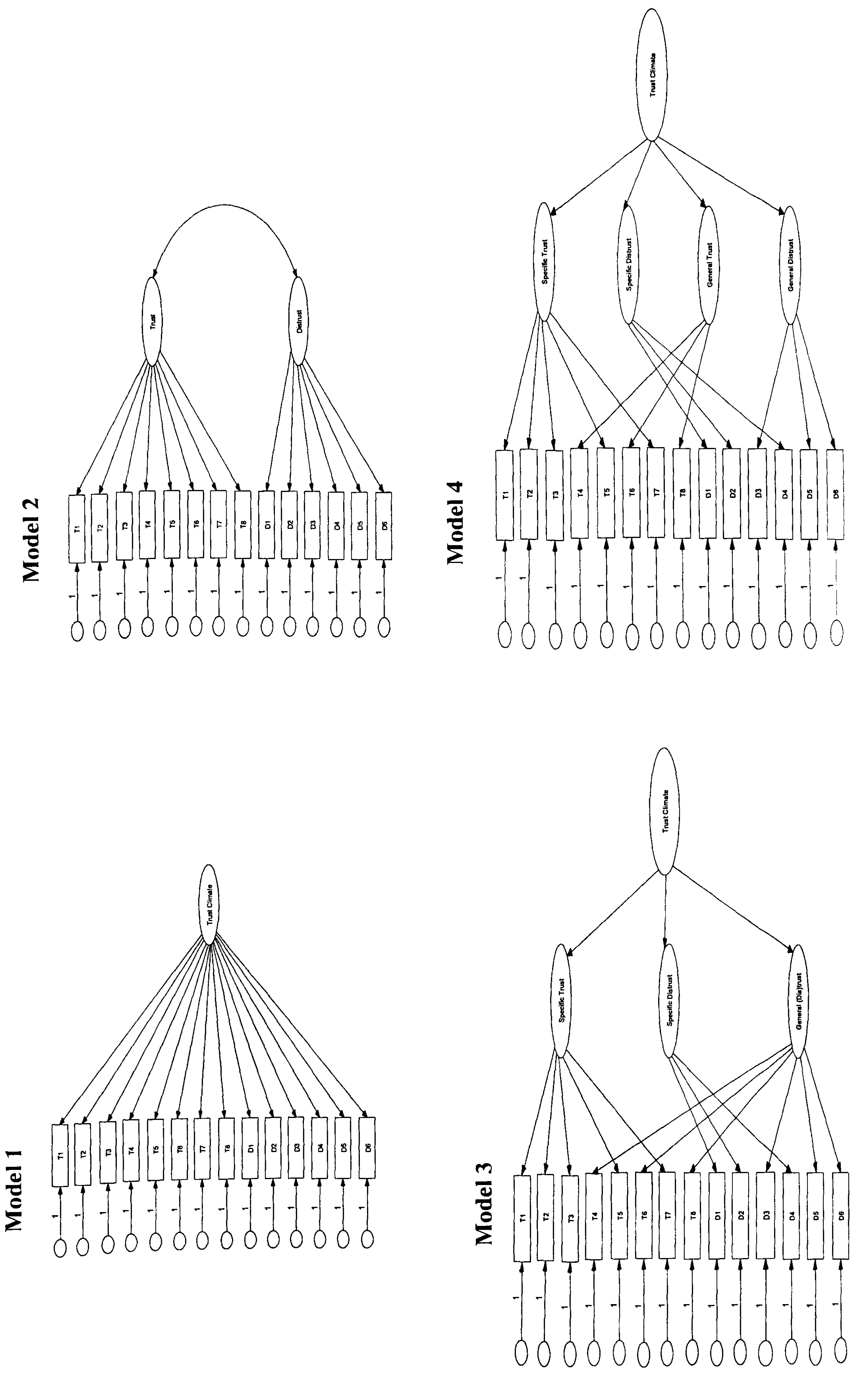

Figure 12.1: Diagrams of nested sequence of measurement models

only one first order latent variable.

Models 1 to 4 were tested separately for the subscales relating to workmates, supervisors, managers, and contractors. To represent trust in the operating company, only Models 1 and 2 were tested as the absence of a domain dimension (general / specific) in this subscale prevented the fit of Models 3 and 4. Collectively, 36 separate models were analysed over two (installation and industry) data sets (4x4x2+1x2x2=36). Analysis was carried out using the statistical package, Amos 4.0 (Arbuckle, 1999). From the fit indices estimated for each model, the χ^2 test, SRMR, RMSEA, CFI, TLI, and AIC were recorded. These were used to assess each model's fit to the data and to compare the relative fit between models. Modification indices were inspected for models indicating a poor fit to the data to identify areas of improvement.

12.6 Results

In some of the subscales, attempts to test Models 3 and 4 estimated a negative residual variance on the third latent variable (general (dist) trust, and general trust, respectively). Referred to as a 'Heywood case' (Harman, 1971), these are generally caused by fitting data to poorly conceived models, identification problems or sampling fluctuations. To control for this, the simplest and most practical approach was taken, which involved setting the offending residual variance to zero (Jöreskog, 1967; Lawley & Maxwell, 1971). Following this modification, the models resulted in an admissible solution and produced the test statistics found in Table 12.1. The negative error variance may therefore be attributed to sampling fluctuations, as this modification is ineffective when Heywood cases result from a fundamental problem with the design of the model (Chen, Bollen, Paxton, Curran, & Kirby, 2001).

12.6.1 Theoretical models: Installation (Map) sample

Results of the exact fit tests fail to support any of the models tested on the installation data (and those tested with industry data), as all have significant χ^2 values. Therefore, consistent with a vast body of research, the fit of each model is based on incremental fit indices only.

An inspection of the incremental fit for each model using the installation data, as shown in Table 12.1, indicates Model 2 (2-factor model) to offer the best fit to the data for managers, contractors, and the operating company. Fit indices for a two-factor model in these subscales are, SRMR $\leq .05$, CFI and TLI $> .90$[19] (see Appendix J for reliability estimates of factors for the best fitting model). Direct comparisons between the relative fit of Models 1-4 further supports a two-factor model. AIC values are smallest for this model, and chi-square difference tests show it to offer a statistically different fit to the data compared to other structures. Specifically, a two-factor model for management is different to a one-factor model ($\Delta\chi^2_{(1)} = 63.35, p <$ .001), three factor model $\Delta\chi^2_{(1)} = 15.05, p < .001$), and a four factor model ($\Delta\chi^2_{(2)} =$ $14.80, p < .001$). Similarly, a two-factor model for the contractor subscale offers a different fit to the data compared to a one factor model ($\Delta\chi^2_{(1)} = 32.45, p < .001$), three factor model ($\Delta\chi^2_{(1)} = 8.06, p < .005$), and a four factor model ($\Delta\chi^2_{(2)} = 8.17, p <$ .025). Regarding the operating company, comparisons reveal a two-factor model to offer a different and superior fit to a one-factor model ($\Delta\chi^2_{(1)} = 28.61, p < .001$).

These results confirm the structures extracted from the EFA in Chapter 7 and show them to be the best fitting models of trust at an installation level. Further, the prediction that trust and distrust co-exist in a single relationship through

---

19 The RMSEA values were not used to estimate model fit with the Map data because the sample size is too small to ensure reliable results.

Table 12.1: Fit indices for the nested sequence of measurement models

Installation (Map) Sample									*Industry Sample*								
Model	χ^2	*df*	*SRMR*	*RMSEA*	*CFI*	*TLI*	*AIC*	*r*	*Model*	χ^2	*df*	*SRMR*	*RMSEA*	*CFI*	*TLI*	*AIC*	*r*
Workmates ($N = 194$)									Workmates ($N = 481$)								
1	272.69	77	.074	.115	.833	.803	328.69		1	396.60	77	.054	.093	.898	.880	452.60	
2	**234.23**	**76**	**.069**	**.104**	**.865**	**.839**	**292.23**	**.80**	**2**	**342.37**	**76**	**.049**	**.085**	**.915**	**.899**	**400.37**	**.88**
3*	241.27	75	.070	.107	.858	.828	301.27		3	341.16	74	.050	.087	.915	.896	403.16	
4	238.60	73	.070	.108	.859	.824	302.60		4*	339.49	74	.050	.086	.916	.896	401.49	
Supervisors ($N = 202$)									Supervisors ($N = 490$)								
1	388.95	77	.062	.142	.833	.798	444.95		1	373.21	77	.036	.089	.942	.931	429.21	
2	**364.91**	**76**	**.062**	**.138**	**.842**	**.811**	**422.91**	**.92**	2	315.94	76	.033	.080	.953	.943	373.94	.93
3	268.38	74	.089	.114	.894	.869	330.38		3	292.21	74	.037	.078	.957	.947	354.21	
4	247.92	73	.087	.109	.904	.881	311.92		**4**	**245.06**	**73**	**.033**	**.069**	**.966**	**.958**	**309.06**	
Management ($N = 202$)									Management ($N = 474$)								
1	268.40	77	.056	.111	.894	.875	324.40		1	372.90	77	.038	.090	.934	.922	428.90	
2	**205.05**	**76**	**.048**	**.092**	**.929**	**.915**	**263.05**	**.88**	2	301.52	76	.035	.079	.950	.940	359.52	.93
3*	220.10	75	.052	.098	.920	.903	280.10		3	221.67	74	.031	.065	.967	.959	283.97	
4*	219.85	74	.052	.099	.919	.901	281.85		**4**	**206.13**	**73**	**.032**	**.062**	**.970**	**.963**	**270.13**	
Contractors ($N = 202$)									Contractors ($N = 499$)								
1	223.13	77	.048	.097	.922	.908	279.13		1	405.43	77	.043	.093	.922	.908	461.43	
2	**190.68**	**76**	**.044**	**.087**	**.939**	**.927**	**248.68**	**.92**	2	373.35	76	.042	.090	.927	.913	431.35	.94
3*	199.74	75	.046	.091	.934	.920	259.74		3	375.95	74	.041	.091	.929	.912	437.95	
4*	198.85	74	.046	.092	.934	.919	260.85		**4**	**361.04**	**73**	**.040**	**.089**	**.932**	**.915**	**425.04**	
Operating Company ($N = 200$)									Operating Company ($N = 492$)								
1	104.21	27	.061	.120	.905	.873	140.21		1	234.69	27	.041	.125	.939	.919	270.69	
2	**75.60**	**26**	**.055**	**.095**	**.943**	**.921**	**110.60**	**.83**	**2**	**154.72**	**26**	**.034**	**.100**	**.962**	**.948**	**192.72**	**.93**

Note: SRMR = standardised root mean residual; RMSEA = root-mean square error of approximation; CFI = comparative fit index; TLI = Tucker-Lewis index; AIC = Akaike's information criterion.

Models: (1) single trust-distrust factor, (2) two oblique (trust and distrust) factors, (3) three factors - specific trust (i.e. trust with safety), specific distrust and general trust/distrust, (4) four factors - specific trust, specific distrust, general trust, general distrust. Models indicating the best fit to the data are in bold typeface.

* Models corrected for Heywood case

compartmentalization (H^T6a) is partially supported by incremental fit indices but not the exact χ^2 test. While a domain effect is not found, distinct attitudes of trust and distrust are.

Regarding workmate and supervisor subscales, comparisons reveal all models to offer a poor fit to the data, including the three-factor models that were extracted from the EFA. Specifically, a three-factor model for workmates and supervisors, respectively, has fit indices of, SRMR = .07 and .09 and CFI / TLI = .86/.83 and .89/.87. Although a two-factor model shows the most promising results, the SRMR is greater than .05 (.07 for workmates and .06 for supervisors), and CFI and TLI values are lower than .95 at .87 and .84 for workmates, and .84 and .81 for supervisors.

An inspection of the standardized residuals locate misfit in the workmates models to items W3 and W13. Specifically, the residual covariance between items W3 and W2 is greater than 2.58 at 2.75, and between W13 and W12 is 3.31. Further, modification indices (MI) reveal a reduction in the chi-square estimate by 12.45 when item W3 is set to zero or its factor loading changed, and by 16.98 when the parametization of W13 is changed. The standardized residuals for the supervisor subscale models locate misfit between items S1 and S2, which have an estimated residual of 4.41. MI indicate a reduction in chi-square by 60.12 when parameter S2 is fixed to zero or its factor loading changed. The results therefore indicate improvements to both subscale models by re-estimation of certain parameters. However in their current form, the models tested for workmate and supervisor subscales using the installation data offer a poor representation of trust climates at this level.

12.6.2 Theoretical models: Industry sample

An inspection of the incremental fit indices of models using the industry data, as shown in Table 12.1, supports the fit of EFA structures for workmates, supervisors, and management subscales, but not the operating company. Specifically, a three-factor model of trust in workmates (extracted from the EFA) offers an adequate fit to the data, RMSEA = .09, SRMR = .05, CFI = .92, and TLI = .90. Similarly, a single factor model of trust in supervisors and trust in managers shows an adequate fit to the data, respectively, RMSEA = .09 and .09, SRMR = .04 and .04, CFI = .94 and .93, and TLI = .93 and .92. In contrast, the single factor structure of trust in the operating company extracted from the EFA has a poor fit to the data, RMSEA = .13, SRMR = .04, CFI = .94, and TLI = .92. An inspection of MI indicates moderately high (31.56) shared residual covariance between items OC4 and OC2. Modifying the model to specify a correlated error variance between these items will improve model fit.

Direct comparisons between EFA and CFA structures for the contractor subscale is not possible as the lack of clear dimensionality in the EFA structures (see Chapters 7 and 10) means that a comparable CFA model was not developed. However, all of the four models tested using CFA offer an adequate fit to the contractor data. In sum, most of the structures extracted from the EFA are confirmed to offer an adequate fit to the industry data.

While most EFA structures adequately represent trust at an industry level, a comparison of fit indices between models indicates superior fit with a four-factor structure for supervisors, management, and contractor subscales. RMSEA estimates in supervisor and management subscales are good at .07 and .06, respectively, with comparable SRMR values at .03. CFI and TLI values also indicate a good fit with estimates > .95. A four-factor model of trust in contractors offers an adequate fit to the data, RMSEA = .09, SRMR = .04, CFI = .93, and TLI = .92. Direct comparison between the four models shows small AIC values for four-factor models and chi-square difference tests indicate these models to offer a statistically different fit to the data. A four factor model for the supervisor subscale offers a superior fit to a one factor model ($\Delta\chi^2_{(4)} = 128.15, p < .001$), two factor model ($\Delta\chi^2_{(3)} = 70.88, p < .001$), and a three factor model ($\Delta\chi^2_{(1)} = 47.15, p < .001$). Similarly, a four factor model of management offers a superior fit to a one factor model ($\Delta\chi^2_{(4)} = 168.77, p < .001$), two factor model ($\Delta\chi^2_{(3)} = 95.39, p < .001$), and a three factor model ($\Delta\chi^2_{(1)} = 15.54, p < .001$). Finally, a four factor model is indicated to perform better for the contractor subscale compared to a one factor model ($\Delta\chi^2_{(4)} = 44.40, p < .001$), two factor model ($\Delta\chi^2_{(3)} = 12.31, p < .01$), and a three factor model ($\Delta\chi^2_{(1)} = 14.91, p < .001$). These results fully support the prediction that trust and distrust co-exist in a relationship through compartmentalization (H^T6a).

For workmates and the operating company, a two-factor model of trust offers the best fit to the data compared to a three and single factor structure extracted from the EFA, respectively. Incremental fit indices show a two-factor model of trust in workmates to offer an adequate fit to the data, RMSEA = .09, SRMR = .05, CFI = .92, and TLI = .90. A direct comparison with other models shows small values for a two-factor model and reveals that a three and four factor model do not offer a statistically different fit to the data ($\Delta\chi^2_{(2)} = 1.21$, (*ns.*) and $\Delta\chi^2_{(2)} = 2.88$ (*ns.*), respectively). A two-factor model of trust in the operating company has an adequate fit, RMSEA = .10, SRMR = .03, CFI = .96, and TLI = .95. A chi-square difference test further supports the superior fit of a two factor model compared to a one factor model, ($\Delta\chi^2_{(1)} = 79.97, p < .001$).

12.7 Discussion

This Chapter had the two main objectives of confirming the installation and industry structures of trust that were extracted from the EFA, and establishing if these offered the best models of trust for the offshore industry. Results of the CFA showed that most of the EFA structures identified in previous Chapters adequately reflect trust attitudes offshore. The results of model comparisons to identify the best structure of trust at an installation level supported a two-factor model, which is consistent with EFA results described in Chapter 7. However, at an industry level, a four-factor model offered a better fit to the data compared to the single factor model extracted from exploratory analyses reported in Chapter 10. A four-factor model specifies distinct dimensions of general trust, general distrust, specific trust, and specific distrust. Sections 12.7.1 and 12.7.2 discuss the implications of the resulting models for our understanding of trust in offshore safety. Following this, section 12.7.3 highlights several exceptions or contradictions in support of the models, and discusses why such exceptions might arise.

12.7.1 Installation analyses

In most cases, the structures of trust that were extracted from earlier exploratory analyses were supported. At an installation level, both EFA and CFA indicted two distinct dimensions of trust and distrust. This supports the theoretical notion that these attitudes are separate constructs that do not exist on a continuum (Lewicki, McAllister, & Bies, 1998), but contrasts with other empirical findings (e.g., Clark & Payne, 1997; Omedei & McClennan, 2000). For instance, Clark and Payne (1997) accounted for their distinct regions of trust and mistrust by arguing that the latter reflected methodological artefact. However, no further analysis beyond their original smallest space analysis was carried out to test for their interpretation of the dimensions that emerged. Therefore, the validity of their conclusion that trust and distrust exist on a single dimension is unknown.

In the present study, it can be concluded that workers hold distinct attitudes of trust and distrust towards others on their installation. For safety professionals this suggests that initiatives should be developed that target one attitude independent of the other. As shown in Chapter 8, the attitude of most importance is likely to be distrust as this acts as a stronger predictor of unsafe behaviour compared to attitudes of trust. Using the Theory of Planned Behaviour (Ajzen, 1985) to help explain these results, it might be argued that distrust operates to reduce the degree of social influence that others have on safety performance. Therefore, in climates that emphasise good safety, distrust is likely to result in individual unsafe acts. Further, distrust attitudes held at a group level are likely to reduce the normative basis of an organization's safety culture and result in disparate safety values and accidents. This suggests that attitudes of distrust have an active role in safety performance, whereas attitudes of trust might play a more passive role.

Using the TPB to explain these results emphasises trust as an interpersonal construct that can expand to a group level. Within social interactions will be positive exchanges between workers, where displays of trust will be reciprocated with safe behaviour (depending on the perceived goal of the trustor, Zohar, 2002) or other organizational citizenship behaviours. While other explanations are available to explain the link between trust and safety performance, such as psychological contracts, these operate at an organization-worker interface, not a worker-worker level, which the present study was predominately focused. Further, the TPB also offers a model for linking trust with safety violations, which as argued by Donald and Canter (1993) are intentional acts that the individual engages in. As suggested by the TPB, immediately preceding behaviour is the intention to act.

12.7.2 Industry analyses

At an industry level a similar finding emerged. The structures of trust extracted from earlier EFA's were supported by CFA as adequate models of trust attitudes offshore. These models specified that attitudes of trust towards workmates manifested as three dimensions (specific trust, specific distrust, and general (dis)trust) and that trust attitudes towards supervisors and managers were uni-dimensional. While these models were supported, CFA revealed the optimal structure of trust (i.e., the model offering the best fit to the data) to have four dimensions in supervisors, management, and contractor subscales, and two dimensions in workmates and the operating company. The extraction of more factors in the CFA for supervisors, management, contractors, and the operating company might be attributed to the problems of under-extraction using EFA. This has been found to explain the differences between EFA and CFA results in other studies (Humphreys, 1964; Cliff, 1988) and might pose a problem here because of the part dependency on the eigenvalue-greater-than-one criterion in earlier analyses.

The four-dimensional structures of trust extracted from the CFA suggest that workers offshore hold distinct attitudes of trust and distrust that are further differentiated based on a specific and general focus. This offers strong support for Lewicki, McAllister and Bies' (1998) suggestion that trust and distrust operate as distinct constructs that are compartmentalized into multiple domains within a relationship. Compared to a uni-dimensional or two-factor structure (EFA), a four-factor model (CFA) gives a more meaningful and detailed insight into the structure of trust offshore that allows for the development of tailored safety initiatives. For instance, future tests using this model might identify specific attitudes of distrust to predict unsafe behaviour, whereas general trust attitudes might not. Using a uni-dimensional structure fails to detect subtleties of this nature and instead might lead to the conclusion that 'trust' influences safety while failing to give an indication of where efforts should be directed to improve the trust-safety link. This echoes the argument made in Chapters 8 and 11 regarding the use of within subscale factors because they provide a better insight into the role of trust in safety compared to primary factors. It also supports the conclusion from the qualitative study that researchers should pay more attention to optimal levels and types of trust rather than to a unified construct of 'trust' (e.g., HSE, 1993; Clarke, 1999). One way to do this is by using the four-factor model identified in the present study. Carrying out further surveys and using a confirmatory approach will allow for a more detailed insight into the role of trust in safety than is presently available within the literature.

The two-dimensional structure extracted from the CFA for workmates at an industry level indicates a distinction between attitudes of trust and distrust. Compared to the three-dimensional structure that was extracted from the EFA, the CFA model is less informative. For instance, a three-dimensional structure reveals an interaction between attitude (trust/distrust) and domain facets (general/specific), whereas a two-factor model indicates a distinction between trust and distrust only. As argued in Chapter 7, the nature of workmate relationships, which involves working in close proximity and on a frequent basis, increases the likelihood of finding refined attitudes between group members. While this is reflected in a three-factor model, a two-factor model fails to capture this level of specificity. This suggests that safety professionals would benefit from using a three rather than a two-dimensional structure when seeking to understand attitudes of trust towards workmates. At a statistical level, the difference between a two and three-factor structure in terms of model fit is minimal. Therefore, choosing a three-factor model still offers an adequate representation of trust attitudes towards workmates offshore.

Together, the results of model comparisons suggest that a general four-dimensional structure of trust for the offshore industry will manifest as some variation on a specific installation. In the present study, this variation was a two-dimensional structure of trust and distrust. On other installations the structure of trust might manifest as three dimensions or fully replicate the structure found here for the industry. The potential for different trust structures between installations is suggested by research into safety climate, which has shown safety attitudes to manifest differently across contexts and industries (see, Flin et al., 2000). The various management styles that are used offshore (Cheyne et al., 2002), and the strength that these have in shaping trust attitudes among organizational members (Pfeffer, 1992), further suggest that differences might emerge and explain why this might be so.

The differences between installation structures will be shown by future surveys at an installation level, which because of the findings reported in this study can initially adopt a confirmatory approach. Before carrying out the present research, this approach could not be applied in a systematic and informed way because no research existed on trust in safety from which models could be developed, tested and confirmed. While most researchers agree that safety performance is affected by general organizational factors, they also highlight the importance of safety related experiences (Lee & Harrison, 2000). Furthermore, some have gone as far as to argue that safety rather then general job-related factors are those that solely influence safety performance (Neal, Griffin, & Hart, 2000). Therefore, while models of trust in a safety context might mirror those extracted for a general organizational context, existing safety research suggests that differences are likely to emerge. Using existing research into trust would fail to capture this potential diversity.

The installation based trust models extracted from future research can be tested for their ability to predict safety offshore. While the predictive validity of the general four-dimensional model for industry can also be tested, this will have limited effectiveness in improving safety if the same model fails to emerge on a specific installation where accidents occur. Therefore, of greater practical utility is an understanding of the predictive validity of models extracted at an installation level. Safety on the installation surveyed in this thesis was predicted by attitudes of distrust rather than attitudes of trust (see Chapter 8).

12.7.3 Exceptions in fit

While most structures of trust attitudes extracted from exploratory analyses were supported by CFA, a few exceptions exist. Specifically, the structures of trust attitudes towards workmates and supervisors at an installation level were identified to have a poor fit to the data and modifications were recommended. Model estimates for the workmates subscale identified misfit caused by a large residual covariance between, '*The people I work with would take credit for something they haven't done*', and '*My workmates would disclose to others information that I had told them in confidence*'. These items measure distrust of workmates based on a perceived breach to affect based trust, and are the only two items in the subscale to measure this dimension. This might explain why they have a relatively high covariance, but low covariance with other items in the subscale.

Regarding supervisors, model estimates identified a strong linear association and a substantial amount of shared error covariance between, *'I can trust my supervisor to be fair in the way he deals with safety incidents'*, and *'I can trust my supervisor's judgement when it comes to safety'*. The strong similarities between the content and wording of these items suggest that model misfit is caused by item redundancy. Further, these results support the observation in Chapter 7 that the Distrust in supervisors safety factor extracted from the Map data, which comprises only these two items, might be a theoretical outlier. Removal of either of these items in a future version of the TCSQ will have minimal effects on the scales validity or reliability.

12.8 Summary

In this Chapter, most of the structures of trust extracted from the EFA's were confirmed as offering a good fit to the data. At an installation level, the best fitting model was two-dimensional and reflected distinct attitudes of trust and distrust. At an industry level, this model was more defined and comprised the four dimensions of specific trust, specific distrust, general trust, and general distrust. Combined, these results offer strong support for the argument that trust and distrust exist as distinct constructs and that safety initiatives should be developed that target each independent of the other. The likely reason why multiple dimension emerged in this study compared to a single dimension in other research relates to the number of trust facets measured. As the results reported here suggest, when multiple facets of trust are explored, more than one dimension is likely to emerge. In other research, the measurement of a single facet of trust has resulted in the finding of a continuum. This Chapter also shows that a general four-dimensional structure of trust for the industry will manifest as some variation at an installation level. The next step for safety professionals would be to conduct more installation surveys to establish if trust manifests in the same way as it did on the installation surveyed here, or if it shows some other variation on the general model. In the next Chapter, the implications of the collective findings reported in this thesis will be discussed.

Chapter 13

General Discussion and Future Directions

Industries such as nuclear, aviation, construction, and offshore oil and gas exploration constantly strive to achieve safe work environments through effective safety management or 'leadership'. Over the past decade, research into this area has drawn attention to the importance of trust within workgroups and trust between workers and management. For instance, Reason (1997) argued that trust forms the foundation of cultures that operate to promote good safety performance. However, despite the perceived importance of trust, little empirical research has explored its nature or role in industrial safety.

The absence of empirical work on the role of trust in safety indicated a number of issues that needed to be addressed. Specifically, there was a need to clarify the nature of a trust construct within industry, develop a reliable measure of trust within safety contexts, and use this measure to establish the relationship between trust and safety. Within this thesis, these issues were addressed and answers were offered. Using a mixed-method approach, a detailed insight into the perceived role of trust in safety was provided, which was quantified on a larger scale using objective methods. Providing a context for the study was the offshore oil and gas exploration industry. This context was chosen because of its heavy emphasis on the importance of trust in the success of offshore safety leadership (O'Dea & Flin, 2001), safety initiatives (Fleming & Lardner, 2001), and safety communication (Cullen, 1990). The results provide one of the first insights into the nature and role of trust in offshore safety, and create a representative and reliable foundation for further work.

13.1 The Nature of Trust Offshore

13.1.1 Trust in safety

To provide initial empirical evidence of the importance of trust in safety, Chapter 4 reported on a number of interviews with offshore workers. Here, trust was found to be necessary for good safety and for reducing perceptions of psychological and physical risk. At an individual level, trust ensures the successful completion of joint tasks. At a group level, it facilitates the transmission of safety culture values within an organization. As one worker argued, without trust between individuals, even the most effective safety culture (in policy form) will be ineffective. Expanding on Reason's (1997) argument that trust is essential for effective safety cultures, the comment made by this worker suggests that trust transforms safety policies into successful safety practices. This is likely to occur through a subjective norm influence, where trust in some object (e.g., manager, group, organization) increases the object's degree of influence in shaping behaviour. Therefore, in environments of trust, shared group values that emphasise good safety are likely to manifest at an individual level in the form of safe behaviour (see, Ajzen, 1985; Chapter 2).

The relationship between trust and good safety is worrying for the offshore industry because of the reported decline by the workers interviewed of trust towards the key agents of safety culture: organization and management. Similar to the findings of organizational research in other areas (Shaw, 1997; McCune, 1998; Davis & Landa, 1998; Zeffane & Connell, 2003), the workers interviewed here attributed declining trust in the organization to recent restructuring, and the ensuing outcomes of restructuring such as redundancies and breaches in psychological contracts. In the offshore industry, breaches in psychological contract typically occur as a re-employment of operator staff as contractor staff, with the associated loss of job security, holiday entitlements and sick pay. A reduction of trust in management was typically attributed in the present study to a perceived career drive, which in most cases results in the prioritisation of production over safety. Therefore, to improve offshore safety culture, these factors might be addressed and improved.

During the interviews it also emerged that moderately high but not complete trust in another is important for good safety. This represents a new finding and advances current safety knowledge by suggesting that attention should be directed towards optimal levels of trust rather than to trust per se. For instance, knowing that "trust" is important for shared intragroup perceptions (Clarke, 1999) and open communication (HSE, 1993) fails to provide organizations with a guide as to the levels of trust that they should strive to achieve for optimal safety. Further, the failure to find a relationship between complete trust and good safety suggests that distrust might feature in this equation. This is consistent with the prediction that distrust plays a functional role in safety, which was supported by interview findings where workers reported this attitude as an important factor in safety.

Distrust manifested as checking and surveillance functions to avoid unnecessary accidents or incidents. Specifically, these acts ensure that workers are not taking short cuts and are aware of safety standards. This supports the argument of Pidgeon et al. (2003) that an element of 'critical trust', which refers to a practical form of reliance on another person or institution combined with healthy skepticism, is essential for safety. Further, the perception that 'healthy' safety cultures require both trust and distrust supports the theoretical arguments that the co-existence of these attitudes between dyadic partners and in social groups is important for successful organizational functioning (Lewicki, McAllister, & Bies, 1998; Gans et al., 2001).

13.1.2 Antecedents of trust

Based on a vast body of research into the nature of trust within organizations (e.g., Deutsch, 1958; Clark & Payne, 1997; Mayer & Davis, 1999), it was predicted that offshore, trust would develop from perceptions of another' s trustworthiness. In Chapter 4, this was supported by findings that interpersonal trust and distrust are based on two of the three main trustworthiness categories that relate to Integrity and Benevolence (Mayer, Davis, & Schoorman, 1995). Positive perceptions of these characteristics are generated by displays of openness, consistency and concern, and operate to create trust. Negative perceptions are generated from lying, egocentric career motives or secrecy, and promote distrust. Also consistent with predictions is the finding that another's Ability plays less of a dominant role in the development of trust offshore, and no role in the development of distrust. This might be accounted for by the demands within the offshore industry for a multi-skilled workforce that results in workers being placed in positions that they are ill trained to deal with. Because of this, another's competence is often attributed to contextual factors, which reduces its importance in decisions of whether to trust or distrust another (see, Heider, 1958).

However, rather than argue that Ability is not important in trust development, it is proposed here that it operates at the periphery of a trustworthiness frame of reference that has Integrity and Benevolence at its core. This is partially supported by the results in Chapters 7 and 10, which found all characteristics to be comprised of an attitude of trust or distrust, thus suggesting that all play some role in the formation of these attitudes. However, what these results do not reveal, and what may be explored in future work, is the relative ordering of the characteristics in terms of their importance for trust development on a quantitative scale.

From the interview findings it can be concluded that a combination of moderately high levels of trust and an element of distrust is important for good safety. Trust is important for instilling in workers shared safety values, while distrust in the form of checks and monitoring ensures that workers are completing jobs in a safe way. This finding expands current safety knowledge by suggesting that more attention should be paid to understanding optimal levels of trust and the interaction these have with distrust in high-risk contexts. It expands organizational theory by suggesting that the proposed uni-dimensional scales of trust-distrust (e.g., Jones & George, 1998) might be modified to look at separate trust and distrust dimensions and their interaction.

13.2 The Structure of Trust Offshore

Currently in the offshore industry there exists a growing need to understand the dimensional structure of trust. This knowledge will facilitate the development of initiatives that promote trust between workers and management, and can be incorporated into existing safety programmes (Fleming & Lardner, 2001; Sutherland, 2003, personal correspondence). Theoretically, it will reveal how the multiple facets of trust interact within a context to shape attitudes and behaviour. This understanding will answer theoretical questions relating to the nature of a trust-distrust relationship and will show the relative salience of different dimensions of trust when studied together. To help provide these understandings, the Trust Climate and Safety Questionnaire (TCSQ) was developed in Chapter 5. This is a multi-faceted tool that is designed to identify the level and 'type' of trust most important for good safety. It extends existing single dimension measures of trust to provide a greater breath of understanding.

Collectively, the facets of the TCSQ measure offshore worker's general attitudes of trust and distrust (i.e., as they apply to another generally without a specific frame of reference) and attitudes specific to safety. Measuring attitudes in different domains allowed the prediction to be tested that trust and distrust would compartmentalise in a relationship. It also allowed a test to establish if trust in one area of organizational functioning was more important for good safety than trust in another area. Also provided by the TCSQ is an indication of the target of trust that has the greatest influence in shaping safety performance by measuring attitudes towards a number of different roles offshore. Finally, the TCSQ also measures the degree of influence that an individual's personality or disposition to trust has in shaping trust attitudes. The inclusion of this latter measure was important for assessing the relative influence of personality, compared to situational factors in trust development.

Because of the novel combination of multiple trust facets in the TCSQ, and the absence of work examining trust in high-risk work contexts, the data were analysed first using exploratory methods. These analyses revealed the TCSQ to be a reliable and valid measure of trust attitudes offshore. Specifically, the measure was revealed as having high levels of internal consistency and good construct, predictive and discriminate validity. Further, the dimensions extracted from the TCSQ allowed models to be developed for the offshore industry, which owing to their confirmatory basis, makes them a reliable and valid foundation for future work.

13.2.1 Structure of trust between offshore groups

Separate exploratory factor analyses (EFA) of two sets of survey data (installation and industry) revealed a strong situational basis to attitudes of trust and distrust offshore. Consistent with the prediction that attitudes would be specific to different occupational roles, these structures were based on the perceived trustworthiness of senior management, workmates, supervisors, contractors, and safety personnel. Furthermore, in line with findings from research on trust (e.g., Creed & Miles, 1996; Whitener et al., 1998) and safety (e.g., Cohen, 1977; Donald & Canter, 1993; Flin et al., 2000), attitudes towards senior management (i.e., offshore managers and the operating company) are most influential in shaping trust and distrust climates offshore (based on explained variance). One process through which this influence is likely to operate is psychological contracts (Morrison & Robinson, 1997). Positive and beneficial actions towards workers from senior management are likely to promote reciprocation in the form of positive attitudes towards management and other members of the organization (Eisenberger et al., 1990). Therefore, for safety initiatives dependent on trust to be successful, safety professionals should seek to improve management's trustworthiness behaviour. Increasing trust at this level has a cascading effect that improves trust at all levels of the organization (Pfeffer, 1992).

In contrast to situational factors, it was predicted that an individual's disposition to trust would have a weak influence on trust attitudes offshore. The structures of trust reported in Chapters 7 and 10 supported this prediction. Compared to perceptions of another's trustworthiness, individual personality has a weak influence in shaping trust levels offshore. Consistent with its original conceptualisation (Rotter, 1967), it shows the strongest effect in novel situations where little experience with another exists. For instance, the relatively strong influence that a dispositional factor had in shaping trust in management and safety officers might be attributed to the limited interaction that workers have with these groups that prevents expectations regarding their trustworthiness from developing.

In sum, it can be concluded that a situation-based structure of trust exists offshore that is specific to different groups. Given the diversity of social dynamics between groups in terms of frequency and formality of interaction, the potential existed for different structures of trust attitudes towards different groups. Support for this differentiation emerged from further analysis (see below). Combined, these results show that trust attitudes structure differently between a macro level (between groups) and a micro level (within groups).

13.2.2 Structures of trust within offshore groups

In contrast to the structure of trust towards different groups that replicates at an installation and industry level, the structure of trust attitudes *within*, or towards a group (i.e., trust attitudes towards different roles measured by the TCSQ) differed between groups and levels of industry. Based on safety writings that suggest trust attitudes structure similarly (i.e., is effected by the same factors) within management-worker and worker-worker relationships (Fleming & Lardner, 2001), this finding was unexpected. A possible explanation for this diversity relates to differences between interpersonal dyads with respect to the factors that are most likely to impact on trust development. For instance, in supervisor-worker dyads, factors relating to leader-member exchange such as decision latitude will be important (Wayne et al., 2002), while in worker-worker dyads, perceived group membership will have a strong role (Tajfel & Turner, 1986). These factors, plus others such as frequency and proximity of interaction will influence the structure of trust attitudes towards different groups. Theoretically, these differences suggest that single models of trust within organizations need revising to reflect diversity between interpersonal dyads. Specifically, when studying trust, academics should consider factors that are likely to impact on trust development in a specific dyad rather than assume all relationships to be affected by the same set of influences.

For safety professionals, the structural differences have important implications because they suggest that applying a uniform 'trust' initiative to all offshore workers will be ineffective. For those expressing a need to incorporate trust into existing empowerment programmes (e.g., Sutherland, 2003), this finding highlights the importance of considering which facet of trust is critical to safety in each group. The findings reported here give some indication of this.

In Chapter 7, within-group analyses showed trust attitudes to structure according to two or three-dimensions at an installation level. Specifically, trust attitudes towards management, the operating company, and safety personnel, manifest as two dimensions that reflect attitudes of trust and distrust. For workmates and supervisors, three dimensions emerged that reflect trust with safety, distrust with safety, and a general trust/distrust attitude. The salience of a domain effect (e.g., general / safety) in these latter structures compared to the two dimensional ones, may be accounted for by frequency of interaction. Basically, daily contact with workmates and supervisors allows behaviour to be observed in a variety of situations and facilitates the development of specific attitudes. In contrast, attitudes towards management and the operating company adopt a general form because of the limited interaction that frontline workers have with these groups. Limited interaction prevents the development of trustworthiness expectations specific to a certain domain or area of organizational functioning. Theoretically, this stresses the importance of considering frequency of interaction when studying trust.

At an industry level, trust attitudes were found to structure in a different way to those on a specific installation. In Chapter 10, most of the within-group structures of trust at an industry level were uni-dimensional. As a single construct, trust and distrust emerge as bipolar opposites and a distinction between worker's attitudes towards another in a job domain and privately (e.g., sharing of personal information) exists. Basically, job based affective (emotional) trust (e.g., *X cares about my safety*) contributes to a state of trust, while private based emotional trust (e.g., *"emotional investments" in our relationship*) loads with distrust items.

The implication of a division in emotional trust runs counter to the conclusion made from the qualitative study, which is that job based trust is cognitively driven and personal based trust is affectively laden. As suggested by the survey results, offshore relationships at a personal level may not have a strong emotional element, while trust as it applies to job-based safety might (see, Costigan, Ilter, & Berman, 1998). At a theoretical level, this finding runs counter to beliefs that cognitive based trust is most dominant in organizations (McAllister, 1995) and suggests that more attention should be paid to understanding the dynamics of emotional trust between organizational members. For safety professionals, this finding emphasises the importance of promoting behaviours that contribute to the development of high levels of emotion-based trust, such as informal communication, decision latitude and safety commitment. While antecedents of cognitive based trust (e.g., ability, competence, etc.) will be effective at reducing accidents in the short-term, in the long-term, it is emotion-based behaviours that will sustain good safety performance. This supports the findings of research that emphasises these behaviours (i.e., indicators of emotional trust) as important in good safety (see, O'Dea & Flin, 2001). The results of this thesis go one step further by suggesting that the process by which these behaviours influence safety performance might be trust, either directly through social routes or indirectly through safety attitudes (Donald & Young, 1996).

13.2.3 A model of trust attitudes offshore

The dimensional structures identified in Chapters 7 and 10 provide the foundation for the development of a model of trust attitudes offshore. Using these salient dimensions in a series of comparisons, Chapter 12 identified the optimal model of trust attitudes for the industry as four-dimensional. These dimensions reflect general trust, general distrust, safety-specific trust and safety-specific distrust. At an industry level, this shows that workers differentiate between the psychological attitudes of trust and distrust, and a general and safety context. At an installation level, a variation of this general four-dimensional model emerged, with attitudes structured only by two distinct dimensions of trust and distrust.

The general four-dimensional model and the installation specific model provide the first insight into the structure of trust attitudes offshore and in contexts where safety is paramount. They provide reliable and valid building blocks for future research, which by adopting a confirmatory approach can further examine the variations on a general four-factor model. The models also allow for tailored safety initiatives to be developed that target the most important aspects of trust attitudes in a safety context, thereby improving their effectiveness.

13.3 Trust subcultures

A major focus of most safety research is the identification of a unitary, integrative culture that reflects the shared meanings of organizational members (Zohar, 1980; CBI, 1990; Dedobbeleer & Béland, 1991). A similar 'collective culture' approach has dominated organizational writings more generally (e.g., Deal & Kennedy, 1982; Schein, 1990), and it is implicated by some safety professionals as also applying to trust (e.g., Reason, 1997). However, growing objection has been directed towards this approach. As argued by Pidgeon (1991), to understand and improve an organization's safety culture it is misleading to talk of organizational culture per se, but rather the culture of small groups, departments or divisions should be examined. Being sensitive to the existence of subcultures is valuable for revealing a diversity of perspectives and interpretations of experiences, which can reveal important issues that might otherwise go unnoticed (Pidgeon, 1998). Similar observations have been made in culture research more generally, where it has been argued that it is inappropriate to apply a homogenous culture to what are essentially heterogeneous groups (Jones & James, 1979). By doing this, researchers fall prey to making erroneous conclusions about an organizational object from diverse individual perceptions. In line with a growing body of research that recognises the importance of culture differentiation (Cox & Flin, 1998; Pidgeon, 1998; Guldenmund, 2000; Richter & Koch, 2004), Chapters 8 and 11 tested for trust subcultures offshore.

In Chapters 8 and 11, group comparisons along a number of dimensions (occupational role, parent company, etc.) revealed two co-existent subcultures at an installation and industry level. These relate to 'Management/Operator staff' and 'Frontline/Contractor staff'. The former subculture is defined by attitudes of trust and distrust held by operator staff and those holding management positions offshore (manager, supervisors, and safety officers). The Frontline/Contractor subculture is defined by attitudes held by contractor staff and frontline positions such as production, maintenance, and construction. The operation of these subcultures at both an installation and industry level supports their robustness to many offshore contexts. Further, the prediction that these subcultures would be based on a fusion of organizational and social climate factors was supported, which suggest that strategies taken to improve trust in these 'cultures' should reflect differences on these factors.

Organizational factors are largely job based and include factors relating to job security and degree of risk exposure. Research typically identifies an association between positive organizational experiences and positive attitudes (McLean Parkes & Kidder, 1994; de Gilder, 2003), which the findings reported here support. For instance, members of the Management/Operator group experience positive organizational experiences such as job stability, promotion prospects, and 'safe environments' (Flin, Mearns, Gordon, & Fleming, 1996), and report high levels (more positive attitudes) of trust. This is in contrast to Frontline/Contractor staff who are typically employed on short-term contracts, are exposed to higher levels of risk and report lower levels of trust towards inter- and intra-group members.

Additional to organizational factors, the social climates in which these groups operate further promote higher levels of trust in Management/Operators compared to a Frontline/Contractor group. Basically, the job stability enjoyed by the former group allows for the development of long-term relationships through repeated social exchanges, which form the foundation of trusting relationships (Blau, 1964). However, contractor staff are employed on short-term contracts and operate at proximally distal parts of the installation. This creates minimal opportunity for interaction and trust building exchanges, and may account for the low levels of trust reported within this group.

In agreement with Pidgeon (1998), it can be concluded that by exploring trust subcultures a number of important issues relating to organizational and social dynamic factors emerged. These are similar to the factors identified by Mearns et al. (1997) in their study of safety attitudes. Basically, they identified a number of distinct groups with the Offshore Safety Questionnaire that were attributed to the factor of 'seniority', which refers to the position that an individual holds offshore.

Similar to the organizational and social climate factors identified in this research, the main determinants of seniority were employing company and occupational role. Further, they found those in senior positions expressed more positive (safety) attitudes compared to those in less senior positions.

Together with the findings reported in this study, it can be concluded that organizational and social climate factors have a strong influences on the shape of attitudes offshore. Results also suggest that irrespective of the type of attitude studied (e.g., trust, safety, stress, job satisfaction, etc.), the same offshore subcultures will emerge. That is, those employed by the operating company who also tend to hold senior positions offshore will be rated more favourably on a measure compared to contractor staff, who typically hold frontline positions. A possible reason for this might be the relatively 'safe' environment that the former group operate in offshore, compared to those in the latter group that carry out the physically demanding and manual labour tasks that expose them to more risk. Further, the relative stability of these subcultures between studies suggests that offshore, an in-group/out-group bias might exist. This bias, which was first used by Collinson (1999) to account for a division in the attitudes reported by contractor and operator staff, may apply here as an account for the differences in levels of trust.

13.4 The Role of Trust in Safety

In Chapters 8 and 11, the role of trust in safety was explored. Based on research on safety attitudes it was predicted that poor safety performance would be related to negative trust attitudes (i.e., distrust) towards management. In support of this, the results revealed an association between poor safety performance and low levels of trust (i.e., distrust on a uni-dimensional scale) or distrust (in a two-factor framework). In most cases, negative trust attitudes towards senior management such as the operating company, managers and supervisors were associated with the likelihood of accidents (at both an industry and installation level) and near-miss events. For instance, comparisons between different companies revealed those with low levels of trust, or distrust, of senior management, experienced more accidents and incidents compared to companies with relatively higher levels of trust. Consistent with studies of safety culture (e.g. Cohen, 1977; Zohar, 1980; Dedobbeleer & Béland, 1991; Clarke, 1998; Flin et al., 2000; Nananidou, 2000), it can be concluded that trust attitudes towards management are the most important determinant of safety and are those that should be addressed by safety initiatives. Moreover, and similar to Nananidou and Donald (2002), the results suggest negative rather than positive attitudes as the main determinants of safety. This represents a new finding and departs from the emphasis that some safety professionals place on the role of 'trust' (e.g., Reason, 1997) by suggesting that attention should be paid to distrust. This echoes and supports the conclusion from the qualitative study, which suggests that the role of distrust in safety is distinct to trust and is one that needs to be explored further by safety professionals.

In addition to management, Chapter 8 indicated distrust of workmates as a main predictor of near-miss events on the installation surveyed. This was not predicted but together with the above findings, suggests a two-tier relationship between trust and safety. Basically, trust towards proximal parties such as workmates is important to prevent frequent and relatively minor safety events (e.g., near misses), whereas trust in management is more important for the prevention of major and more serious safety events (e.g., accidents and disasters). This might be accounted for by the finding that attitudes towards senior positions influence behaviour on a global offshore level, whereas attitudes towards workmates influence daily safety performance (Mearns et al., 1997).

13.5 Trust-Distrust Dynamic

The importance of understanding a trust-distrust dynamic was emphasised in Chapter 3, where the current confusion that exists within theoretical writings regarding this relationship was outlined. It was also argued that the nature of this relationship is likely to influence the way safety initiatives are developed. Basically, it was argued that if trust and distrust operate on a continuum then a single strategy approach would be effective for modifying either attitude. However, if trust and distrust exist as distinct constructs, as suggested by two-factor type theories, then a different strategy would be required for trust and for distrust. The present research provided mixed support for both approaches.

A two-factor approach was shown in Chapter 7 to explain attitudes at an installation level, where workers hold distinct attitudes of trust and distrust. This was supported by the confirmatory analysis in Chapter 12 and extended to an industry level. Specifically, a four-factor model of trust for the industry shows workers to hold distinct attitudes of trust and distrust that are further differentiated by a specific and general domain. This offers the first empirical validation of Lewicki, McAllister and Bies' (1998) argument that trust and distrust compartmentalize in a relationship and is further supported by the findings reported in Chapter 10. Here, it emerged that offshore workers differentiate their level of trust in another depending on the domain under evaluation. Workers invest emotional trust in another with job-based safety, but not at a personal level. These findings support the theoretical argument that trust and distrust are distinct entities that co-exist within a relationship.

However, while two-factor theories explain some of the results found in the present study, they are unable to account for the qualitative finding that the antecedents of trust and distrust are opposites. This finding is consistent with a continuum-based approach. Further, a single dimension was suggested by the exploratory analyses in Chapter 10 to represent trust attitudes towards senior positions at an industry level. Based on these findings, it can be concluded that a trust-distrust dynamic is more complicated than the trust literature argues. The results presented here suggest that both theories should be regarded as complementary rather than as competing explanations. Further, as one approach does not apply conclusively to a single work context or collection of groups, an initiative based solely on a continuum or two-factor approach will fail to reach optimal effectiveness.

One reason for the simplicity of theories relating to a trust-distrust dynamic is the minimal number of trust facets they incorporate. For instance, a continuum-based approach is typically supported by studies that focus on a single domain or general trust (e.g., Pugh, Skarlicki, & Passell, 2003), while two-factor models focus on a single type of trust (e.g., cognition or affect). However, the findings of this thesis suggest that these theories fail to appreciate the full depth and complexities of the relationship between trust and distrust. For instance, the present research shows the dimensional nature of trust depends on the interplay between the facets being measured, the trustee (i.e., person to be trusted), frequency of interaction, and the level at which attitudes are assessed (installation or industry). Theoretically, the results suggest that researchers should modify their current use of trust as a single facet and specify the level (e.g., moderate or high) or aspect of trust (e.g., antecedents, functions, etc.) they are exploring. Only in this way can researchers begin to fully understand the complexities of trust.

13.6 Practical Applications

The most direct practical application of the research relates to the use of the TCSQ cross-nationally and cross-industry as an assessment tool of trust climates. As the results of this thesis have shown, the data collected with this tool provide a reliable and valid insight into trust attitudes within high-risk contexts. Initially, the TCSQ may be used to survey trust on a larger number of installations operating in UK waters. This will establish a benchmark of trust climates for the UK Continental Shelf, which can be used as a comparison for trust climates in offshore industries operating on the Norwegian Continental Shelf or the Gulf of New Mexico.

Comparisons between offshore industries will indicate if the structure of trust and its role in safety within the UK transcends cultural barriers and generalises to other countries. The model identified in this study will allow comparisons between countries to be made in a reliable way, and will identify variations on a general four-factor model for each installation. Difference between cultures might be expected based on the different safety standards held by different offshore industries. For instance, installations operating on the UKCS are governed by stringent safety laws, which came into operation following Lord Cullen's (1990) enquiry into the 1986 Piper Alpha disaster. However, in other countries, such as Brazil, safety is emphasized less by operating companies and government. Therefore, in these other countries, general trust might not distinguish from safety specific trust, nor be as important in predicting safety performance.

Expanding beyond the offshore industry, the TCSQ may be adapted and used to survey trust climates in other industries such as nuclear, railway and construction, where trust is equally important in safety (e.g., Clarke, 1999, 2003; Lee & Harrison, 2000). This will provide an indication of industries that have positive trust climates and will give an insight into their trust building processes, which may be adopted in industries where lower levels of trust exist. The successful adoption of practices between industries has been illustrated with the use of crew resource management, which was originally used in aviation but is now employed offshore as a way to improve safety (O'Connor & Flin, 2003). Together, cross-industrial and cross-national surveys using the TCSQ will provide a level of understanding of trust and its role in safety that is comparable to that on safety attitudes. Methodologically, it will also allow the TCSQ's psychometric properties to be explored further and will provide an extensive test of the models of trust extracted in the present study.

Less direct, the findings from the research may be used to facilitate improvements to existing safety programmes and to guide some interventions. With respect to safety programmes, research now suggests that a necessary prerequisite for their success is trust within workgroups and between workers and managers (Fleming & Lardner, 2001). For instance, it has been suggested by Sutherland (2003, personal correspondence) that by addressing the dynamic of trust, the effectiveness of safety initiatives and empowerment programmes will be enhanced, which in turn will improve safety. The research reported here offers one of the first empirical insights into how this trust initiative may be developed.

First, it identifies a need for *multiple* initiatives that are specific to different groups offshore. This is important given that trust attitudes towards these groups (e.g., workmates, managers, etc.) manifest in a variety of ways. For supervisors and workmates, trust structures according to specific and general domains, which is in contrast to trust in management and the operating company where a domain effect does not exist. Reflecting these differences within initiatives illustrates why a single approach applied to all offshore groups is inadequate.

Second, the study identified the nature of trust and distrust in the offshore industry to relate to the trustworthy characteristics of Ability, Integrity and Benevolence. To improve levels of trust (and to reduce distrust), this finding suggests that attention should be paid to promoting (or reducing) perceptions of these characteristics in others. Depending on the target of trust and the level at which analyses are carried out (installation / industry), these qualities will be either generally based (e.g., managers) and / or specific to safety (e.g., workmates). Further, certain external factors, such as job security, risk exposure and frequency of interaction might be considered as these were identified in the present research to shape trust attitudes. Based on this it might be concluded that at an interpersonal (core) level, safety initiatives might focus on promoting displays of trustworthiness, while at a broader (peripheral) level, the promotion of positive job experiences might be attempted.

The research might also be used to guide the way future restructuring plans are carried out. During the interviews with offshore workers in Chapter 4, restructuring emerged as a causal factor in the decline of trust at an organizational level. Important, however, was the observation that reductions in trust resulted from the climate in which this process was carried out, not from the consequences of restructuring per se. For instance, in climates of openness and honesty where management engage in frequent communication with the workforce, restructuring had minimal affects on trust levels. However, workers reported less trust in organizations and management that they perceived as 'secretive' during this process. These findings suggest that in an industry facing regular changes and continuing downsizing, benefits can be gained from regular meetings with workers where good and bad feedback is discussed.

13.7 Future Directions

The research reported in this thesis can be extended in at least three ways. The first looks at using the TCSQ to survey trust attitudes of senior management – the results reported in this thesis were predominately based on the perceptions of frontline worker such as production, construction and maintenance staff. Focusing on management will serve two functions. First it will provide an insight into 360° feedback by indicating the bi-directional levels of trust between all levels of personnel offshore. For instance, while much is known about the level of trust that organizational members have in management (e.g., Butler & Cantrell, 1984; Deluga, 1994; Whitener, 1997; Clark & Payne, 1997; Tan & Tan, 2000; Bijlsma & van de Bunt, 2003), less is known about how much trust managers have in the workforce. Second, it will establish the degree of consistency between what management perceive as important in trust development compared to frontline workers. Extrapolating from Clarke's (1999) argument that shared inter-group safety perceptions are important for establishing a good safety culture, it may be argued that shared inter-group trust perceptions are important for establishing a good trust climate.

A second way to extend the current research is by examining the interaction between trust and other causal factors in safety. As Rundmo and his colleagues (Rundmo, 1994; Rundmo, Hestad, & Ullerberg, 1998) have argued, a full understanding of safety can only be achieved by studying how causal factors *interact*. Therefore, while studying trust in isolation allowed a reliable measure of this attitude to be developed, the natural next step is to understand its relationship with other causal factors such as safety attitudes (Donald & Canter, 1993), health status (Defares, Brandjes, Naas, & Ploeg, 1984), job stress (Sutherland & Flin, 1989), and job satisfaction (Sutherland & Davidson, 1993).

As well as extending the research focus to look at other causal factors, a third line of future research might explore the levels of trust in different organizational domains and their interaction in safety. As research typically shows, safety is affected by safety *and* job related factors (Keenan, Kerr, & Sherman, 1951; Flin & Slaven, 1996; Lee & Harrison, 2000). Therefore, the TCSQ might be extended to include measures of trust and distrust towards another in specific domains such as production and promotion prospects. In the original version of the TCSQ it was envisaged that 'general' items would act as an umbrella concept representing various job related domains. However, the results of some of the analyses suggested that general items are interpreted in a safety context owing to the salience of this dimension within the questionnaire.

Methodological considerations

An important element of any future research will be a consideration of methodological problems and how these might be controlled to have minimal effects. Throughout this thesis, a number of problems associated with the development and implementation of the TCSQ emerged. At a development level, problems arose with item positioning in the questionnaire (e.g., item embeddedness; Harrison & McLaughlin, 1993) and using a safety context to introduce and name the questionnaire (i.e., The 'Trust Climate and *Safety* Questionnaire'). In making safety salient to respondents, a type of priming effect was produced that is argued by Salancik and Pfeffer (1977) to influence subsequent responses that are given to neutral questions. In the current study this had the advantage of increasing confidence that the TCSQ was tapping the attitude that it was designed to address, but in other research this could pose a problem. Regarding the TCSQ's implementation, problems arose with sample size. It was suggested that the relatively small number of respondents in the installation survey might have produced a less stable and biased factor structure. Further, the use of a union sample in the industry survey may have produced results that are not reflective of non-union members trust attitudes. Finally, the distribution of the questionnaire by the offshore safety and environment officer in the installation survey created the potential for biased responding in a positive direction. Freepost return envelopes and assured confidentiality controlled for this to some extent.

The central themes of this thesis have been the nature of trust and its role in industrial safety. Trust has been shown to have a multi-dimensional nature that manifests in different ways between contexts and groups. At an installation level, trust operates with distrust in a two-dimensional structure, while at an industry level, these attitudes operate in a four-dimensional structure where they are further differentiated by a general and safety-specific context. Further, when considered for their role in safety, it is typically attitudes of distrust that have a stronger influence on unsafe performance. Therefore, while the current emphasis in safety research is on the importance of 'trust', the present study shows its multi-faceted nature, and the need to explore the variety of ways that trust may manifest and influence safety performance. Trust is clearly a more complex phenomenon than much of the current literature suggests.

References

ACSNI (1993). Organising for safety: Third report. *Advisory Committee on the Safety of Nuclear Installations*. London: HMSO.

Adams, J. S. (1965). Inequity in social exchange. In L. Berkowitz (Ed.), *Advances in experimental social psychology* (Vol. 2, pp. 267-299). San Diego: Academic Press.

Ajzen, I. (1985). From intentions to actions: A theory of planned behaviour. In J. Kuhl & J. Beckmann (Eds.), *Action-control: From cognition to behaviour* (pp. 11-39). Heidelberg: Springer.

Ajzen, I. (1988). *Attitudes, personality and behavior.* Chicago, IL: Dorsey Press.

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes, 50,* 179-211.

Akaike, H. (1987). Factor analysis and AIC. *Psychometrika, 52,* 317-332.

Albrecht, S., & Travaglione, A. (2003). Trust in public-sector senior management. *International Journal of Human Resource Management, 14,* 76-92.

Alexander, S., & Ruderman, M. (1987). The role of procedural justice and distributive justice in organizational behavior. *Social Justice Research, 1,* 177-197.

Allen, B. (1986). Attitudes and safety. *The Safety Practitioner March 9-12.*

Allen, M. W. (1992). Communicational and organizational commitment: Perceived organizational support as a mediating factor. *Communication Quarterly, 40,* 357-367.

Allison, R. E. (1993). *Global disasters: Inquiries into management ethics.* New York: Prentice Hall.

Altman, I., & Taylor, D. A. (1973). *Social penetration: The development of interpersonal relationships.* New York: Holt, Rinehart & Winston.

Anderson, L. M., & Batesman, T. S. (1997). Cynicism in the workplace: Some causes and effects. *Journal of Organizational Behavior, 18,* 449-469.

Andriessen, J. H. T. H. (1978). Safe behaviour and safety intervention. *Journal of Occupational Hazards, 1,* 363-376.

Arbuckle, J. L. (1996). Full information estimation in the presence of incomplete data. In G. A. Marcoulides & R. E. Schumacker (Eds.), *Advanced structural equation modelling: Issues and techniques* (pp. 243-277). Mahwah, NJ: Lawrence Erlbaum Associates.

Arbuckle, J. L. (1999). *Amos 4.0.* Chicago: Smallwaters.

Armstrong-Stassen, M. (2001). Reactions of older employees to organizational downsizing: The role of gender, job level, and time. *Journals of Gerontology, 56B,* 234-243.

Arnold, K. A., Barling, J., & Kelloway, K. E. (2001). Transformational leadership or the iron cage: Which predicts trust, commitment and team efficacy? *Leadership and Organization Development Journal, 22,* 315-320.

Arrow, K. (1974). *The limits of organization.* New York: Norton.

Aryee, S., Budhwar, P. S., & Chen, Z. X. (2002). Trust as a mediator of the relationship between organizational justice and work outcomes: Test of a social exchange model. *Journal of Organizational Behavior, 23,* 267-285.

Ashford, S. J., Lee, C., & Bobko, P. (1989). Content, causes, and consequences of job insecurity: A theory-based measure and substantive test. *Academy of Management Journal, 32,* 803-829.

Barber, B. (1983). *The logic and limitations of trust.* New Brunswick, New Jersey: Rutgers University Press.

Barling, J., & Phillips, M. (1993). Interactional, formal and distributive justice in the workplace: An exploratory study. *Journal of Psychology, 127,* 649-656.

Bartlett, M. S. (1954). A note on the multiplying factors for various chi square approximations. *Journal of the Royal Statistical Society, 16,* 296-298.

Bass, B. M., & Mitchell, C. W. (1976). Influences on the felt need for collective bargaining by business and science professionals. *Journal of Applied Psychology, 61,* 770-773.

Bass, B. M. (1990). *Bass & Stogdill's handbook of leadership: Theory, research and managerial applications* (3rd ed). New York: Free Press.

Bem, D. J. (1972). Self-perception theory. In L. Berkowitz (Ed.), *Advances in experimental social psychology* (Vol. 6, pp.1-62). San Diego, CA: Academic Press.

Bennis, W. G. (1989). *Why leaders can't lead: The unconscious conspiracy.* San Fransisco: Jossey-Bass.

Benson, J. (1987). Detecting item bias in affective scales. *Educational and Psychological Measurement, 47,* 55-67.

Bentler, P. M., & Chou, C. P. (1987). Practical issues in structural equation modeling. *Sociological Methods and Research, 16,* 78-117.

Bentley, T. A., & Haslam, R. A. (2001). A comparison of safety practices used by managers of high and low accident rate postal delivery offices. *Safety Science, 37,* 19-37.

Berends, J. J. (1996). On the measurement of safety culture (Unpublished graduation report). Eindhoven University of Technology, Eindhoven.

Bies, R. J., & Tripp, T. M. (1996). Beyond distrust. "Getting even" and the need for revenge. In R. M. Kramer & T. R. Tyler (Eds.), *Trust in organizations. Frontiers of theory and research* (pp. 246-260). USA: Sage Publications.

Bigley, G. A., & Pearce, J. L. (1998). Staining for shared meaning in organizational science: Problems of trust and distrust. *Academy of Management Review, 23,* 405-421.

Bijlsma, K. M., & Van de Bunt, G. G. (2003). Antecedents of trust in managers: A "bottom up" approach. *Personnel Review, 32,* 638-664.

Bijlsma, K. M., Prins, E., & Weber, B. (1999). Managerial perspectives on success and failure of post-acquisition processes. In A. Rahim, R. T. Golembiewski, & K. D. Mackenzie (Eds.), *Current topics in management* (Vol. 4, pp. 155-179). Stamford, CT: JAI Press.

Bijlsma, K. M., & Koopman, P. (2003). Introduction: Trust within organizations. *Personnel Review, 35,* 543-555.

Blau, P. M. (1964). *Exchange and power in social life.* New York: Wiley.

Blomqvist, K. and Stahle, P. (2000). Building Organizational Trust. Paper presented at the 16th IMP conference. September 6th-9th, Bath, UK.

Bluhm, L. H. (1987). Trust, terrorism and technology. *Journal of British Ethics, 6,* 333-342.

Blunsdon, B., & Reed, K. (2003). The effects of technical and social conditions on workplace trust. *International Journal of Human Resource Management, 14,* 12-27.

Boisot, M. H. (1995). *Information space, a framework for learning in organizations, institutions and culture.* London: Routledge.

Bollen, K., & Medrano, J. D. (1998). Who are the Spaniards? Nationalism and identification in Spain. *Social Forces, 77,* 587-622.

Bollen, K. A. (1989). *Structural equations with latent variables.* New York: Wiley.

Bollen, K. A., & Long, J. S. (1993). *Testing structural equation models.* Newbury Park, CA: Sage.

Bonacich, P., & Schneider, S. (1992). Communication networks and collective action. In W. G. Liebrand, D. M. Messick, & H. A. M. Wilke (Eds.), *A social psychological approach to social dilemmas* (pp. 128-141). Oxford, England: Pergammon.

Boon, S. D., & Holmes, J. G. (1991). The dynamics of interpersonal trust: Resolving uncertainty in the face of risk. In R. A. Hinde & J. Groebel (Eds.), *Cooperation and prosocial behavior* (pp. 167-182). New York: Cambridge University Press.

Boone, D. E. (1991). Item reduction vs. subset-reduction from on the WAIS-R with psychiatric patients. *Journal of Clinical Psychology, 47,* 271-276.

Bradley, K. J. (2001). The application of item response theory to nursing job satisfaction data. *Dissertation abstracts international: Section B-The sciences and engineering, 61,* 6391

Brewer, M. (1993). The role of distinctiveness in social identity and group behaviour. In M. A. Hogg & D. Abrams (Eds.), *Group motivation: Social psychological perspectives* (pp. 1-16). New York: Harvester-Wheatscheaf.

Brewer, M. B. (1979). In-group bias in the minimal intergroup situation: A cognitive-motivational analysis. *Psychological Bulletin, 86,* 307-324.

Brewer, M. B., & Miller, N. (1996). *Intergroup relations.* New York: Brooks and Cole.

Brockner, J., & Siegel, P. A. (1996). Understanding the interaction between procedural and distributive justice: The role of trust. In R. M. Kramer & T. R. Tyler (Eds.), *Trust in organizations. Frontiers of theory and research* (pp. 390-413). London: Sage.

Brockner, J., Seigel. P. A., Daly, J. P., & Tyler, T. (1997). When trust matters: The moderating effects of outcome favorability. *Administrative Science Quarterly, 43,* 558-583.

Bromiley, P., & Cummings, L. L. (1996). Transaction costs in organizations with trust. In R. Bies, R. Lewicki, & B. Sheppard (Eds.), *Research on negotiation in organizations*, (pp. 219-247). Greenwich, CT: JAI.

Brown, R. L. (1994). Efficacy of the indirect approach for estimating structural equation models with missing data: A comparison of five models. *Structural Equation Modeling: A Multidisciplinary Journal, 1,* 287-316.

Brown, R. L., & Holmes, H. (1986). The use of a factor-analytic procedure for assessing the validity of an employee safety climate model. *Accident Analysis and Prevention, 18,* 455-470.

Browne, M. W. (1968). A comparison of factor analytic techniques. *Psychometrika, 33,* 267–334.

Browne, M. W., & Cudeck, R. (1993). Alternative ways of assessing model fit. In K. A. Bollen, & J. S. Long (Eds.), *Testing structural equation models* (pp. 445-455). Newbury Park, CA: Sage.

Burke, M. J., Brief, A. P., George, J. M., Robertson, L., & Webster, J. (1989). Measuring affect at work: Confirmatory analyses of competing mood structures with conceptual linkage to the cortical regulatory systems. *Journal of Personality and Social Psychology, 75,* 1091-1102.

Burt, R. S., & Knez, M. (1996). Trust and third party gossip. In R. M. Kramer, & T. R. Tyler (Eds.), *Trust in organizations. Frontiers of theory and research* (pp. 68-89). USA: Sage Publications.

Butler, J. K. (1983). Reciprocity of trust between professionals and their secretaries. *Psychological Reports, 53,* 411-416.

Butler, J. K. (1991). Towards understanding and measuring conditions of trust: Evolution of conditions of trust inventory. *Journal of Management, 17,* 643-663.

Butler, J. K., & Cantrell, S. R. (1984). A behavioral decision theory approach to modeling dyadic trust in superiors and subordinates. *Psychological Reports, 55,* 19-28.

Byrne, B. M. (2001). *Structural Equation Modeling with AMOS: Basic concepts, applications and programming.* London: Lawrence Erlbaum Associates.

Cacioppo, J. T., & Gardner, W. L. (1993). What is underlying medical donor attitudes and beavhiour? *Health Psychology, 12,* 269-271.

Caldwell, C., & Clapham, S. E. (2003). Organizational trustworthiness: An international perspective. *Journal of Business Ethics, 47,* 349-364.

Canter, D. (1985). *Facet theory: Approaches to social research.* New York: Springer-Verlag.

Carnegie, D. (1995). *Effective supervisors on offshore petroleum platforms.* Paper presented at the Fourth OIM conference, 'Team Working', RGU, Aberdeen, April 27.

Carroll, J. S. (May, 2002). *Leadership and safety in nuclear power and health care.* Paper presented at Managers and Safety in High Reliability Organisations Seminar. Aberdeen University.

Cashman, J., Danserau, F., Graen, G., & Haga W. J. (1976). Organizational understructure and leadership: A longitudinal investigation of the managerial role-making process. *Organizational Behavior and Human Performance, 15,* 278-296.

Cattell, R. B. (1966). The screen test for the number of factors. *Multivariate Behavioral Research, 1,* 245-276.

Cattell, R. B.,&Vogelmann, S. (1977). A comprehensive trial of the scree and KG criteria for determining the numbe of factors. *Journal of Educational Measurement, 14,* 289-325.

CBI (1991). *Developing a safety culture.* London: Confederation of British Industry.

Charmaz, K. (1995). Grounded theory. In J. A. Smith (Ed.), *Rethinking methods in psychology,* (pp.27-49). London: Sage.

Charter, R. A. (2003). A breakdown of reliability coefficients by test type and reliability method, and the clinical implications of low reliability. *Journal of General Psychology, 130,* 290-304.

Chen, F., Bollen, K. A., Paxton, P., Curran, P. J. and Kirby, J. B. (2001). Improper solutions in structural equation models: Causes, consequences, and strategies. *Sociological Methods and Research, 29,* 468-508.

Cheyne, A., Oliver, A., Tomás, J. M., & Cox, S. (2002). The architecture of employee attitudes to safety in the manufacturing sector. *Personnel Review, 31,* 649-670.

Clark, M. C., & Payne, R. L. (1997). The nature and structure of workers' trust in management. *Journal of Organizational Behavior, 18,* 205-224.

Clark, M. S., & Mills, J. (1979). Interpersonal attraction in exchange and communal relationships. *Journal of Personality and Social Psychology, 37,* 12-24.

Clarke, S. (1998). Safety culture on the UK railway network. *Work and Stress, 12,* 285-292.

Clarke, S. (1999). Perceptions of organizational safety: Implications for the development of safety culture. *Journal of Organizational Behavior, 20,* 185-198.

Clarke, S. (2003). The contemporary workforce: Implications for organizational safety culture. *Personnel Review, 32,* 40-57.

Cliff, N. (1988). The eigenvalue-greater-than-one rule and the reliability of components. *Psychological Bulletin, 103,* 276-279.

Cliff, N., & Hamburger, C. D. (1967). The study of sampling errors in factor analysis by means of artificial experiments. *Psychological Bulletin, 68,* 430-445.

Cohen, A. (1977). Factors in successful occupational safety programmes. *Journal of Safety Research, 9,* 168-178.

Collinson, D. L. (1999). 'Surviving the rigs': Safety and surveillance on North Sea oil installations. *Organization Studies, 20,* 579-600.

Comrey, A. L., & Lee, H. B. (1992). *A first course in factor analysis.* (2nd ed.). Hillside, NJ: Lawrence Erlbaum Associates.

Cook, J., & Wall, T. (1980). New work attitude measures of trust, organizational commitment and personal need non-fulfilment. *Journal of Occupational Psychology, 53,* 39-52.

Cook, W. W., & Medley, D. M. (1954). Proposed hostility and pharisaic virtue scales for the MMPI. *Journal of Applied Psychology, 238,* 414-418.

Cooper, D. (1998). *Improving safety culture: A practical guide.* Chichester: Wiley.

Cooper, M. D. (2000). Towards a model of safety culture. *Safety Science, 36,* 111-136.

Costa, A. C. (2003). Work team trust and effectiveness. *Personnel Review, 32,* 605-622.

Costigan, R. D., Ilter, S. S., & Berman, J. J. (1998). A multi-dimensional study of trust in organizations. *Journal of Managerial Issues, 10,* 303-317.

Coursey, D. H., & Pandey, S. K. (2004, January). Public service motivation measurement: Testing an abridged version of Perry's scale. *Proceedings from the Southern Political Science Association.* New Orleans.

Cox, S. J., & Cheyne, A. (2000). Assessing safety culture in offshore environments. *Safety Science, 34,* 111-129.

Cox, S. J., & Cox, T. R. (1991). The structure of employee attitudes to safety: A European example. *Work and Stress, 5,* 93-106.

Cox, S. J., & Cox, T. R. (1996). *Safety, systems and people.* Oxford: Butterworth-Heinemann.

Cox, S. J., & Flin, R. (1998). Safety culture: Philosopher's stone or man of straw? *Work and Stress, 12,* 189-201.

Cox, S. J, Jones, B. & Rycraft, H. (2004). Behavioural approaches to safety management within nuclear reaction plants. *Safety Science, 42,* 825-839.

Cox, S. J., & Tait, N. R. S. (1991). *Reliability, safety and risk management: An integrated approach.* Oxford: Butterworth Heinemann.

Coyle, I. R., Sleeman, S. D., & Adams, N. (1995). Safety climate. *Journal of Safety Research, 26,* 247-254.

Creed, D. W. E., & Miles, R. E. (1996). Trust in organizations: A conceptual framework linking organizational forms, managerial philosophies and the opportunity costs of control. In R. M. Kramer, & T. R. Tyler (Eds.), *Trust in organizations. Frontiers of theory and research* (pp. 16-38). London: Sage.

Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika, 16,* 297-334.

Cudeck, R., & Browne, M. W. (1983). Cross-validation of covariance structures. *Multivariate Behavioral Research, 18,* 147-167.

Cullen, D. (1990). *The public inquiry into the Piper Alpha disaster.* London: HMSO.

Cummings, L. L., & Bromiley, P. (1996). The Organizational Trust Inventory (OTI): Development and validation. In R. M. Kramer, & T. R. Tyler (Eds.), *Trust in organizations. Frontiers of theory and research* (pp. 302-330). London: Sage.

Currall, S. C., & Judge, T. A. (1995). Measuring trust between boundary role persons. *Organizational Behaviour and Human Decision Processes, 64,* 151-170.

Cvetkovich, G., Siegrist, M., Murray, R., & Tagesser, S. (2002). New information and social trust: Asymmetry and perseverance of attributions about hazard managers. *Risk Analysis, 22,* 359-367.

Das, T. K., & Teng, B. (2001). Trust, control and risk in strategic alliances: An integrated framework. *Organization Studies, 22,* 251-283.

Dasgupta, P. (1988). Trust as a commodity. In Gambetta (Ed.), *Trust: Making and breaking cooperative relations* (pp. 49-72). New York: Basil Blackwell.

Davenport, S., Davies, J., & Grimes, C. (1999). Collaborative research programmes: Building trust from difference. *Techovation, 19,* 31-40.

Davis, J. H., Schoorman, F. D., Mayer, R. C., & Tan, H. H. (2000). The trusted general manager and business unit performance. Empirical evidence of a competitive advantage. *Strategic Management Journal, 21,* 563-576.

Davis, R. T., & Stahl, R. W. (1964). *Safety organization and activities of award-winning companies in the coal mining industry.* Bureau of Mines, US Department of Interior.

Davis, T., & Landa, M. J. (1999). The trust deficit. *Canadian Manager, 24,* 10-27.

Dawes, R. M., & Smith, T. L. (1985). Attitude and opinion measurement. In G. Lindzey, & E. Aronson (Eds.), *Handbook of social psychology* (3rd ed, pp. 509-566). New York: Random House.

Deal, T. E., & Kennedy, A. A. (1982). *Corporate cultures: The rites and rituals of corporate life.* Addison Wesley: Reading, MA.

de Gilder, D. (2003). Commitment, trust and work behaviour: The case of the contingent workers. *Personnel Review, 32,* 588-604.

Dedobbeleer, N., & Béland, F. (1991). A safety climate measure for construction sites. *Journal of Safety Research, 22,* 97-103.

Dedobbeleer, N., & Béland, F. (1998). Is risk perception one of the dimensions of safety climate? In A. Feyer, & A. Williamson (Eds.), *Occupational injury. Risk prevention and intervention* (pp. 73-81). London: Taylor Francis Ltd.

Defares, P. B., Brandjes, M., Naas, C. H. T., & Ploeg, J. D. (1984). Coping styles and vulnerability of women at work in residential settings. *Ergonomics*, *27,* 199-218.

Deluga, R. J. (1994). Supervisor trust building, leader-member exchange and organizational citizenship behaviour. *Journal of Occupational and Organizational Psychology, 67,* 315-326.

Deutsch, M. (1958). Trust and Suspicion. *Journal of Conflict Resolution, 2,* 265-279.

Deutsch, M. (1968). Field theory. In G. Lindsay, & E. Aronson (Eds.), *Handbook of social psychology* (Vol. 1, pp. 412-487). Reading, MA: Addison-Wesley.

Deutsch, M. (1973). The resolution of conflict. New Haven, CT: Yale University Press.

Dion, K. L (1973). Cohesiveness as a determinant of ingroup-outgroup bias. *Journal of Personality and Social Psychology*, *28,* 163-171.

Dirks, D., & Ferrin, L. (2001). The role of trust in organizational settings. *Organization Science*, *12,* 450-467.

Dirks, K. T., & Ferrin, D. L. (2002). Trust in leadership: Meta-analytic findings and implications for research and practice. *Journal of Applied Psychology*, *87,* 611-628.

Donald, I. (1994). Measuring psychological factors in safety. *Safety and Health Practitioner, March,* 26-29.

Donald, I. (1995). Facet theory: Defining research domains. In G. M. Breakwell, S. Hammond, & C. Fife-Schaw (Eds.), *Research methods in psychology* (pp. 116-137). London: Sage.

Donald, I., & Canter, D. (1991). *The contribution of attitudinal and management factors to risk in the chemical industry.* Second interim report to the Heath and Safety Executive.

Donald, I., & Canter, D. (1993). Psychological factors and the accident plateau. *Health and Safety Information Bulletin, 215,* 5-8.

Donald, I., & Cooper, S. R. (2001). A facet approach to extending the normative component of the theory of reasoned action. *British Journal of Social Psychology, 40,* 599-21.

Donald, I., & Young, S. (1996). Managing safety: An attitudinal-based approach to improving safety in organizations. *Leadership and Organization Development Journal, 17,* 13-20.

Doney, P. M., & Cannon, J. P. (1997). An examination of the nature of trust in buyer-seller relationships. *Journal of Maketing, 61,* 35-51.

Douglas, M. (1992). *Risk and blame.* London: Routledge.

Driel, O. P. Van. (1978). On various causes of improper solutions in maximum likelihood factor analysis. *Psychometrika, 43,* 225-243.

Driscoll, J. W. (1978). Trust and participation in orgainzational decision making as predictors of satisfaction. *Academy of Management Journal, 21,* 44-56.

Eagly, A., & Chaiken, S. (1993). *The psychology of attitudes.* Harcourt Brace: Jovanovich College.

Edmonson, A. (1999). Psychological safety and learning behaviour in work teams. *Administrative Science Quarterly, 44,* 350-383.

Eisenberger, R., Fasolo, P., & Davis-LasMastro, V. (1990). Perceived organizational support and employee diligence, commitment and innovation. *Journal of Applied Psychology, 75,* 51-59.

Eisenberger, R., Huntington, R., Hutchinson, S., & Sowa, D. (1986). Perceived organizational support. *Journal of Applied Psychology, 71,* 500-507.

Elangovan, A. R., & Shapiro, D. L. (1998). Betrayal of trust in organizations. *Academy of Management Review, 23,* 547-566.

Ellison, C. W., & Firestone, I. J. (1974). Development of interpersonal trust as a function of self-esteem, target status, and target style. *Journal of Personality and Social Psychology, 29,* 655-663.

Erdem, F., & Ozen, J. (2003). Cognitive and affective dimensions of trust in developing team performance. *Team Performance Management: An International Journal, 9,* 131-135.

Erickson, E. H. (1963). *Childhood and society* (2nd ed.). New York: Norton.

Fan, X., Thompson, B., & Wang, L. (1999). Effects of sample size, estimation methods, and model specification on structural equal modeling indexes. *Structural Equation Modeling: A Multidisciplinary Journal, 6,* 56-83.

Farmer, E., & Chambers, E. G. (1926). *A study of accident proneness among motor drivers*. Report 84, Medical Research Council, Industrial Health Research Board. London.

Farmer, E., & Chambers, E. G. (1929). A study of personal qualities in accident proneness and proficiency. *Industrial Health Research Board Report, 55,* 80.

Farrell, D., & Rusbult, C. E. (1981). Exchange variables as predictors of job satisfaction, job commitment and job turnover: The impacts of rewards, costs, alternatives and investments. *Organizational Behavior and Human Performance, 27,* 78-95.

Fasolo, P. M. (1995). Procedural justice and perceived organizational support: Hypothesized effects on job performance. In R. Cropanzano, & K. M. Kramer (Eds.), *Managing social climate at work* (pp. 185-195). Westport, CT: Quorum Press.

Fava, J. L., & Velicer, W. F. (1992). The effects of overextraction on factor and component analysis. *Multivariate Behavioural Research, 27,* 387-415.

Festinger, L. (1957). *A Theory of Cognitive Dissonance.* Evanston, Illinois: Row, Peterson.

Fife-Schaw, C. (1995). Questionnaire design. In G. M. Breakwell, S. Hammond, & C. Fife-Schaw (Eds.), *Research methods in psychology* (pp. 174-193). London: Sage.

Fishbein, M. (1967). Attitude and prediction of behavior. In M. Fishbein (Ed.), *Readings in attitude theory and measurement* (pp. 477-492). New York: Wiley.

Fishbein, M., & Ajzen, I. (1975). *Belief, attitude, intention and behavior: An introduction to theory and research.* Reading, MA: Addison-Wesley.

Fishbein, M., & Stasson, M. (1990). The role of desires, self-predictions, and perceived control in the prediction of training sessions attendance. *Journal of Applied Social Psychology, 20,* 173-198.

Fitness, J. (2000). Anger in the workplace: An emotion script approach to anger episodes between workers and their supervisors, co-workers, and sub-ordinates. *Journal of Organizational Behavior, 21,* 147-162.

Fitness, J. (2001). Betrayal, rejection, revenge and forgiveness: An interpersonal script approach. In M. Leary (Ed.), *Interpersonal rejection* (pp.73-103). Oxford University Press.

Fitness, J., & Fletcher, G. J. O. (1993). Love, hate, anger and jealousy in close relationships: A prototype and cognitive appraisal analysis. *Journal of Personality and Social Psychology, 65,* 942-958.

Fleming, M., & Lardner, R. (2001). *Behaviour modification to improve safety: A review of the literature.* Suffolk: HSE Books.

Flin, R., & Slavin, G. (1996). *Managing the Offshore Installation Workforce.* Oklahoma: Pennwell Books.

Flin, R., Mearns, K., Fleming, M., & Gordon, R. (1996). *Risk perception and safety in the offshore oil and gas industry*. London: (OTH 94454) HSE Books.

Flin, R., Mearns, K., O'Connor, P., & Bryden, R. (2000). Measuring safety climate: Identifying the common features. *Safety Science, 34*, 177-192.

Folger, R., & Konovsky, M. (1989). Effects of procedural and distributive justice on reactions to pay raise decisions. *Academy of Management Journal, 32,* 115-130.

Foulkes, F. K. (1973). Learning to live with OSHA. *Harvard Business Review,* 57-67.

Frederikson, N., Jensen, O., & Beaton, A. E. (1972). *Prediction of organizational behavior.* New York: Pergamon.

Frewer, L. J., Howard, C., Hedderley, D., & Shepherd, R. (1996). What determines trust in information about food-related risks? Underlying psychological constructs. *Risk Analysis, 16,* 473-485.

Frost, T., Stimpson, D. V., & Maughan, M. R. C. (1978). Some correlates of trust. *Journal of Psychology, 99,* 103-108.

Gabarro, J. J. (1978). The development of trust, influence and expectations. In A. G. Athos, & J. J. Gabarro (Eds.), *Interpersonal behavior. Communicating and understanding in relationships* (pp. 290-303). New Jersey: Prentice Hall.

Gable, R. K., & Wolf, M. B. (1993). *Instrumental development in the affective domain* (2nd ed.). Norwell, MA: Kluwer Academic Publishers.

Gambetta, D. (1988). Can we trust? In D. Gambetta (Ed.), *Trust: Making and breaking cooperative relations* (pp. 213-238). New York: Basil Blackwell.

Gambetta, D. (1988). *Trust: Making and breaking cooperative relations*. New York: Basil Blackwell.

Gans, G., Jarke, M., Kethers, S., & Lakemeyer, G. (2001). Modeling the impact of trust and distrust in agent networks. In *Proceedings of the 3rd Workshop on Agent-Oriented Information Systems (AOIS-2001)*(pp. 45-58). Interlaken, June 2001.

Gaylin, W. (1984). *The rage within: Anger in modern life.* New York: Simons and Schuster.

Geller, E. S. (1994). Ten principles for achieving a Total Safety Culture. *Professional Safety September,* 18-24.

Gerbing, D. W., & Anderson, J. C. (1993). Monte Carlo evaluations of goodness-of-fit indices for structural equation models. In K. A. Bollen, & J. S. Long (Eds.), *Testing structural equation models* (pp. 40-65). Newbury Park, CA: Sage.

Gill, J., & Butler, R. (1996). Cycles of trust and distrust in joint-ventures. *European Journal of Management, 14,* 81-89.

Gillespie, N. (In Press). Measuring trust in working relationships: The Behavioral Trust Inventory. *Journal of Applied Psychology.*

Glaser, B. G. (1992). Emergence vs forcing: Basics of Grounded Theory analysis. Mill Valley, CA: Sociology Press.

Glaser, B. G., & Strauss, A. L. (1967). *The discovery of grounded theory: Strategies for qualitative research.* Chicago, IL: Aldine Publishing Company.

Glendon, A. I., & Litherland, D. K. (2001). Safety climate factors, group differences and safety behaviour in road construction. *Safety Science, 39,* 157-188.

Glendon, A. I., & McKenna, E. F. (1995). *Human safety and risk management.* London: Chapman and Hall.

Glennon, D. P. (1982). Measuring organizational safety climate. *Australian Safety News,* Jan/Feb, 23-28.

Glick, W. H. (1985). Conceptualizing and measuring organizational and psychological climate: Pitfalls in multilevel research. *Academy of Management Review, 10,* 601-616.

Gorsuch, R. L. (1983). *Factor analysis.* Hillside, NJ: L. Erlbaum.

Goto, S. G. (1996). To trust or not to trust: Situational and dispositional determinants. *Social Behavior and Personality, 24,* 119-132.

Granovetter, M. (1985). Economic action and social structure: The problem of embeddedness. *American Journal of Sociology, 91,* 481-510.

Green, P. E., & Rao, V. R. (1970). Rating scales and information recovery. How many scales and response categories to use? *Journal of Marketing, 34,* 33-39.

Green, S. B., Akey, T. M., Fleming, K. K., Hershberger, S. L., & Marquis, J. G. (1997). The effect of the number of scale points on Chi-square fit indices in Confirmatory Factor Analysis. *Structural Equation Modeling Journal: A Multidisciplinary Journal, 4,* 108-120.

Greenwood, M., & Woods, H. M. (1919). *The incidence of industrial accidents upon individuals with specific reference to multiple accidents.* Industrial Fatigue Research Board. Report 4. London.

Gregory, R. J. (1999). *Foundation of intellectual assessment: The WAIS-III an other tests in clinical practice.* Boston: Allyn & Bacon.

Gregory, X. (1983). Native view paradigms: multiple cultures and culture conflicts in organizations. *Administrative Science Quarterly, 28*, 359-379.

Grey, C., & Garsten, C. (2001). Trust, control and post-bureaucracy. *Organisation Studies, 22,* 229-250.

Griffiths, D. K. (1985). Safety attitudes of management. *Ergonomics, 28,* 61-67.

Guadagnoli, E., & Velicer, W. F. (1988). Relation of sample size to the stability of component patterns. *Psychological Bulletin, 103,* 265-275.

Guildford, J. P., & Fruchter, B. (1978). *Fundamental statistics in psychology and education* (6th ed.). New York: McGraw-Hill.

Gulati, R. (1995). Does familiarity breed trust? The implications of repeated ties for contractual choice in alliances. *Academy of Management Journal, 38,* 85-112.

Guldenmund, F. W. (2000). The nature of safety culture: a review of theory and research. *Safety Science, 34,* 215-257.

Gurtman, M. B. (1992). Trust, distrust, and interpersonal problems: A circumplex anlaysis. *Journal of Personality and Social Psychology, 62,* 989-1002.

Guttman, L. (1959). A structural theory for intergroup beliefs and action. *American Sociological Review, 24,* 318-328.

Haight, F. A. (September, 2000). *Accident proneness: The history of an idea.* Presented at the International Conference on Traffic and Transport Psychology. Berne, Switzerland, 4-7 September 2000.

Haines, V. Y., Merrheim, G., & Roy, M. (2001). Understanding reactions to safety incentives. *Journal of Safety Research, 32,* 17-30.

Hair, J. F., Anderson, R. E., Tatham, R. L., & Black, W. C. (1995). *Multivariate data: Analysis with readings* (4th Ed.). International Editions: Prentice Hall.

Hardin, R. (2002). *Trust and trustworthiness.* New York: Russell Sage Foundation.

Harman, H. H. (1971). *Modern factor analysis.* Chicago: University of Chicago Press.

Harman, H. H. (1976). *Modern factor analysis.* (2nd ed.). Chicago: University of Chicago Press.

Harris, G. M. (1994). *Trust and betrayal in the workplace: The subordinates' point of view.* Unpublished Doctoral Dissertation, University of Utah.

Harrison, D. A. & McLaughlin, M. E. (1993). Cognitive processes in self-report responses: Tests of item context effects in work attitude measures. *Journal of Applied Psychology, 78,* 129-140.

Heider, F. (1958). *The Psychology of interpersonal relations.* John-Wiley and Sons: New York.

Heinrich, H. W. (1931). *Industrial accident prevention: A scientific approach.* New York: McGraw Hill.

Hidden, A. (1989). *Investigation into the Clapham Junction Railway accident.* Department of Transport. London: HMSO.

Higgins, E. T. (1990). Personality, social psychology and person-situation relations: Standards and knowledge activation as a common language. In L. A. Pervin (Ed.), *Handbook of personality: Theory and research* (pp. 301-338). New York: Guildford Press.

Hofmann, D. A., & Morgeson, F. P. (1999). Safety-related behavior as a social exchange: The role of perceived organizational support and leader-member exchange. *Journal of Applied Psychology, 84,* 286-296.

Hogan, R., Curphy, G., & Hogan, J. (1994). What we know about leadership: effectiveness and personality. *American Psychologist, 49,* 493-504.

Hogan, T. P., Benjamin, A., & Brenzinski, K. L. (2000). Reliability methods: A note on the frequency of use of various types. *Education and Psychological Measurement, 60,* 523-531.

Holbert, L. R., & Stephenson, M. T. (2002). Structural equation modeling in the communication sciences, 1995-2000. *Human Communication Research, 28,* 531-551.

Hollnagel, E. (1993). The phenotype of erroneous actions. *International Journal of Man-Machine-Studies, 39,* 1-32.

Holmes, J. G., & Rempel, J. K. (1989). Trust in close relationships. In C. Hendrick (Ed.), *Close relationships* (pp. 187-220). Newbury Park, CA: Sage.

Horlick-Jones, T. (1996). The problem of blame. In C. Hood, & D. Jones (Eds.), *Accident and design* (pp. 144-154). London: University College London Press.

Horn, J. L. (1965). A rationale and test for the number of factors in factor analysis. *Psychometrika, 30,* 179–185.

Hosmer, D. W., & Lemeshow, S. (1989). *Applied logistic regression.* New York: Wiley.

Hosmer, L. (1995). Trust: The connecting link between organizational theory and philosophical ethics. *Academy of Management Review, 20,* 379-403.

Hovland, C. I., Janis, I. L., & Kelley, H. H. (1953). *Communication and persuasion.* New Haven, CT: Yale University Press.

Howell, D. C. (1995). *Statistical methods for psychology.* (4th ed.). Duxbury Press.

Hoyle, R. H., & Panter, A. T. (1995). Writing about structural equation models. In R. H. Hoyle (Ed.), *Structural equation modeling: Comments, issues, and applications* (pp. 158-176). Thousand Oaks, CA: Sage.

HSC (1993). *ACSNI study group on human factors.* 3rd Report: Organising for safety. Health and Safety Commission, HMSO, London.

HSE (1991). *Successful health and safety management.* HMSO: London.

HSE (1997). *Successful health and safety management, 2nd edition.* Suffolk: HSE Books.

HSE (1999). *Reducing error and influencing behaviour*, HSG48, 2nd Edition. Suffolk: HSE Books.

HSE (2001). *Revitalising health and safety.* Suffolk: HSE Books.

Hu, L. T., & Bentler, P. M. (1995). Evaluation model fit. In R. H. Hoyle (Ed.), *Structural equation modeling: Concepts, issues and applications* (pp. 76-99). Thousand Oaks, CA: Sage.

Hu, L. T., & Bentler, P. M. (1998). Fit indices in covariance structure modeling: Sensitivity to underparameterized model misspecification. *Psychological Methods, 3,* 424-453.

Hu, L. T., & Bentler, P. M. (1999). Cut off criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal, 6,* 1-55.

Humphreys, L. G. (1964). Number of cases and number of factors: An example where *N* is very large. *Educational and Psychological Measurement, 24,* 457-466.

Hurley, A. E., Scandura, T., Schriesheim, C. A., Brannick, M. T., Seers, A., Vandenberg, R. J., & Williams, L. J. (1997). Exploratory and confirmatory analysis: Guidelines, issues, and alternatives. *Journal of Organizational Behavior, 18,* 667-683.

Hurst, N. W., Young, S., Donald, I., Gibson, H., & Muyselaar, A. (1996). Measures of safety management performance and attitudes to safety at major hazard sites. *Journal of Loss Prevention Process Industry, 9,* 161-172.

International Atomic Energy Authority (IAEA, 1986). *Summary report on the post accident review meeting on the Chernobyl accident*, 75-INSAG-1. IAEA, Vienna.

International Atomic Energy Authority (IAEA, 1991). *Safety culture* (Safety Series No 75- INSAG-4). International Nuclear Safety Advisory Group, International Atomic Energy Authority, Vienna.

James, K. (1993). The social context of organizational justice: Cultural, intergroup and structural effects on justice behaviors and perceptions. In R. Croponzano (Ed.), *Justice in the workplace: Approaching fairness in human resource management* (pp. 21-50). Hillside, CT: Erlbaum.

James, L. R., & Jones, A. P. (1974). Organizational climate: A review of theory and research. *Psychological Bulletin, 81,* 1096-1112.

Janis, I. (1972). *Victims of Groupthink.* Boston: Houghton Mifflin.

Joe, V. C. (1971). Review of the internal-external control construct as a personality variable. *Psychological Reports, 28,* 619-640.

Johnson, H. M. (1946). The detection and treatment of accident prone drivers. *Psychological Bulletin, 43,* 489-532.

Jones, A. P. and James, L. R. (1979). Psychological climate: Dimensions and relationships of individual and aggregated work environment perceptions. *Organizational Behavior and Human Performance, 23,* 201-250.

Jones, A. P., James, L. R., & Bruni, J. R. (1975). Perceived leadership behaviour and employee confidence in leader as moderated by job involvement. *Journal of Applied Psychology, 60,* 146-149.

Jones, G. R., & George, J. M. (1998). The experience and evolution of trust: Implications for cooperation and teamwork. *Academy of Management Review, 23,* 531-546.

Jones, W. H., & Burdette, M. P. (1994). Betrayal in relationships. In A. L. Weber, & J. H. Harvey (Eds.), *Perspectives on close relationships* (pp. 243-262). USA: Allyn & Bacon.

Jones, W. H., Couch, L., & Scott, S. (1997). Trust and betrayal. The psychology of getting along and getting ahead. In R. Hogan, J. Johnson, & Briggs, S. (Eds.), *Handbook of personnel psychology* (pp. 465-482). USA: Academic Press.

Jonson, K. M. (1982). Diagnostic analysis of safety issues. In, Proceedings of the first national conference on industrial safety, Sydney, Australia, pp. 30-39.

Jöreskog, K. G. (1967). Some contributions to maximum likelihood factor analysis. *Psychometrika, 32,* 443-482.

Jöreskog, K. G. (2001). Analysis of ordinal variables 2: Cross sectional data. Unpublished manuscript.

Jöreskog, K. G., & Sorbom, D. (1988). *LISREL 7: A guide to the program and applications.* Chicago: SPSS Inc.

Jöreskog, K. G., & Sorbom, D. (1996). *LISREL 8: User's reference guide.* Chicago: Scientific Software International.

Kaiser, H. F. (1970). A second-generation Little Jiffy. *Psychometrika, 35,* 401-415.

Kaiser, H. F. (1974). An index of factorial simplicity. *Psychometrika, 39,* 31-36.

Kanter, R. M., & Stein, B. A. (1979). *Life in organizations: Workplaces as people experience them.* New York: Basic Books.

Kasperson, R. E., Golding, D., & Tuler, S. (1992). Social distrust as a factor in sitting hazardous facilities and communicating risk. *Journal of Social Issues, 48,* 161-187.

Kasperson, R. E., Kasperson, J. X., Pidgeon, N. F., & Slovic, P. (2003). The social amplification of risk: Assessing fifteen years of research and theory. In N. F. Pidgeon, R. K. Kasperson, & P. Solvic (Eds.), *The social amplification of risk.* London: Earthscan.

Katz, D., & Stotland, E. (1959). A preliminary statement to a theory of attitude structure and change. In S. Koch (Ed.), *Psychology: A study of science* (Vol. 3, pp. 423-475). New York: McGraw-Hill.

Katz, I., & Hass, R. G. (1988). Racial ambivalence and American value conflict: Correlational and priming studies of dual cognitive structures. *Journal of Personality and Social Psychology, 55,* 893-905.

Katz, I., Wackenhut, J., & Hass, R. G. (1986). Racial ambivalence, value duality and behaviour. In J. F. Dovidio, & S. L. Gaetner (Eds.), *Prejudice, discrimination and racism*, (pp. 35-59). San Diego: Academic Press.

Kee, H. W., & Knox, R. E. (1970). Conceptual and methodological considerations in the study of trust. *Journal of Conflict Resolution, 14,* 357-366.

Keenan, V., Kerr, W., & Sherman, W. (1951). Psychological climate and accidents in an automotive plant. *Journal of Applied Psychology, 35,* 108-111.

Kelley, T. L. (1923). *Statistical method.* New York: Macmillan.

Kelloway, K. K. (1995). Structural equation modelling in perspective. *Journal of organisational behaviour, 16,* 215-224.

Kennedy, R., & Kirwan, B. (1998). Development of a hazard and operability-based method for identifying safety management vulnerabilities in high-risk systems. *Safety Science, 30,* 249-274.

Kern, H. (1998). Lack of trust, surfeit of trust: Some causes of the innovation crises in German Industry. In C. Lane, & R. Bachman (Eds.), *Trust within and between organizations* (pp. 203-213). Oxford: Oxford University Press.

Kiesler, D. J. (1983). The 1982 interpersonal circle: A taxonomy for complimentarity in human transactions. *Psychological Review, 90,* 185-214.

Kiesler, S., & Cummings, J. N. (2002). What do we know about proximity and distance in work groups? A legacy of research. In S. Kiesler, & P. Hinde (Eds.), *Distributed work* (pp. 57-80). Cambridge MA: MIT Press.

Kline, P. (2000). *A psychometric primer.* London: Free Association Books.

Konovsky, M. A., & Pugh, S. D. (1994). Citizenship behavior and social exchange. *Academy of Management Journal, 37,* 656-669.

Kouzes, J. M., & Posner, B. Z. (1993). *Credibility: How leaders gain and lose it, and why people demand it.* San Francisco: Jossey-Boss.

Kramer, R. M. (1989). Windows of vulnerability or cognitive illusion? Cognitive processes and the nuclear arms race. *Journal of Experimental Social Psychology, 25,* 79-100.

Kramer, R. M. (1994). The sinister attribution error: Paranoid cognition and collective distrust in organizations. *Motivation and Emotion, 18,* 199-230.

Kramer, R. M. (1999). Trust and distrust in organizations: Emerging perspectives, enduring questions. *Annual Review of Psychology, 50,* 569-598.

Kruglanski, A. W. (1970). Attributing trustworthiness in supervisor-worker relations. *Journal of Experimental Social Psychology, 6,* 214-232.

Lagace, R. R., & Gassenheimer, J. B. (1989). A measure of global trust and suspicion: Replication. *Psychological Reports, 65,* 473-474.

Larzelere, R. E., & Huston, T. L. (1980). The dyadic trust scale: Toward understanding interpersonal trust in close relationships. *Journal of Marriage and the Family, 42,* 595-604.

Lawley, D. N., & Maxwell, A. E. (1971). *Factor analysis as a statistical method.* London: Butterworths.

Leather, P. J. (1988). Attitudes towards safety performance on construction work: an investigation of public and private sector differences. *Work and Stress, 2,* 157-167.

Lee, T. (1998). Assessment of safety culture at a nuclear reprocessing plant. *Work and Stress, 12,* 217-237.

Lee, H. B., & Comrey, A. L. (1979). Distortions in a commonly used factor analytic procedure. *Multivariate Behavioral Research, 14,* 301–321.

Lee, T., & Harrison, K. (2000). Assessing safety culture in nuclear power stations. *Safety Science, 34,* 61-97.

Lefcourt, H. M. (1976). *Locus of control.* Erlbaum: Hillside, NJ.

Levinger, G., & Snoek, J. D. (1972). *Attraction in relationships: A new look at interpersonal attraction.* Morristown, NJ: General Learning Press.

Levinson, H. (1965). Reciprocation: The relationship between man and organization. *Administrative Science Quarterly, 9,* 370-390.

Lewicki, R. J., & Bunker, B. B. (1996). Developing and maintaining trust in work relationships. In R. M. Kramer, & T. R. Tyler (Eds.), *Trust in organizations. Frontiers of theory and research* (pp. 114-139). Sage Publications: USA.

Lewicki, R. J., McAllister, D. J., & Bies, R. J. (1998). Trust and distrust: new relationships and realities. *Academy of Management Review, 23,* 438-458.

Lewis, D. J., & Weigert, A. (1985). Trust as a social reality. *Social Forces, 63,* 967-985.

Liden, R. C., & Graen, G. (1980). Generalizability of the vertical dyad linkage model of leadership. *Academy of Management Journal, 23,* 451-465.

Lieberman, J. K. (1981). *The litigious society.* New York: Basic Books.

Locke, S. D., & Gilbert, B. O. (1995). Method of psychological assessment, self-disclosure and experiential differences: A study of computer, questionnaire and interview assessment forms. *Journal of Social Behavior and Personality, 10,* 255-263.

Luhmann, N. (1979). *Trust and power.* Chichester, England: Wiley.

Luhmann, N. (1988). Familiarity, confidence and trust: Problems and alternatives. In D. Gambetta (Ed.), *Trust* (pp. 94-107). New York: Basil Blackwell.

MacCallum, R. C., Widaman, K. F., Preacher, K. J., & Hong, S. (2001). Sample size in factor analysis: The role of model error. *Multivariate Behavioral Research, 36,* 611-637.

MacDonald, A. P., Kessel, V. S., & Fuller, J. B. (1972). Self-disclosure and two kinds of trust. *Psychological Reports, 63,* 143-148.

Manz, C. C., & Sims, H. P. (1993). *Business without bosses: How self-managing teams are building high-performing companies.* New York: Wiley.

March, J. G., & Oslen, J. P. (1994). *Democratic governance.* New York: Free Press.

Marottoli, R. A., Cooney, L. M., & Tinetti, M. E. (1997). Self-report versus state records for identifying crashes among older drivers. *Journal of Gerontology, 52,* 184-187.

Marsh, H. W. (1986). The bias of negatively worded items in rating scales for young children: A cognitive-developmental phenomenon. *Developmental Psychology, 22*, 37-49.

Marsh, H. W., & Hocevar, D. (1985). Application of confirmatory factor analysis to the study of self-concept: First- and higher order factor model sand their invariance across groups. *Psychological Bulletin, 97,* 562-582.

Masterson, S. S., Lewis, K., Goldman, B. M., & Taylor, M. S. (2000). Integrating justice and social exchange: The differing effects of fair procedures and treatment on work relationships. *Academy of Management Journal, 43,* 738-748.

Matell, M. S., & Jacoby, J. (1972). Is there an optimal number of alternatives for Likert Scale Items? *Journal of Applied Psychology, 56,* 506-509.

May, J. (1998). Safety since Piper Alpha. *Petroleum International*, 125-127.

Mayer, R. C., & Davis, J. H. (1999). The effects of the performance appraisal system on trust for management: A field quasi-experiment. *Journal of Applied Psychology, 84,* 123-136.

Mayer, R. C., Davis, J. H., & Schoorman, D. F. (1995). An integrative model of organizational trust. *Academy of Management Review, 20,* 709-734.

McAllister, D. J. (1995). Affect and cognition-based trust as foundations for interpersonal cooperation in organizations. *Academy of Management Journal, 38,* 24-59.

McAllister, D. J. (1997). The second face of trust: Reflections on the dark side of interpersonal trust in organizations. In R. J. Lewicki, & R. J. Bies (Eds.), *Research on negotiation in organizations* (pp. 87-111). Stamford, CT: JAI Press.

McCaul, K. D., O'Neil, H. K., & Glasgow, R. E. (1988). Predicting the performance of dental hygiene behaviors: An examination of the Fishbein and Ajzen model and self-efficacy expectations. *Journal of Applied Social Psychology, 18,* 114-128.

McCauley, D. P., & Kuhnert, K. W. (1992). A theoretical review and empirical investigation of employee trust in management. *Public Administrative Quarterly*, 265-284.

McCune, J. C. (1998). The elusive thing called trust: Trust in the workplace. *Management Review, 87,* 10-17.

McDonald, N., & Ryan, F. (1992). Constraints on the development of safety culture: A preliminary analysis. *Irish Journal of Psychology, 13,* 273-281.

McDonald, N., Corrigan, S., Daly, C., & Cromie, S. (2000). Safety management systems and safety culture in aircraft maintenance organizations. *Safety Science, 34,* 151-176.

McEvily, B., Perrone, V., & Zaheer, A. (2003). Trust as an organizing principle. *Organization Science, 14,* 91-103.

McFall, L. (1987). Integrity. *Ethics, 98,* 5-20.

McKay, J. R. (1991). Assessing aspects of object relations associated with immune function: Development of the affiliative trust-mistrust coding system. *Psychological Assessment, 3,* 641-647.

McKenna, F. P. (1983). Accident proneness: A conceptual analysis. *Accident Analysis and Prevention, 15,* 65-71.

McKnight, D. H., Cummings, L. L., & Chervany, N. L. (1998). Initial trust formation in new organizational relationships. *Academy of Management Review, 23,* 473-490.

McLean Parks, J., & Kidder, D. L. (1994). Till death us do part ... changing work relationships in the 1990's. In C. L. Cooper and D. M. Rousseau (Eds.), *Trends in organizational behavior* (pp. 111-133). Chichester: Wiley.

Mearns, K., Flin, R., Gordon, G., & Fleming, M. (1997). *Organisational and human factors in offshore safety.* OTH 543 Report, Suffolk: HSE Books.

Mearns, K., Flin, R., Gordon, G., & Fleming, M. (2001). Human and organizational factors in offshore safety. *Work Stress, 12,* 144-160.

Mearns, K., Whitaker, S. M., & Flin, R. (2003). Safety climate, safety management practice and safety performance in offshore environments. *Safety Science, 41,* 641-680.

Meier, S. T. (1994). *The chronic crisis in psychological measurement and assessment: A historical survey.* San Diego, CA: Academic Press.

Mernard, S. (2002). *Applied logistic regression analysis* (2nd ed.). Thousand Oaks, CA: Sage Pulbications. Series: Quantitative Applications in the Social Sciences, No. 106.

Messick, D. M., Wilke, H., Brewer, M. B., Kramer, R. M., Zemke, P. E., & Lui, L. (1983). Individual adaptations and structural changes as solutions to social dilemmas. *Journal of Personality and Social Psychology, 44,* 294-309.

Metlay, D. (1999). Institutional trust and confidence: A journey into a conceptual quagmire. In G. T. Cvetkovich, & R. E. Löfstedt (Eds.), *Social trust and the management of risk.* London: Earthscan.

Metts, S. (1994). Relational impressions. In W. Cupach, & B. Spitzberg (Eds.), *The dark side of interpersonal communication* (pp. 217-239). Hillside, NJ: Lawrence Erlbaum.

Miller, G. A. (1956). The magical number seven. Plus or minus two: some limits on our capacity for processing in formation. *Psychological Review, 63,* 81-97.

Mintz, A., & Blum, M. L. (1949). Re-examination of the accident proneness concept. *Journal of Applied Psychology, 33,* 195-211.

Mollering, G., Bachman, R., & Hee Lee, S. (2004). Introduction: Understanding organizational trust – foundations, constellations, and issues of operationalisation. *Journal of Managerial Psychology, 19,* 556-571.

Moorman, R. H., Blakely, G. L., & Niehoff, B. P. (1998). Does perceived organizational support mediate the relationship between procedural justice and organizational citizenship behavior? *Academy of Management Journal, 41,* 351-357.

Moreland, R. L., & Levine, J. M. (2002). Socialization and trust in work groups. *Group Processes and Intergroup Relations, 5,* 185-201.

Morgan, D. E., & Zeffane, R. (2003). Employee involvement, organizational change and trust in management. *International Journal of Human Resource Management*, *14,* 55-75.

Morgan, R. M. and Hunt, S. D. (1994). The commitment-trust theory of relationship marketing. *Journal of Marketing, 58,* 20-38.

Morrison, E. W. and Robinson, S. L. (1997). When employees feel betrayed: A model of how psychological contract violation develops. *Academy of Management Review, 22,* 226-257.

Mulaik, S. A. (1972). *Survey Methods in Social Investigation.* New York: Basic Books.

Nacci, P., Stapleton, R. E., & Tedeschi, J. T. (1973). An empirical restatement of the reciprocity norms. *Journal of Social Psychology, 91,* 263-271.

Nagelkerke, N. J. D. (1991). A note on a general definition of the coefficient of dermination. *Biometrika, 78,* 691-692.

Nagle, R. J., & Bell, N. L. (1994). Validation of an item-reduction short form of the Standford-Binet intelligence scale: fourth edition with college students. *Journal of Clinical Psychology, 51,* 63-70.

Nananidou, A. (2000). *A hierarchical model of safety attitudes: A study in four European countries.* Unpublished Doctorate Thesis. The University of Liverpool.

Nananidou, A., & Donald, I. (May, 2002). *Management's role in the safety system.* Presentation at Managers and Safety in High Reliability Organisations seminar, Aberdeen University.

Neal, A., Griffin, M. A., & Hart, P. M. (2000). The impact of organizational climate on safety climate and individual behavior. *Safety Science, 34,* 99-109.

Niskanen, T. (1994). Safety climate in the road administration. *Safety Science, 7,* 237-255.

Nunally, J. C. (1978). *Psychometric theory.* New York: McGraw-Hill.

Nunally, J. C., & Bernstein, J. H. (1994). *Psychometric theory* (3rd ed.). New York: McGraw-Hill.

O'Connor, P., & Flin, R. (2003). Crew Resource Management training for offshore oil production teams. *Safety Science, 41,* 591-609.

O'Dea, A., & Flin, R. (2001). Site managers and safety leadership in the offshore oil and gas industry. *Safety Science, 37,* 39-57.

O'Leary, M., & Chappell, S. L. (1993). Confidential incident reporting systems create vital awareness of safety programmes. *ICAO Journal, 51,* 11-13.

OECD Nuclear Agency (1987). *Chernobyl and the safety of nuclear reactors on OECD countries.* Organization for Economic Co-operation and Development, Paris.

Olearnik, H., & Canter, D. (1989). Empirical validation of the relationship between safety attitudes and industrial accidents. In *Proceedings of British Psychological Society London conference,* 19-20 September.

Omodei, M. M., & McLennan, J. (2000). Conceptualizing and measuring global interpersonal mistrust-trust. *The Journal of Social Psychology, 140,* 279-294.

Organ, D. W. (1988). *Organizational citizenship behavior.* Lexington, MA: Lexington Books.

Otnes, C., Lowrey, T. M., & Shrum, L. J. (1997). Toward an understanding of consumer ambivalence. *Journal of Consumer Research, 24,* 80-93.

Oxford English Dictionary (2002). Second Edition.

Parker, D. (May, 2002). *Measuring readiness to change in high-risk industry.* Paper presented at Managers and Safety in High Reliability Organisations seminar. Aberdeen University.

Parkes, K. R. (2002). *Psychological aspects of work and health in the North Sea oil and gas industry: Summaries of reports published 1996-2001.* Health and Safety Executive Report 002. London: HSE Books.

Parks, C. D., & Hulbert, L. G. (1995). High and low trusters' responses to fear in a payoff matrix. *Journal of Conflict Resolution, 39,* 134-151.

Parks, C. D., Henager, R. F., & Scamahorn, S. D. (1996). Turst and reactions to messages of intent in social dilemmas. *Journal of Conflict Resolution, 40,* 718-730.

Payer, H. (1998). ISM Code: the future impact. *Safety at Sea, 350,* 12-14.

Payne, R. L., & Clark, M. C. (2003). Dispositional and situational determinants of trust in two types of managers. *International Journal of Human Resource Management, 14,* 128-138.

Pearce, J. L., Somer, S. M., Morris, A., & Frideger, M. (1992). *A configurational approach to Interpersonal relations: Profiles of workplace social relations and task interdependence.* Unpublished manuscript, University of California at Irvine.

Perrow, C. (1984). *Normal accidents.* Basic Books: New York.

Peter, J. P. (1979). Reliability: A review of psychometric basics and recent marketing practices. *Journal of Marketing Research, 16,* 6-17.

Petty, R. E., & Cacioppo, J. T. (1996). Addressing disturbing and disturbed consumer behavior: Is it necessary to change the way we conduct behaviour research? *Journal of Marketing Research, 33,* 1-8.

Pfeffer, J. (1992). *Organizations and organization theory.* Pitman Publishing Inc., MA.

Pidgeon, N. (1991). Safety culture and risk management in organizations. *Journal of Cross Cultural Psychology, 22,* 129-140.

Pidgeon, N. (1998). Safety culture: key theoretical issues. *Work and Stress, 12,* 202-216.

Pidgeon, N., & O'Leary, M. (2000). Man-made disasters: Why technology and organizations (sometimes) fail. *Safety Science, 34,* 15-30.

Pidgeon, N., Walls, J., Weyman, A., & Horlick-Jones, T. (2003). *Perceptions of and trust in the Health and Safety Executive as a risk regulator.* Research Report 2003/100, Norwich: HSE Books.

Pilotte, W. J., & Gable, R. K. (1990). The impact of positive and negative item stems on the validity of a computer anxiety scale. *Educational and Psychological Measurement, 50,* 603-610.

Podaskoff, P. M., MacKenzie, S. B., Lee, J. Y., & Podaskoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology, 88,* 879-903.

Poortinga, W. & Pidgeon, N. (2003). Exploring the dimensionality of trust in risk regulation. *Risk Analysis, 23,* 961-972.

Porter, L. W., & Steers, R. M. (1973). Organizational work and personal factors in employee turnover and absenteeism. *Psychological Bulletin, 80,* 151-176.

Priester, J. R., & Petty, R. E. (1996). The gradual threshold model of ambivalence. Relating the positive and negative bases of attitudes to subjective ambivalence. *Journal of Personality and Social Psychology, 71,* 431-449.

Pruitt, D. G., & Kimmel, M. J. (1977). Twenty years of experimental gaming: Critique, synthesis, and suggestions for the future. *Annual Review of Psychology, 28,* 363-392.

Prussia, G. E., Brown, K. A., & Willis, P. G. (2003). Mental models of safety: Do managers and employees see eye to eye? *Journal of Safety Research, 34,* 143-156.

Pugh, S. D., Skarlicki, D. P., & Passell, B. S. (2003). After the fall: Layoff victims' trust and cynicism in re-employment. *Journal of Occupational and Organizational Psychology, 76,* 201-212.

Quigley-Fernandez, B., Malkis, F. S., & Tedeschi, J. T. (1985). Effects of first impressions and reliability of promises on trust and cooperation. *British Journal of Social Psychology, 24,* 29-36.

Ramsey, J. O. (1973). The effect of number of categories in rating scales on precision of estimation of scale values. *Psychometrika, 37*, 513-532.

Ramussen, J., & Jensen, A. (1974). Mental procedures in real-life tasks: A case study of electronic troubleshooting. *Ergonomics, 17,* 293-307.

Ratnasingham, P. (1999). Risks in low trust among trading partners in electronic commerce. *Computers and Security, 18,* 587-592.

Reason, J. T. (1991). *Human Error.* Cambridge University Press: Cambridge.

Reason, J. T. (1997). *Managing the Risks of Organizational Hazards.* Ashgate: Alsershot.

Reason, J. T. (1998). Achieving a safety culture: theory and practice. *Work and Stress, 12,* 293-306.

Reichers, A. E., & Schneider, B. (1990). Climate and culture: An evolution of constructs. In B. Schneider (Ed.), *Organizational climate and culture* (pp. 5-39). San Francisco: Jossey Bass.

Reis, H. T., Wheeler, L., Kermis, M. H., Spiegel, N., & Nezleck, J. (1985). On specificity in the impact of social participation on physical and psychological health. *Journal of Personality and Social Psychology, 48,* 456-471.

Reisel, W. D., & Banai, M. (2002). Comparison of a multidimensional and a global measure of job insecurity: Predicting job attitudes and work behaviors. *Psychological Reports, 90,* 913-922.

Rempel, J. K., Holmes, J. G., & Zanna, M. P. (1985). Trust in close relationships. *Journal of Personality and Social Psychology, 49,* 95-112.

Richter, A., & Koch, C. (2004). Integration, differentiation and ambiguity in safety culture. *Safety Science, 42*, 703-722.

Ring, S. M. & Van de Ven, A. (1992). Structuring cooperative relationships between organizations. *Strategic Management Journal, 13,* 483-498.

Robiner, W. N., Dossa, D., & O'Dowd, W. (1988). Abbreviated WAIS-R procedures: Use and limitations with head-injured patients. *Clinical Neuropsychologists, 2,* 365-374.

Robinson, S. L. (1996). Trust and breach of the psychological contract. *Administrative Science Quarterly, 41,* 574-599.

Rogers, R. W. (1995). The psychological contract of trust. Part 1 and 2. *Executive Development, 8,* 7-19.

Rosen, B., & Jerdee, T. H. (1977). Influence of subordinate characteristics on trust and use of participative decision strategies in a management simulation. *Journal of Applied Psychology, 62,* 628-631.

Rosen, M. (1997). Towards a global nuclear safety culture. *Nuclear Energy, 36,* 287-289.

Rosenberg, M. (1965). *Society and the adolescent self-image.* Princeton University Press, Princeton.

Rosenberg, M. J., & Hovland, C. I. (1960). Cognitive, affect and behavioral components of attitudes. In C. I. Hovland, & M. J. Rosenberg (Eds.), *Attitude, organization and change: An analysis of consistency among attitude components* (pp. 1-14). New Haven, CT: Yale University Press.

Rotter, J. B. (1967). A new scale for the measurement of interpersonal trust. *Journal of Personality, 35,* 651-665.

Rotter, J. B. (1971). Generalized expectancies for interpersonal trust. *American Psychologist, 26,* 443-452.

Rotter, J. B. (1980). Interpersonal trust, trustworthiness and gullibility. *American Psychologist, 35,* 1-7.

Rummel, R. J. (1970). *Applied factor analysis.* Evanston: Northwestern University Press.

Rundmo, T. (1994). Associations between organizational factors and safety and contingency measures on offshore petroleum platforms. *Scandinavian Journal of Work, Environment and Health, 20,* 128-131.

Rundmo, T. (1992). Risk perception and safety on offshore petroleum platforms. Part II: Perceived risk, job stress and accidents. *Safety Science, 15,* 53-68.

Rundmo, T. (1996). Associations between risk perception and safety. *Safety Science, 24,* 197-209.

Rundmo, T. (2000). Safety climate, attitudes and risk perception in Norsk Hydro. *Safety Science, 34,* 47-59.

Rundmo, T., Hestad, H., & Ulleberg, P. (1998). Organisational factors, safety attitudes and workload among offshore personnel. *Safety Science, 29,* 75-87.

Rundmo, T., & Sjoberg, L. (1996). Employee risk perception related to offshore oil platform movements. *Safety Science, 24,* 211-227.

Sagarin, B. J., Rhoads, K. L., & Cialdini, R. B. (1998). Deceiver's distrust: Denigration as a consequence of undiscovered deception. *Personality and Social Psychology Bulletin, 24,* 1167-1176.

Salancik, G. R. & Pfeffer, J. (1977). An examination of the need-satisfaction models of job attitudes. *Administrative Science Quarterly, 22,* 427-456.

Salvia, J., & Ysseldyke, J. (1988). *Assessment in special and remedial education* (4th ed.). Boston: Houghton Mifflin.

Satz, P., & Model, S. (1962). An abbreviation of the WAIS for clinical use. *Journal of Clinical Psychology, 18,* 77-79.

Schein, E. H. (1990). Organizational Culture. *American Psychologist, 45,* 109-119.

Schein, E. H. (1992). *Organizational Culture and Leadership.* 2nd Edition.

Scher, C. D., Stein, M. B., Ingram, R. E., Malcarne, V. L., & McQuaid, J. R. (2002). The Parent Threat Inventory: Development, reliability, and validity. *Child Abuse and Neglect, 26,* 207-225.

Schill, T., Toves, C., & Ramanaiah, N. V. (1980). Interpersonal trust and coping with stress. *Psychological Reports,47,* 1192.

Schlenker, B. R., Helm, B., & Tedeshci, J. T. (1973). The effects of personality and situational variables on behavioral trust. *Journal of Personality and Social Psychology, 25,* 419-427.

Schmitt, N., & Stults, D. M. (1985). Factors defined by negatively keyed items: The result of careless respondents? *Applied Psychological Measurement, 9,* 367-373.

Schneider, B. (1975). Organizational climates: An essay. *Personnel Psychology, 28,* 447-479.

Schoorman, F. D., Mayer, R. C., & Davis, J. H. (1996). *Empowerment in veterinary clinics: The role of trust in delegation.* Paper presented at the 11th annual meeting of the Society of Industrial and Organizational Psychology, San Diego, CA.

Scott, C. L. (1980). Interpersonal trust: A comparison of attitudinal and situational factors. *Human and Organization Studies, 8,* 319-336.

Seiders, K., & Berry, L. I. (1998). Serive Fairness: What it is and why it matters. *Academy of Management Executive, 12,* 8-20.

Settoon, R. P., Bennett, N., & Liden, R. C. (1996). Social exchange in organizations: Perceived organizational support, leader-member exchange and employee reciprocity. *Journal of Applied Psychology, 81,* 219-227.

Shannon, H. S., Mayr, J., & Haines, T. (1997). Overview of the relationship between organizational and workplace factors and injury rates. *Safety Science, 26,* 201-217.

Shannon, H. S., Walters, B., Lewchuk, W., Richardson, J., Moran, L. A., Haines, T., & Verma, D. (1996). Workplace organizational correlates of lost time accident rates in manufacturing. *American Journal of Industrial Medicine, 29,* 258-268.

Shapiro, D. L., Sheppard, B. H., & Cheraskin, L. (1992). Business on a handshake. *Negotiation Journal, 8,* 365-377.

Shapiro, S. P. (1987). The social control of interpersonal trust. *American Journal of Sociology, 93,* 623-658.

Shaw, R. B. (1997). *Trust in the balance.* San Fransisco: Jossey-Bass.

Shore, L. M., & Shore, T. H. (1995). Perceived organizational support and organizational justice. In R. S. Cropanzano & K. M. Kacmar (Eds.), *Organizational politics, justice and support: Managing the social climate of the workplace.* Westport, CT: Greenwood.

Shye, S. (1978). *Theory construction and data analysis in behavioral sciences.* San Fransisco: Jossey-Bass.

Silverstein, A. B. (1968). Validity of a new approach to the design of WAIS and WASC, and WPPSI short forms. *Journal of Consulting and Clinical Psychology, 32,* 478-479.

Simmons, T. (1999). Behavioral integrity as a critical ingredient for transformational leadership. *Journal of Organizational Change Management, 12,* 89-104.

Sitkin, S. B., & Roth, N. L. (1993). Explaining the limited effectiveness of legalistic "remedies" of trust/distrust. *Organization Science, 4,* 367-392.

Siu, O. (2001). A study of safety climate, work stress and safety performance among construction workers in Hong Kong: A facet approach. In Proceeding of Facet Theory: *Integrating theory construction with data analysis*, July 15-18, Prague, Czech Republic.

Siu, O., Phillips, D.R., & Leung, T. (2003). Safety climate and safety performance among construction workers in Hong Kong. The role of psychological strains as mediators. *Accident Analysis and Prevention, 36,* 359-366.

Smircich, L. (1983). Concepts of culture and organizational analysis. *Administrative Science Quarterly, 28,* 339-358.

Smith, J. A. (1995). Semi-structured interviewing and qualitative analysis. In J. A. Smith (Ed.), *Rethinking methods in psychology* (pp.9-26). London: Sage.

Solomon, L. (1960). The influence of some types of power relationships and game strategies upon the development of interpersonal trust. *Journal of Abnormal and Social Psychology, 61,* 223-230.

Stack, L. C. (1978). Trust. In H. London, & J. E. Exner (Eds.), *Dimensionality of personality*, (pp. 561-599). New York: Wiley.

Stallings, M. C., Dunham, C. C., Gatz, M., & Bengston, V. L. (1997). Relationships among life events and psychological well-being: More evidence for a two-factor theory of well-being. *Journal of Applied Getontology, 16,* 104-119.

Stetzer, A., Morgeson, F. P., & Anderson, E. L. (1997). Organizational climate and ineffectiveness: Evidence from 25 outdoor work crew divisions. *Journal of Quality Management, 2,* 251-265.

Stewart, K. J. (2003). Trust transfer on the World Wide Web. *Organization Science, 14,* 5-17.

Strickland, L. H. (1958). Surveillance and trust. *Journal of Personality*, 26, 200-215.

Sutherland, V., & Davidson, M. (1993). Using a stress audit: The construction site manager experience in the United Kingdom. *Work and Stress, 7,* 273-286.

Sutherland, K. M. & Flin, R. H. (1989). Stress at sea: A review of working conditions in the offshore oil and fishing industries. *Work and Stress, 3,* 269-285.

Symonds, P. M. (1924). On the loss of reliability in ratings due to coarseness of the scale. *Journal of Experimental Psychology, 7,* 456-461.

Tabacknick, B. G. & Fidell, L. S. (2001). *Using multivariate statistics.* (4th ed.). New York: Allyn & Bacon.

Tajfel, H. (1982). Instrumentality, identity and social comparisons. In H. Tajfel (Ed.), *Social identity and intergroup relations* (pp. 483-507). Cambridge, England: Cambridge University Press.

Tajfel, H., & Turner, J. C. (1986). The social identity theory of intergroup behaviour. In S. Worchel & W. G. Austin (Eds.), *Psychology of intergroup relations* (pp. 7-24). Chicago, IL: Nelson-Hall.

Tan, H. H., & Tan, C. S. F. (2000). Toward the differentiation of trust in supervisor and trust in organization. *Genetic, Social, and General Psychology Monographs*, *126,* 241-260.

Tanaka, J. (1993). Multifaceted conceptions of fit in structural equation models. In J. A. Bollen, & J. S. Long (Eds.), *Testing structural equation models* (pp. 10-39). Newbury Park, CA: Sage.

Terry, D. J., Hogg, M. A., & White, K. M. (1999). The theory of planned behavior: Self-identity, social identity and group norms. *British Journal of Social Psychology, 38,* 225-244.

Thibaut, J. W., & Kelly, H. H. (1991). *The social psychology of groups.* New Brunswick, CT: John Wiley and Sons.

Thompson, R. C., Hilton, T. F., & Witt, A. L. (1998). Where the safety rubber meets the shop floor: A confirmatory model of management influence on workplace safety. *Journal of Safety Research, 29,* 15-24.

Throop, W. F., & MacDonald, A. P. (1971). Internal-external locus of control: A bibliography. *Psychological Report Monographs Supplement, 28,* 175-190.

Tinmannsvik, R. K., & Hovden, J. (2003). Safety diagnosis criteria – development and testing. *Safety Science, 41,* 575-590.

Tinsley, D. B. (1996). Trust plus capabilities. *The Academy of Management Review, 21,* 335-338.

Tucker, L. R., & Lewis, C. (1973). A reliability coefficient for maximum likelihood factor analysis. *Psychometrika, 38,* 1-10.

Tukey, J. W. (1953). *The problem of multiple comparisons*. Unpublished manuscript, Princeton University.

Turner, B. A. (1976). The organizational and interorganizational development of disasters. *Administrative Science Quarterly, 21*, 378-397.

Turner, B. A. (1988). Connoisseurship in the study of organizational cultures. In A. Bryman (Ed.), *Doing research in organizations (*pp. 108-122). London: Routledge.

Turner, B. A., Pidgeon, N., Blockely, D., & Toft, B. (1989). *Safety culture: Its importance in future risk management.* Position paper for the Second World Bank Workshop on Safety Control and Risk Management. Karlstead, Sweden.

Turnley, W. H., & Feldman, D. C. (2000). Re-examining the effects of psychological contract violations: Unmet expectations and job dissatisfaction as mediators. *Journal of Organizational Behavior, 21*, 25-42.

Tyler, T., & Lind, E. A. (1992). A relational model of authority in groups. In M. Zanna (Ed.), *Advances in experimental psychology* (Vol. 25, pp. 115-192). New York: Academic Press.

Tyler, T. R. (2003). Trust within organizations. *Personnel Review, 32,* 556-568.

Tyler, T. R., & DeGoey, P. (1996). Trust in organizational authorities: The influence of motive attributions on willingness to accept decisions. In R. M. Kramer & T. R. Tyler (Eds.), *Trust in organizations. Frontiers of theory and research* (pp. 331-357). London: Sage.

Tyler, T. R., & Kramer, R. M. (1996). Whither trust? In R. M. Kramer and T. R. Tyler (Eds.), *Trust in organizations. Frontiers of theory and research* (pp. 1-15). London: Sage.

Tzeng, O. C. S. (1992). On reliability and number of principal components: Joiner with Cliff and Kaiser. *Perceptual and Motor Skills, 75,* 929–930.

UKOOA (2004). *Maximising Britain's oil and gas resource.* UK Offshore Oil Association 2004 economic report.

Van den Bos, K., Wilke, A. M., & Lind, E. A. (1998). When do we need procedural fairness? The role of trust in authority. *Journal of Personality and Social Psychology, 75,* 1449-1458.

Van Dyne, L., & Ang, S. (1998). Organizational citizenship behavior of contingent workers in Singapore. *Academy of Management Journal, 41,* 692-703.

Van Vuuren, W. (2000). Cultural influences on risk and risk management: six case studies. *Safety Science, 34,* 31-45.

Velicer, W. F., & Fava, J. L. (1987). An evaluation of the effects of variable sampling on component, image, and factor patterns. *Multivariate Behavioral Research, 22,* 193-209.

Velicer, W. F., & Jackson, D. N. (1990) Component analysis versus common factor analysis: Some issues for selecting an appropriate procedure. *Multivariate Behavioral Research, 25*, 1-28.

Wagenaar, W. A. (1992). Risk-taking and accident causation. In J. Yates (Ed.), *Risk-taking behaviour*. Chichester: Wiley.

Walster, E., Berscheid, E., & Walster, G. W. (1976). New directions in equity research. In L. Berkowitz, & E. Walster (Eds.), *Advances in experimental social psychology* (Vol. 9, pp. 1-42). New York: Academic Press.

Warr, P. B., Barter, J., & Brownridge, G. (1983). On the independence of positive and negative affect. *Journal of Personality and Social Psychology, 44,* 644-651.

Watson, D., & Tellegen, A. (1985). Toward a consensual structure of mood. *Psychological Bulletin, 98,* 219-235.

Wayne, S. J., Shore, L. M., Bommer, W. H., & Tetrick, L. E. (2002). The role of fair treatment and rewards in perceptions of organizational support and leader-member exchange. *Journal of Applied Psychology, 87,* 590-598.

West, S. G., Finch, J. F., & Curran, P. J. (1995). Structural equation models with nonnormal variables: Problems and remedies. In R. H. Hoyle (Ed.), *Structural equation modeling: Concepts, issues and applications* (pp. 56-75). Thousand Oaks, CA: Sage.

Wheeless, L. R. (1978). A follow-up study of the relationship among trust, disclosure, and interpersonal solidarity. *Human Communication Research, 4,* 143-157.

Whitener, E. M. (2001). Do "high commitment" human resource practices affect employee commitment? A cross-level analysis using hierarchical linear modeling. *Journal of Management, 27,* 515-535.

Whitener, E. M. (1997). The impact of human resource activities on employee trust. *Human Resource Management Review, 7,* 389-404.

Whitener, E. M., Brodt, S. E., Korsgaard, A. M., & Werner, J. M. (1998). Managers as initiators of trust: An exchange framework for understanding managerial trustworthy behaviour. *Academy of Management Review, 23,* 513-530.

Wiggins, J. S. (1979). A psychological taxonomy of trait-descriptive terms: The interpersonal domain. *Journal of Personality and Social Psychology, 37,* 395-412.

Williams, M. (2001). In whom we trust: group membership as an affective context for trust development. *Academy of Management Review, 26,* 377-396.

Williams, R. B., Barefoot, J. C., & Shekelle, R. B. (1985). The health consequences of hostility. In M. A. Chesney & R. H. Rosenham (Eds.), *Anger and hostility in cardiovascular and behavioural disorders* (pp. 173-185). Washington DC: Hemisphere.

Williamson, A. M., Feyer, A., Cairns, D., & Biancotti, D. (1997). The development of a measure of safety climate: The role of safety perceptions and attitudes. *Safety Science, 2,* 55-65.

Wong, E. S., Then, D., & Skitmore, M. (2000). Antecedents of trust in intra-organizational relationships within three Singapore public sector construction project management agencies. *Construction Management and Economics, 18,* 797-806.

Wrightsman, L. S. (1974). *Assumption about human nature: A social psychological approach.* Monterey CA: Brooks & Cole.

Wrightsman, L. S. (1991). Interpersonal trust and attitudes towards human nature. In J. Robinson, P. Shaver, & L. S. Wrightsman (Eds.), *Measures of personality and social psychological attitudes* (pp. 373-412). San Diego, CA: Academic Press.

Young, S., & Chalk, J. (1995). *Attitudinal and organizational contributions to safety.* Final report to BP Oil Grangemouth Ltd.

Yudin, L. W. (1966). An abbreviated form of the WISC for use with emotionally disturbed children. *Journal of Consulting Psychology, 30,* 272-294.

Zaccoro, S. J., & Dobbins, G. H. (1989). Contrasting group organizational commitment: Evidence for differences among multilevel attachments. *Journal of Organizational Behaviour, 10,* 267-273.

Zaheer, A., McEvily, B., & Perrone, V. (1998). Does trust matter? Exploring the effects of interorganizational and interpersonal trust on performance. *Organization Science, 9,* 141-159.

Zand, D. E. (1972). Trust and managerial problem solving. *Administrative Science Quarterly, 17,* 229-239.

Zeffane, R., & Connell, J. (2003). Trust in the workplace. *International Journal of Human Resource Management, 14,* 3-11.

Zohar, D. (1980). Safety climate in industrial organizations: Theoretical and applied implications. *Journal of Applied Psychology, 65,* 96-102.

Zohar, D. (2002). Modifying supervisory practices to improve subunit safety: A leadership-based intervention model. *Journal of Applied Psychology, 87,* 156-163.

Zucker, L. G. (1986). Production of trust: Institutional sources of economic structure. *Research in Organizational Behavior, 8,* 53-111.

Zwick, W. R., & Velicer, W. F. (1982). Factors influencing four rules for determining the number of components to retain. *Multivariate Behavioral Research, 17,* 253–269.

Zwick, W. R., & Velicer, W. F. (1986). Comparison of five rules for determining the number of components to retain. *Psychological Bulletin, 99,* 432-442.

Appendix

Appendix A

Safety

- I'm interested in your concerns about safety. When you think about safety what springs to mind?
  - Safety equipments
  - Safety training
  - Safety communication
  - **Teamwork** – (ask with relation to trust also)
- Do you think any of these aspects are more important than others?
- Who do you think is responsible for safety? Who has the most influences on your safety performance (e.g., senior managers, supervisors, etc.).What are your opinions about safety systems?
- Would you say there was pressure to work in an unsafe manner?
- Do you think the recent restructuring (e.g., **redundancies**) affect your safety?

Trust/Distrust

Ranking Exercise - Levels of Trust in different occupational groups

- Explain trust ratings. On what basis where they made? Do you differentiate between trust of the individual and trust of the organization? **EXAMPLE**
- Does the HSE officer play a major role offshore? Safety reps? - Trust
- Where did you get this information from to base these ratings on?
  - Third parties
  - Reputation/past experiences – e.g., employing company
  - Personal characteristics – **Trustworthiness**
  - Which source of information do you think is most important?
- Who do you think there is more trust between, contractors or operators?
- Do you think trust/distrust affects your safety?
  - Communication, co-operation, decision latitude, etc.
- Do you think trust could have a negative effect on your safety? Could distrust be a good thing?

Domains

- Are there other aspects of your work that you think affect your safety?
  - Productivity, task overload/ time constraints, skill shortages, redundancy
- Who do you think is responsible for these? Do you think trust is important in these areas? For what reasons?

Close: Thank Participants

Figure A1: Interview Schedule

Appendix B

Table A1: Ranking exercise table

Job Title ....

Employer: Contracting company / Operating company *(delete as appropriate)*

Please mark with a tick your level of trust/distrust in each of the occupational groups (listed in the left hand column) with relation to safety. Tick as many as applies for each group.

Target of Trust		Distrust			Neutral (Neither trust nor distrust)	Trust		
		Great Deal	**Some Extent**	**Very Little**		**Very Little**	**Some Extent**	**Great Deal**
	Operating Company							
	Contracting Company							
	OIM							
	Supervisor:							
	Operator							
	Contractor							
	Maintenance							
	Production							
	Construction							
	Drillers							
	Deck Crew							
	Catering							
	Admin. Staff							
	HSE officer							

Appendix C: Categories, codes and definitions from interviews

Code	Definition
Trust:	
-Antecedents	
Ability	
Competent	Self-explanatory
Experience	Past experience with another
Job standard-high	Carrying out jobs to a high standard (i.e., safely)
Knowledge	Of industry and own job (skills)
Qualifications	Work related qualifications
Integrity	
Behavioural integrity	Consistency between words and actions
Consistent	Self-explanatory
Credible	Believable – trustworthy characteristic
Fair	Used with respect to rule enforcement
Openness	On safety and other job issues
Personal integrity	Truth telling
Truth	Self-explanatory
Benevolence	
Care	Company/individual expressing care regarding safety
Considerate	Consideration of others when making safety decisions
Genuine	Self-explanatory
Honesty	Self-explanatory
Kind	Self-explanatory
OIM support	Management support of the workforce on safety issues
Rapport	Bond with management
Support	On safety issues and in general
Other	
Background	Background info used to decide others trustworthiness
Clear personality	Trustworthiness characteristic
Common goal	Shared goals facilitating trust development
Mutual respect	Between management and worker and within workers
-Types	
Implicit trust	e.g., to carry out a job safely based on perceived ability
Individual trust	Trust at an individual level
Individual vs. company	Influences in trust development directly compared
Initial mistrust	Self-explanatory
Professional (dis)trust	(Dis)trust in the way an individual carried out a job
Reciprocal trust	Importance of both parties trusting each other
Trust meaning	What trust means to worker (i.e., their understanding)
- Levels	
Build trust	Discussion of the development of trust
Earn trust	Link to the code 'build trust'
First impressions	Self-explanatory
Levels of trust	Discussion of levels of trust between groups offshore
Third parties	Influence of third parties in trust development
Trust deterioration	Reductions in trust levels offshore over time

Trust development	Discussion of how trust develops
-Atmospheres	
Bonding	Bonding between group members
Confidant	Individual told personal information to in confidence
Family	Likening offshore groups to families
Friends	Offshore workers likened to friends
Psychological safety	Feeling able to express concerns without consequences
Rely	Reliance on others to carry out tasks, etc.
Leadership Qualities	
Coach	Used to refer to supervisor
Decision maker	Used to refer to management-linked into military type
Dictatorial	Management style
Follower	Company looking for a follower rather than a leader
Isolationist	No decision latitude to workers, lack open communication
Leader	Supervisor that leads team (trustworthy characteristic)
Manipulator	OIM style
Military type	OIM style
Reputation management	Management/company wanting to be seen in positive light
Distrust	
-Antecedents	
Ability	
Lack competency	To manage people or carry out certain job
Integrity	
2-faced	Used to refer to management
Covert behaviour	Carrying out hidden safety checks
Credit	Taking credit for others good work
Evasive	Ambiguous
Inconsistent	Lack of consistency in actions/words
Lying	Self-explanatory
Secrecy	Self-explanatory
Unfair	New starts unequal status/taking blame for shortfalls
Vague	Management vague on safety issues
Benevolence	
Career man	Career aspirations leading to breach of safety
Company man	Management pleasing company (safety jeopardised)
Figure fixing	Company fixing figures to create favourable impression
Non-team player	Distrust characteristic
Other	
Distrust	Mentions of distrust of another
Vague	Management vague on safety issues
Safety	
-State	
Disaster	Reference to the Piper Alpha
Good company	Good companies taking a proactive approach to safety
Improved safety	Safety standards improved over years
Legal pressure	Legal pressure to adhere to safety standards

Personal safety	Safety of personal self
Rule enforcement	Enforcing rules as a basis to establish good behaviour
Unsound decisions	Made by supervisors/management that jeopardise safety
Workforce safety	Safety of the workforce
-Systems	
Audits	Mention of safety audits
Formal SMS	Discussion of paperwork, white letters, etc.
Housekeeping	Of installation/rig
HSE	Reference to the heath and safety executive
Individual responsibility	Individual responsibility for safety
Just culture	Discussions of Just culture and associated training
Paperwork	Less accidents offshore because paperwork increased
PPE	Mention of PPE
Responsibility-everyone	Whole workforce responsible for safety
Safety initiative	Discussions of safety initiatives
Safety systems	Mention of safety system (usually regarding management)
STOP system	Mention of the STOP system safety initiative
Tailored approached	Safety approach tailored to individual/platform
-Behaviour	
Compliance	Following safety procedures
Confrontation	Raising issues that not happy about regarding safety
Human-error variation	Different reasons why individual make mistakes
Incidents	Self-explanatory
Mistakes	Self-explanatory
Negligence	Carry out job in a haphazard way
Personality vs. situational	Situational factors having more influence on safety performance compared to personality factors
Rechecks	Rechecking another's work
Risk refusal	Refusal to carry out job regarded as risky
Safety attitudes	Attitudes towards safety
Safety commitment	Commitment to safety
Safety demonstration	Demonstration of a commitment to safety
Self-imposed pressure	To work in an unsafe way (cf. 'risk refusal')
Short-cuts	Unsafe performance to complete job quickly
Supervisors influence	Influence of supervisors on safety performance
Unsafe behaviour	Self-explanatory – (link to 'short-cuts')
-Negative influence	
Cost-cutting	Reducing staff / maintenance to increase profits
Figure fixing	'Fixing' figure to create favourable company impression
Maintenance	Mention of maintenance – good or bad
Management pressure	Pressure from management to breach safety standards
Production before safety	Production emphasised over safety
Profit	Discussion of profit and its affect on safety
Safety influence	Mention of who influences safety
Task overload	Too many tasks to complete (negative effect on safety)

Communication	
1-way communication	Management to workers
Blame	Attribution of blame for accidents to workers
Degrading	Communication degrading
Education vs. blame	Suggestion of educating workers rather than blaming them
Feedback	On safety issues
Informal discussion	Between OIM and workers
Information overload	Self-explanatory
Lack consultation	With workers about restructuring plans
Listening	Management listening to workers about safety issues
Miscommunication	Regarding safety
Political talk	Managements approach when discussing safety
Safety discussion	Self-explanatory
Safety suggestions	Suggestions of how safety may be improved
Threat	Discussion between workers regarded as threat by management
Withholding information	OIM not informing workers of decisions/actions
Within workforce	Communication between workforce members
Workgroup dynamics	
Contractor vs. operator	Comparisons between contractor and operator staff
Contractor-host r/ship	Relationship between contractors and operator company
Contractors	Mention of contractor staff
Frequency interaction	Between contractor and operator staff (and within groups)
Group separation	Splitting up group after teambuilding exercises
OIM/company divide	Division between OIM and company
Onshore/offshore divide	Division between onshore and offshore
Operators	Mention of operator staff
Subgroups and politics	Political undercurrents when have multiple subgroups
Supervisors	Mention of supervisors
Supervisors dual role	Supervisors managing safety and ensuring task completion
Teamwork	
Team building	Teambuilding exercises/training, etc.
Team consensus	Agreement within a team about safety issues
Team player	Trustworthy characteristics (team participation)
Teamwork	Self-explanatory
Teamwork-fragile	Reference of teamwork as fragile
Teamwork-negative	Teamwork perceived to have negative effects
Trust and team working	Pivotal role of trust in teams
Offshore Environment	
Job experience	Learn from experience of carrying out a job
Low morale	Between offshore workers/ within the industry
Multi-skill	Workers required to do more than one job
Professional	Carrying out jobs in a professional way
Redundancy	Down sizing to increase profits
Stress	Stress associated with working offshore
Work vs. home	Mention of conflict of work and home balance

Appendix D

Original version of The Trust Climate and Safety Questionnaire

THE UNIVERSITY
of LIVERPOOL

Safety Research Unit

Trust Climate and Safety Questionnaire - 2003

The University of Liverpool is carrying out research into safety on your installation. To do this we rely on information about safety from you. We would therefore be grateful if you would take the time to complete the following questionnaire.

All the information provided will be treated **in the strictest confidence**. The questionnaires will not be seen by any member of the organization other than yourself. Only the Safety Research Unit at the University of Liverpool will have access to the questionnaires. Only general trends will be reported. **No individual will be identified.**

Please put your completed questionnaires in the FREEPOST envelope provided and mail it directly to us at the University of Liverpool. **No stamp is needed.**

Thank you very much for your help with this project.

Stacey Conchie

INSTRUCTIONS

On the following pages there are a number of statements about those you work with. Please show how much you agree with each statement by putting a circle around the number that best represents YOUR view.

Do not spend too long thinking about each statement. Give your opinion as quickly as possible. Please give your opinion of all the statements.

Please complete the questionnaire on your own.

WE WOULD BE GRATEFUL IF YOU COULD RETURN THE QUESTIONNAIRE A WEEK AFTER RECEIVING IT USING THE FREEPOST ENVELOPE PROVIDED

Section One: YOUR WORKMATES	Very Strongly Disagree	Strongly Disagree	Disagree	Neither Disagree nor Agree	Agree	Strongly Agree	Very Strongly Agree
1. I trust that my workmates are competent in their own areas	1	2	3	4	5	6	7
2. I can trust my workmates to support me if I had a complaint about safety	1	2	3	4	5	6	7
3. Generally, I don't trust my workmates	1	2	3	4	5	6	7
4. My workmates are kind and thoughtful	1	2	3	4	5	6	7
5. I can't trust my workmates to maintain high levels of safety even when they say they will	1	2	3	4	5	6	7
6. I can trust my workmates to be open and honest when it comes to mistakes they might have made	1	2	3	4	5	6	7
7. My workmates lack the ability to decide if a job is safe to carry out	1	2	3	4	5	6	7
8. The people I work with know the difference between having a laugh and doing the job safely	1	2	3	4	5	6	7
9. I can trust my workmates to tell the truth	1	2	3	4	5	6	7
10. My workmates are not experienced offshore workers	1	2	3	4	5	6	7
11. My workmates don't care about my safety	1	2	3	4	5	6	7
12. The people I work with would take credit for something they haven't done	1	2	3	4	5	6	7
13. My workmates would disclose to others information that I had told them in confidence	1	2	3	4	5	6	7
14. I trust the people I work with to carry out jobs safely	1	2	3	4	5	6	7
15. My workmates are not afraid to stop a job if they think it is unsafe	1	2	3	4	5	6	7

Section Two: YOUR SUPERVISOR

1. I can trust my supervisor to be fair in the way he deals with safety incidents	1	2	3	4	5	6	7
2. I can trust my supervisor's judgement when it comes to safety	1	2	3	4	5	6	7
3. I don't trust my supervisor's ability to make sure jobs are carried out in a safe way	1	2	3	4	5	6	7

		Very Strongly Disagree	Strongly Disagree	Disagree	Neither Disagree nor Agree	Agree	Strongly Agree	Very Strongly Agree
4.	I often find that what my supervisor says is untrue	1	2	3	4	5	6	7
5.	My supervisor would go out of his way to help me	1	2	3	4	5	6	7
6.	My supervisor is not willing to listen to concerns I might have about safety	1	2	3	4	5	6	7
7.	I trust my supervisor to make decisions that affect me	1	2	3	4	5	6	7
8.	I can talk to my supervisor and know that he will want to listen	1	2	3	4	5	6	7
9.	I can't trust my supervisor with a job that impacts on my safety	1	2	3	4	5	6	7
10.	My supervisor keeps the promises that he makes	1	2	3	4	5	6	7
11.	My supervisor often emphasises safety publicly but then cuts corners when carrying out his job	1	2	3	4	5	6	7
12.	My supervisor wants a job done safely even if it means extra time or extra cost	1	2	3	4	5	6	7
13.	My supervisor is incompetent when it comes to managing his team	1	2	3	4	5	6	7
14.	I trust my supervisors ability to do his job	1	2	3	4	5	6	7
15.	My supervisor is afraid of upsetting management	1	2	3	4	5	6	7

Section Three: OFFSHORE MANAGEMENT

1.	Management frequently demonstrate their commitment to safety	1	2	3	4	5	6	7
2.	Management like to blame people when mistakes are made	1	2	3	4	5	6	7
3.	I can trust management to do what they say they will do	1	2	3	4	5	6	7
4.	I am not confident in management's skills	1	2	3	4	5	6	7
5.	Management will overlook safety issues to advance their career	1	2	3	4	5	6	7
6.	Management are honest when it comes to safety	1	2	3	4	5	6	7
7.	I have a good rapport with management	1	2	3	4	5	6	7

		Very Strongly Disagree	Strongly Disagree	Disagree	Neither Disagree nor Agree	Agree	Strongly Agree	Very Strongly Agree
8.	I can trust management to make sure the installation is run in a safe way	1	2	3	4	5	6	7
9.	Management are well qualified	1	2	3	4	5	6	7
10.	Management is successful at ensuring safety policies are adhered to offshore	1	2	3	4	5	6	7
11.	Management lie about safety standards offshore to create a favourable picture	1	2	3	4	5	6	7
12.	I am suspicious of the motives behind management's actions	1	2	3	4	5	6	7
13.	Management are vague when answering questions the workforce have about issues that affect them	1	2	3	4	5	6	7
14.	Management lack the experience needed to know how to do a job safely	1	2	3	4	5	6	7
15.	I trust management on my installation	1	2	3	4	5	6	7

Section Four: SAFETY PERSONNEL

1.	My safety representatives are open and honest	1	2	3	4	5	6	7
2.	I can trust my safety officer to give me feedback	1	2	3	4	5	6	7
3.	I can trust my safety representatives to listen to suggestions I might have about how safety can be improved	1	2	3	4	5	6	7
4.	My safety officer rarely supports the workforce when they raise safety issues	1	2	3	4	5	6	7
5.	Safety representatives have my best interests at heart	1	2	3	4	5	6	7
6.	My safety representatives lack the expertise required to represent the workforce on safety issues	1	2	3	4	5	6	7
7.	I see my safety officer as part of management	1	2	3	4	5	6	7
8.	My safety officer lacks the interpersonal skills necessary to carry out his role	1	2	3	4	5	6	7
9.	I trust my safety officer's ability to do his job	1	2	3	4	5	6	7

	Very Strongly Disagree	Strongly Disagree	Disagree	Neither Disagree nor Agree	Agree	Strongly Agree	Very Strongly Agree
10. My safety officer is not open to suggestions I might have	1	2	3	4	5	6	7

Section Five: OPERATING COMPANY

1. A feeling of 'us' and 'them' exists between the workforce and the operating company	1	2	3	4	5	6	7
2. The operating company fully support the structures they have in place which allow me to work safely	1	2	3	4	5	6	7
3. The operating company doesn't care about my safety, they care only about making profits	1	2	3	4	5	6	7
4. The operating company are clear about what they want with respect to safety offshore	1	2	3	4	5	6	7
5. With respect to safety, I can trust the operating company	1	2	3	4	5	6	7
6. The company operate 'best practice' when it comes to safety	1	2	3	4	5	6	7
7. I can trust the operating company to keep their promises	1	2	3	4	5	6	7
8. The operating company are not sincere when they say safety is their number one priority	1	2	3	4	5	6	7
9. The operating company doesn't invest enough money on maintaining my installation	1	2	3	4	5	6	7
10. I don't trust the operating company	1	2	3	4	5	6	7

Section Six: CONTRACTORS

1. I can trust contractors to consider other peoples' safety when carrying out their work	1	2	3	4	5	6	7
2. Contractors are open and honest about safety	1	2	3	4	5	6	7
3. Contractors often take short-cuts to get the job done quickly even if it puts others at risk	1	2	3	4	5	6	7
4. Generally, I trust contractors	1	2	3	4	5	6	7
5. Contractors lack the training needed to carry out jobs in a safe way	1	2	3	4	5	6	7

		Very Strongly Disagree	Strongly Disagree	Disagree	Neither Disagree nor Agree	Agree	Strongly Agree	Very Strongly Agree
6.	Contractors are not professional in the way they carry out their work	1	2	3	4	5	6	7
7.	Sound principles guide contractors behaviour	1	2	3	4	5	6	7
8.	Contractors are inconsistent in the way they carry out their work	1	2	3	4	5	6	7
9.	Contractors are only concerned with looking after themselves	1	2	3	4	5	6	7
10.	Contractors are very capable at performing their job	1	2	3	4	5	6	7
11.	Based on past experience, I know I can trust contractors to act safely	1	2	3	4	5	6	7
12.	Contractors would conceal mistakes they might make even if doing so might put others at risk	1	2	3	4	5	6	7
13.	I trust contractor's judgement in deciding whether a job is safe enough to carry out	1	2	3	4	5	6	7
14.	I can't trust contractors when it comes to safety	1	2	3	4	5	6	7
15.	Contractors would go out of their way to help me	1	2	3	4	5	6	7

Section Seven: GENERALIZED OTHERS

The following section does not refer to those working offshore but to other people in general. Please complete this section in the same way as you did with those above.

1.	One should be very cautious with strangers	1	2	3	4	5	6	7
2.	Most experts tell the truth about limits of their knowledge	1	2	3	4	5	6	7
3.	Most people can be counted on to do what they say they will do	1	2	3	4	5	6	7
4.	These days, you must be alert or someone is likely to take advantage of you	1	2	3	4	5	6	7
5.	Most salespeople are honest in describing their products	1	2	3	4	5	6	7
6.	Most repair people will not overcharge people who are ignorant of their speciality	1	2	3	4	5	6	7
7.	Most people answer public opinion polls honestly	1	2	3	4	5	6	7
8.	Most adults are competent at their jobs	1	2	3	4	5	6	7

Section Eight: BACKGROUND INFORMATION

In this section there are a number of questions about your job. Please answer them by circling the appropriate answer or by filling in the space provided.

All answers are in the **strictest confidence.** No one outside the Safety Research Unit at the University of Liverpool will see the completed questionnaire. No attempts will be made to identify you from the responses you make. Our interest is in understanding interpersonal trust and safety, and in making where you work a safer place.

Name of installation: ....

Date: ....

Gender:

Male Female

Age: ....

Job Title:

Admin/Management	Deck Crew	Construction
Catering	Drilling/Well service	Production
Maintenance	Medic	Other ....

Are you employed by:

Operating company

Contracting company Name of Contractor company ....

Shift Pattern:

All days	All nights	24 hour call
½ day, ½ night	Other	

Rotation:

2 on 2 off	1 on 1 off	2 on 3 off
3 on 3 off	Other	

Are you a supervisor?

Yes No

How many years have you worked on THIS installation? ....

How many years have you worked on offshore installations? ....

How many installations have you worked on?

1-5 6-10 More than 10

Section Nine: ACCIDENTS, INCIDENTS AND NEAR MISSES

Have you been involved in an *accident* or *incident* whilst WORKING OFFSHORE? YES NO

Did you require medical attention? YES NO

How many *accidents/incidents* have you had within the past 6 months? ....

Have you had an accident on THIS INSTALLATION? YES NO

How many accidents have you had on this installation in the past 6 months? ....

In your opinion, who was responsible the accident? MANAGEMENT YOURSELF CORE CREW CONTRACTOR

Have you been involved in a *near-miss* while working on this installation? YES NO

How many *near-misses* have you been involved in? ....

THANK YOU FOR YOUR HELP

Appendix E: Psychometric test results using 6 factors from the Map Installation

Table A2: Inter-correlations between *Map Installation* six factor scores and predisposition to trust measure

		F1	F2	F3	F4	F5	F6
F1	Senior management						
F2	Contractors	.40**					
F3	Supervisors	.64**	.51**				
F4	Workmates	.47**	.45**	.60**			
F5	Safety Representatives	.61**	.35**	.52**	.45**		
F6	Generalised Others	.19**	.06	.19	.11	.10	
PT	Predisposition to trust	.35**	.24**	.26**	.27**	.29**	.63**

** Correlations significant at the 0.01 level

Table A3: One-way ANOVA results for the primary *Map Installation* six factor structure and predisposition to trust measure

	Supervisors *(1,180)*			Employing Company *(1,184)*			Occupational Group *(6,184)*			Number of years offshore *(3,183)*			Number of years on installation *(3,176)*		
Factor	*F*	*p.*	η^2	*F*	**p.**	η^2	*F*	**p.**	η^2	*F*	**p.**	η^2	*F*	**p.**	η^2
Senior management	4.13	.05	.02	.50	ns.	-	4.45	.01	.13	1.09	ns.	-	.25	ns.	-
Contractors	.47	ns.	-	38.49	.01	.17	4.00	.01	.12	.36	ns	-	4.48	.01	.07
Supervisors	1.51	ns.	-	.07	ns.	-	1.79	ns.	-	1.21	ns.	-	.24	ns.	-
Workmates	.08	ns.	-	.05	ns.	-	.68	ns.	-	2.02	ns.	-	.57	ns.	-
Safety Representatives	.28	ns.	-	1.18	ns.	-	1.33	ns.	-	.17	ns.	-	1.52	ns.	-
Generalised others	.60	ns.	-	.07	ns.	-	.57	ns.	-	1.10	ns.	-	.78	ns.	-
Predisposition trust	.42	ns.	-	1.42	ns.	-	.58	ns.	-	1.02	ns.	-	1.18	ns.	-

Table A4: Direct logistic regression results from the primary *Map Installation* six factors and predisposition to trust measure

	Accidents/Incidents Offshore		Accident/incidents on Installation		Near-miss Involvement	
Factor	*Wald Statistic* (z)	*p.*	*Wald Statistic (z)*	*p.*	*Wald Statistic (z)*	*p.*
Senior management	7.92	.01	1.54	ns.	6.61	.01
Contractors	2.62	ns.	3.93	.05	2.90	ns.
Supervisors	2.37	ns.	1.26	ns.	4.10	.05
Workmates	3.80	.05	.16	ns.	13.94	.01
Safety Representatives	5.68	.05	.99	ns.	4.92	.05
Generalised others	.05	ns.	.65	ns.	.24	ns.
Predisposition to trust	4.41	.05	.50	ns.	4.11	.05

Table A5: Forward Stepwise Logistic Regression results of *Map Installation* six factors and predisposition to trust measure

Accidents/incidents Offshore				Accidents/incidents on Installation				Near miss Involvement			
Factor	***Wald (z)***	*p.*	*Exp.(B)*	*Factor*	*Wald (z)*	*p.*	*Exp.(B)*	***Factor***	*Wald (z)*	*p.*	*Exp.(B)*
Senior Management	7.47	.01	.98	Contractors	3.93	.05	.97	Workmates	13.90	.01	.93

Note: Exp.(B) = expected change in beta weight with a one unit increase in the factor score

Appendix F

Modified version of The Trust Climate and Safety Questionnaire

THE UNIVERSITY
of LIVERPOOL

Safety Research Unit

Trust Climate and Safety Questionnaire - 2004

The University of Liverpool, in collaboration with your **trade union - XXX**, are carrying out research into safety in the offshore industry. To do this we rely on information about safety from offshore workers. Your union has suggested you to be a suitable candidate to take part in this survey. We would therefore be grateful if you would take the time to complete this questionnaire.

All the information provided will be treated **in the strictest confidence**. The questionnaires will not be seen by any member of your union or organization other than yourself. Only the Safety Research Unit at the University of Liverpool will have access to the questionnaires. Only general trends will be reported. **No individual will be identified. Your trade union fully approves of, and supports this survey.**

Please put your completed questionnaires in the FREEPOST envelope provided and mail it directly to us at the University of Liverpool. **No stamp is needed.**

Thank you very much for your help with this project.

Stacey Conchie

INSTRUCTIONS

On the following pages there are a number of statements about those you work with. Please show how much you agree with each statement by putting a circle around the number that best represents YOUR view.

Do not spend too long thinking about each statement. Give your opinion as quickly as possible. Please give your opinion of all the statements.

Please complete the questionnaire on your own.

Section One: YOUR WORKMATES

		Very Strongly Disagree	Strongly Disagree	Disagree	Neither Disagree nor Agree	Agree	Strongly Agree	Very Strongly Agree
1.	I trust my workmates to be competent in their own areas	1	2	3	4	5	6	7
2.	My workmates can be trusted to support me if I had a complaint about safety	1	2	3	4	5	6	7
3.	Generally, I don't trust my workmates	1	2	3	4	5	6	7
4.	My workmates are kind and thoughtful	1	2	3	4	5	6	7
5.	I can talk freely to my workmates about difficulties I have at work and know that they want to listen	1	2	3	4	5	6	7
6.	I can trust my workmates to be open and honest when it comes to mistakes they might have made	1	2	3	4	5	6	7
7.	My workmates lack the ability to decide if a job is safe to carry out	1	2	3	4	5	6	7
8.	The people I work with know the difference between having a laugh and doing the job safely	1	2	3	4	5	6	7
9.	My workmates and I have made considerable emotional investments in our working relationship	1	2	3	4	5	6	7
10.	I can trust my workmates to tell the truth	1	2	3	4	5	6	7
11.	My workmates are not experienced offshore workers	1	2	3	4	5	6	7
12.	The people I work with would take credit for something they haven't done	1	2	3	4	5	6	7
13.	My workmates would disclose to others information that I had told them in confidence	1	2	3	4	5	6	7
14.	My workmates don't care about my safety	1	2	3	4	5	6	7
15.	I have a sharing relationship with my workmates. We can both talk freely about our feelings about safety	1	2	3	4	5	6	7
16.	I trust the people I work with to carry out jobs safely	1	2	3	4	5	6	7
17.	If I shared a safety problem with my workmates, I know they would respond constructively and caringly	1	2	3	4	5	6	7
18.	My workmates are not afraid to stop a job if they think it is unsafe	1	2	3	4	5	6	7

Section Two: YOUR SUPERVISOR

		Very Strongly Disagree	Strongly Disagree	Disagree	Neither Disagree nor Agree	Agree	Strongly Agree	Very Strongly Agree
1.	I can trust my supervisor to be fair in the way he deals with safety incidents	1	2	3	4	5	6	7
2.	My supervisor and I have made strong emotional investments in our relationship	1	2	3	4	5	6	7
3.	I can trust my supervisor's judgement when it comes to safety	1	2	3	4	5	6	7
4.	I don't trust my supervisor's ability to make sure jobs are carried out in a safe way	1	2	3	4	5	6	7
5.	I often find that what my supervisor says is untrue	1	2	3	4	5	6	7
6.	My supervisor would go out of his way to help me	1	2	3	4	5	6	7
7.	My supervisor would respond constructively and caringly if I were to have a safety problem	1	2	3	4	5	6	7
8.	My supervisor is not willing to listen to concerns I might have about safety	1	2	3	4	5	6	7
9.	I trust my supervisor to make decisions that affect me	1	2	3	4	5	6	7
10.	I can talk to my supervisor and know that he will want to listen	1	2	3	4	5	6	7
11.	My supervisor keeps the promises that he makes	1	2	3	4	5	6	7
12.	My supervisor often emphasises safety publicly but then cuts corners when carrying out his job	1	2	3	4	5	6	7
13.	I am free to share my ideas and hopes about safety with my supervisor	1	2	3	4	5	6	7
14.	My supervisor wants a job done safely even if it means extra time or extra cost	1	2	3	4	5	6	7
15.	My supervisor is incompetent when it comes to managing his team	1	2	3	4	5	6	7
16.	I trust my supervisors ability to do his job	1	2	3	4	5	6	7
17.	My supervisor is afraid of upsetting management	1	2	3	4	5	6	7

Section Three: OFFSHORE MANAGEMENT

1.	Management frequently demonstrate their commitment to safety	1	2	3	4	5	6	7

		Very Strongly Disagree	Strongly Disagree	Disagree	Neither Disagree nor Agree	Agree	Strongly Agree	Very Strongly Agree
2.	I know that my manager wants to listen to the problems I might be having at work	1	2	3	4	5	6	7
3.	Management like to blame people when mistakes are made	1	2	3	4	5	6	7
4.	I can trust management to do what they say they will do	1	2	3	4	5	6	7
5.	I am not confident in management's skills	1	2	3	4	5	6	7
6.	Management will overlook safety issues to advance their career	1	2	3	4	5	6	7
7.	My manager and I share our ideas, feelings and hopes about safety with each other	1	2	3	4	5	6	7
8.	Management are honest when it comes to safety	1	2	3	4	5	6	7
9.	My manager would respond constructively and caringly if I were to share a safety problem with him	1	2	3	4	5	6	7
10.	I can trust management to make sure the installation is run in a safe way	1	2	3	4	5	6	7
11.	Management are well qualified	1	2	3	4	5	6	7
12.	Management is successful at ensuring safety policies are adhered to offshore	1	2	3	4	5	6	7
13.	Management lie about safety standards offshore to create a favourable picture	1	2	3	4	5	6	7
14.	I am suspicious of the motives behind management's actions	1	2	3	4	5	6	7
15.	Management are vague when answering questions the workforce have about issues that affect them	1	2	3	4	5	6	7
16.	Considerable emotional investments have been made by my manager and myself in our relationship	1	2	3	4	5	6	7
17.	Management lack the experience needed to know how to do a job safely	1	2	3	4	5	6	7
18.	I trust management on my installation	1	2	3	4	5	6	7

Section Four: SAFETY PERSONNEL

1.	My safety representatives are open and honest	1	2	3	4	5	6	7

		Very Strongly Disagree	Strongly Disagree	Disagree	Neither Disagree nor Agree	Agree	Strongly Agree	Very Strongly Agree
2.	I can trust my safety representative to do what he says he will do	1	2	3	4	5	6	7
3.	I can't trust safety representatives to support me in my concerns about safety	1	2	3	4	5	6	7
4.	My safety officer cares about me	1	2	3	4	5	6	7
5.	I can't trust safety representatives to tell me the truth	1	2	3	4	5	6	7
6.	I trust my safety officer is concerned about my safety	1	2	3	4	5	6	7
7.	My safety representative and I freely share our ideas, feelings and hopes regarding safety	1	2	3	4	5	6	7
8.	I can trust my safety officer to give me feedback	1	2	3	4	5	6	7
9.	I can trust my safety representatives to listen to suggestions I might have about how safety can be improved	1	2	3	4	5	6	7
10.	I know my safety officer wants to listen about difficulties I am having at work	1	2	3	4	5	6	7
11.	My safety officer rarely supports the workforce when they raise safety issues	1	2	3	4	5	6	7
12.	My safety representative lacks the skills needed to fulfil this role	1	2	3	4	5	6	7
13.	My safety officer is not fair in the way he deals with safety	1	2	3	4	5	6	7
14.	My safety representatives are well qualified	1	2	3	4	5	6	7
15.	Both my safety officer and myself have made considerable emotional investments in our relationship	1	2	3	4	5	6	7
16.	Safety representatives have my best interests at heart	1	2	3	4	5	6	7
17.	My safety officer often shares his feelings and ideas with me regarding safety, and I share mine with him.	1	2	3	4	5	6	7
18.	My safety representatives lack the expertise required to represent the workforce on safety issues	1	2	3	4	5	6	7
19.	I can share any difficulties I am having at work with my safety representative	1	2	3	4	5	6	7
20.	My safety officer lacks the interpersonal skills necessary to carry out his role	1	2	3	4	5	6	7

		Very Strongly Disagree	Strongly Disagree	Disagree	Neither Disagree nor Agree	Agree	Strongly Agree	Very Strongly Agree
21.	My safety representative takes a constructive approach to solve safety problems I might have	1	2	3	4	5	6	7
22.	I trust my safety officer's ability to do his job	1	2	3	4	5	6	7
23.	There is a strong emotional connection between me and my safety representative	1	2	3	4	5	6	7
24.	If I shared a safety problem with my safety officer, I know he would respond caringly	1	2	3	4	5	6	7
25.	Safety representatives are not consistent in the way they deal with safety issues	1	2	3	4	5	6	7
26.	My safety officer is incompetent when it comes to ensuring safety is adhered to	1	2	3	4	5	6	7
27.	I can trust my safety officers ability to ensure safety is followed on this platform	1	2	3	4	5	6	7
28.	Safety representatives are not interested in my concerns	1	2	3	4	5	6	7
29.	I can trust my safety officer to do what he says he will do where safety is concerned	1	2	3	4	5	6	7
30.	I trust my safety representatives ability to represent me on safety issues	1	2	3	4	5	6	7

Section Five: OPERATING COMPANY

1.	A feeling of 'us' and 'them' exists between the workforce and the operating company	1	2	3	4	5	6	7
2.	The operating company fully support the structures they have in place which allow me to work safely	1	2	3	4	5	6	7
3.	The operating company cares about profit more than safety	1	2	3	4	5	6	7
4.	The operating company are clear about what they want with respect to safety offshore	1	2	3	4	5	6	7
5.	With respect to safety, I can trust the operating company	1	2	3	4	5	6	7
6.	The company operate 'best practice' when it comes to safety	1	2	3	4	5	6	7
7.	I can trust the operating company to keep their promises	1	2	3	4	5	6	7

		Very Strongly Disagree	Strongly Disagree	Disagree	Neither Disagree nor Agree	Agree	Strongly Agree	Very Strongly Agree
8.	The operating company are not sincere when they say safety is their number one priority	1	2	3	4	5	6	7
9.	I don't trust the operating company	1	2	3	4	5	6	7

Section Six: CONTRACTORS

1.	I can trust contractors to consider other peoples' safety when carrying out their work	1	2	3	4	5	6	7
2.	Contractors are open and honest about safety	1	2	3	4	5	6	7
3.	Contractors often take short-cuts to get the job done quickly even if it puts others at risk	1	2	3	4	5	6	7
4.	Generally, I trust contractors	1	2	3	4	5	6	7
5.	Contractors lack the training needed to carry out jobs in a safe way	1	2	3	4	5	6	7
6.	I have a strong emotional connection with contractors on my installation	1	2	3	4	5	6	7
7.	Contractors are not professional in the way they carry out their work	1	2	3	4	5	6	7
8.	Sound principles guide contractors behaviour	1	2	3	4	5	6	7
9.	Contractors are inconsistent in the way they carry out their work	1	2	3	4	5	6	7
10.	Contractors are only concerned with looking after themselves	1	2	3	4	5	6	7
11.	Contractors are happy to listen to difficulties I might have with safety at work	1	2	3	4	5	6	7
12.	Contractors are very capable at performing their job	1	2	3	4	5	6	7
13.	Based on past experience, I know I can trust contractors to act safely	1	2	3	4	5	6	7
14.	Contractors would conceal mistakes they might make even if doing so might put others at risk	1	2	3	4	5	6	7
15.	My relationship with contractors involves sharing ideas and feelings	1	2	3	4	5	6	7

		Very Strongly Disagree	Strongly Disagree	Disagree	Neither Disagree nor Agree	Agree	Strongly Agree	Very Strongly Agree
16.	I trust contractor's judgement in deciding whether a job is safe enough to carry out	1	2	3	4	5	6	7
17.	Contractors would go out of their way to help me	1	2	3	4	5	6	7
18.	Contractors would respond caringly if I shared a safety problem with them	1	2	3	4	5	6	7

Section Seven: GENERALIZED OTHERS

The following section does not refer to those working offshore but to other people in general. Please complete this section in the same way as you did with those above.

1.	One should be very cautious with strangers	1	2	3	4	5	6	7
2.	Most experts tell the truth about limits of their knowledge	1	2	3	4	5	6	7
3.	Most people can be counted on to do what they say they will do	1	2	3	4	5	6	7
4.	These days, you must be alert or someone is likely to take advantage of you	1	2	3	4	5	6	7
5.	Most salespeople are honest in describing their products	1	2	3	4	5	6	7
6.	Most repair people will not overcharge people who are ignorant of their speciality	1	2	3	4	5	6	7
7.	Most people answer public opinion polls honestly	1	2	3	4	5	6	7
8.	Most adults are competent at their jobs	1	2	3	4	5	6	7

PLEASE TURN OVER FOR FINAL SECTIONS

Section Eight: BACKGROUND INFORMATION

In this section there are a number of questions about your job. Please answer them by circling the appropriate answer or by filling in the space provided.

All answers are in the **strictest confidence.** No one outside the Safety Research Unit at the University of Liverpool will see the completed questionnaire. No attempts will be made to identify you from the responses you make. Our interest is in understanding interpersonal trust and safety, and in making where you work a safer place.

Name of installation: .... **Operating Company:** ....

Date: ....

Gender: Male Female

Age: ....

Job: Admin/Management Deck Crew Construction

Catering Drilling/Well service Production

Maintenance Medic Other ....

Are you employed by:

Operating company

Contracting company Name of Contractor company ....

Shift Pattern:

All days All nights 24 hour call

½ day, ½ night Other ....

Rotation:

2 on 2 off 1 on 1 off 2 on 3 off

3 on 3 off Other ....

Are you a supervisor? Yes No

How long have you worked on THIS installation?

Less than 1 year 1-2 years 3-5 years 6-10 years 11-20 years 20 years +

How long have you worked on offshore installations?

Less than 1 year 1-2 years 3-5 years 6-10 years 11-20 years 20 years +

How many installations have you worked on? 1-5 6-10 More than 10

Section Nine: ACCIDENTS, INCIDENTS AND NEAR MISSES

Have you been involved in an *accident* or *incident* whilst WORKING OFFSHORE? YES NO

Was it a reportable *accident* or *incident*? YES NO

Did you require medical attention? YES NO

How many *accidents/incidents* have you had within the past 6 months? ....

Have you had an accident on THIS INSTALLATION? YES NO

How many accidents have you had on this installation in the past 6 months? ....

In your opinion, who was responsible the accident? MANAGEMENT YOURSELF CORE CREW CONTRACTOR

Have you been involved in a *near-miss* while working on this installation? YES NO

How many *near-misses* have you been involved in? ....

THANK YOU FOR YOUR HELP

Appendix G: Item-total correlations of items in each TCSQ subscale

Table A6

Workmates subscale

	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12	W13	W14	W15
W1															
W2	.67														
W3	.54	.44													
W4	.32	.36	.26												
W5	.19	.16	.40	.11											
W6	.46	.45	.34	.42	.15										
W7	.43	.37	.41	.19	.47	.35									
W8	.57	.50	.42	.32	.24	.44	.44								
W9	.50	.44	.39	.42	.17	.71	.33	.62							
W10	.38	.30	.28	.27	.24	.30	.49	.41	.37						
W11	.36	.32	.31	.28	.34	.42	.51	.40	.46	.52					
W12	.32	.29	.27	.32	.16	.39	.30	.30	.41	.24	.34				
W13	.18	.24	.27	.34	.24	.44	.23	.28	.42	.25	.27	.51			
W14	.61	.53	.43	.49	.20	.54	.41	.57	.60	.41	.41	.36	.29		
W15	.46	.49	.30	.34	.03	.40	.28	.44	.50	.22	.24	.29	.25	.66	

Supervisor subscale

	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	S15
S1															
S2	.86														
S3	.58	.52													
S4	.53	.50	.51												
S5	.52	.42	.52	.56											
S6	.48	.44	.60	.63	.66										
S7	.52	.51	.46	.52	.66	.68									
S8	.67	.62	.48	.51	.66	.60	.75								
S9	.26	.26	.42	.35	.31	.43	.27	.27							
S10	.49	.44	.40	.56	.68	.59	.71	.67	.27						
S11	.48	.44	.49	.54	.46	.57	.52	.50	.40	.49					
S12	.50	.40	.41	.50	.55	.57	.55	.51	.25	.51	.60				
S13	.39	.36	.36	.47	.48	.51	.36	.37	.24	.44	.37	.52			
S14	.50	.48	.54	.49	.54	.54	.48	.55	.33	.53	.44	.39	.41		
S15	.46	.41	.44	.49	.51	.48	.52	.55	.26	.49	.37	.43	.43	.38	

Management subscale

	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	M14	M15
M1															
M2	.33														
M3	.47	.42													
M4	.39	.49	.38												
M5	.52	.58	.47	.55											
M6	.61	.47	.64	.43	.66										
M7	.35	.24	.35	.36	.37	.38									
M8	.67	.40	.56	.48	.59	.70	.37								
M9	.45	.46	.51	.54	.52	.54	.37	.65							
M10	.54	.43	.51	.47	.59	.62	.34	.70	.66						
M11	.35	.49	.38	.46	.60	.57	.41	.52	.52	.55					
M12	.42	.57	.46	.50	.62	.58	.39	.50	.56	.55	.66				
M13	.35	.54	.38	.38	.55	.53	.35	.46	.38	.41	.52	.58			
M14	.38	.38	.48	.53	.59	.55	.43	.55	.61	.54	.66	.53	.50		
M15	.55	.49	.50	.55	.63	.66	.38	.67	.64	.69	.64	.67	.61	.61	

Safety Personnel subscale

	SP1	SP2	SP3	SP4	SP5	SP6	SP7	SP8	SP	SP10
SP1										
SP2	.56									
SP3	.73	.57								
SP4	.26	.49	.33							
SP5	.64	.47	.66	.33						
SP6	.37	.29	.40	.33	.42					
SP7	.04	.15	-.05	.20	.02	.20				
SP8	.46	.51	.43	.58	.45	.39	.17			
SP9	.40	.46	.43	.53	.43	.44	.13	.64		
SP10	.25	.27	.12	.39	.19	.18	.22	.32	.28	

Operating Company subscale

	OC1	OC2	OC3	OC4	OC5	OC6	OC7	OC8	OC9	OC10
OC1										
OC2	.24									
OC3	.39	.47								
OC4	.20	.48	.48							
OC5	.30	.52	.56	.53						
OC6	.33	.62	.54	.63	.64					
OC7	.46	.46	.47	.41	.55	.58				
OC8	.41	.45	.44	.27	.39	.38	.47			
OC9	.34	.23	.26	.11	.25	.23	.38	.45		
OC10	.58	.53	.56	.45	.55	.51	.54	.52	.51	

Contractor subscale

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15
C1															
C2	.73														
C3	.59	.57													
C4	.72	.71	.61												
C5	.56	.53	.55	.60											
C6	.62	.54	.52	.62	.58										
C7	.43	.41	.47	.42	.30	.31									
C8	.57	.54	.49	.50	.54	.58	.33								
C9	.58	.57	.49	.60	.54	.52	.27	.56							
C10	.65	.54	.42	.58	.55	.67	.33	.52	.52						
C11	.73	.71	.59	.72	.55	.67	.35	.57	.61	.66					
C12	.56	.57	.61	.58	.59	.58	.39	.60	.60	.54	.63				
C13	.65	.63	.50	.59	.46	.53	.33	.52	.64	.60	.67	.51			
C14	.17	.16	.37	.23	.24	.13	.14	.22	.22	.10	.16	.26	.16		
C15	.55	.57	.28	.48	.48	.45	.31	.50	.52	.58	.60	.46	.67	.10	

Appendix H

Table A7: Single factor structure of supervisor subscale using industry data

	Questionnaire Item	Factor loading	h^2
S10	I can talk to my supervisor and know that he will want to listen	.871	.759
S3	I can trust my supervisor's judgement when it comes to safety	.866	.794
S7	My supervisor would respond constructively and caringly if I were to have a safety problem	.853	.728
S6	My supervisor would go out of his way to help me	.847	.717
S1	I can trust my supervisor to be fair in the way he deals with safety incidents	.834	.696
S16	I trust my supervisors ability to do his job	.829	.687
S9	I trust my supervisor to make decisions that affect me	.829	.687
S11	My supervisor keeps the promises that he makes	.822	.676
S13	I am free to share my ideas and hopes about safety with my supervisor	.807	.651
S12	My supervisor often emphasises safety publicly but then cuts corners when carrying out his job	.805	.648
S5	I often find that what my supervisor says is untrue	.780	.608
S17	My supervisor is afraid of upsetting management	.722	.522
S2	My supervisor and I have made considerable emotional investments in our relationship	.716	.513
S14	My supervisor wants a job done safely even if it means extra time or extra cost	.715	.512
S8	My supervisor is not willing to listen to concerns I might have about safety	.695	.485
S4	I don't trust my supervisor's ability to make sure jobs are carried out in a safe way	.608	.369
S15	My supervisor is incompetent when it comes to managing his team	.596	.355
Eigenvalue		**10.36**	

Table A8: Single factor structure of management subscale using industry data

	Questionnaire Item	Factor loading	h^2
M10	I can trust management to make sure the installation is run in a safe way	.874	.764
M9	My manager would respond constructively and caringly if I were to share a safety problem with him	.837	.701
M18	I trust management on my insallation	.837	.700
M14	I am suspicious of the motives behind management's actions	.827	.684
M8	Management are honest when it comes to safety	.817	.668
M12	Management is successful at ensuring safety policies are adhered to offshore	.806	.650
M13	Management lie about safety standards offshore to create a favourable picture	.788	.622
M6	Management will overlook safety issues to advance their career	.762	.581
M7	My manager and I share our ideas, feelings and hopes about safety with each other	.761	.579
M2	I know that my manager wants to listen to the problems I might be having at work	.759	.576
M15	Management are vague when answering questions the workforce have about issues that affect them	.743	.552
M4	I can trust management to do what they say they will do	.742	.551
M11	Management are well qualified	.729	.531
M1	Management frequently demonstrate their commitment to safety	.694	.481
M17	Management lack the experience needed to know how to do a job safely	.678	.460
M16	Considerable emotional investments have been made by my manager and myself in our relationship	.671	.450
M3	Management like to blame people when mistakes are made	.656	.431
M5	I am not confident in managements skills	.570	.325
Eigenvalue		**10.31**	

Table A9: Single factor structure of safety officer subscale using industry data

	Questionnaire Item	Factor loading	h^2
SP6	I trust my safety officer is concerned about my safety	.851	.725
SP22	I trust my safety officer's ability to do his job	.843	.711
SP29	I can trust my safety officer to do what he says he will do where safety is concerned	.831	.691
SP24	If I shared a safety problem with my safety officer, I know he would respond caringly	.829	.688
SP10	I know my safety officer wants to listen about difficulties I am having at work	.829	.687
SP4	My safety officer cares about me	.820	.673
SP27	I can trust my safety officers ability to ensure that safety is followed on this platform	.810	.656
SP8	I can trust my safety officer to give me feedback	.799	.639
SP13	My safety officer is fair in the way he deals with safety	.799	.638
SP17	My safety officer often shares his feelings and ideas with me regarding safety, and I share mine with him	.747	.558
SP11	My safety officer rarely supports the workforce when they raise safety issues	.726	.527
SP20	My safety officer lacks the interpersonal skills necessary to carry out his role	.707	.499
SP26	My safety officer is incompetent when it comes to ensuring safety is adhered to	.683	.467
SP15	Both my safety officer and myself have made considerable emotional investments in our relationship	.654	.428
Eigenvalue		**8.59**	

Table A10: Single factor structure of operating company subscale using industry data

	Questionnaire Item	Factor loading	h^2
OC5	With respect to safety, I trust the operating company	.898	.806
OC8	The operating company are not sincere when they say safety is their number one priority	.885	.783
OC9	I don't trust the operating company	.868	.753
OC6	The company operate 'best practice' when it comes to safety	.848	.720
OC3	The operating company cares about profit more than safety	.843	.710
OC2	The operating company fully support the structures they have in place which allow me to work safely	.821	.674
OC7	I can trust the operating company to keep their promises	.798	.636
OC4	The operating company are clear about what they want with respect to safety offshore	.686	.471
OC1	A feeling of 'us' and 'them' exists between the workforce and the operating company	.666	.444
Eigenvalue		**5.99**	

Appendix I: Psychometric test results using 7 factors from the Industry Survey

Table A11: Inter-correlations between *industry* seven factor scores and predisposition to trust measure

		F1	F2	F3	F4	F5	F6	F7
F1	Senior management							
F2	Contractors	.49**						
F3	Safety reps.	.45**	.38**					
F4	Workmates	.52**	.51**	.46**				
F5	Supervisors	.72**	.48**	.47**	.63**			
F6	Safety officers	.61**	.47**	.65**	.54**	.62**		
F7	Generalised others	.34**	.40**	.32**	.26**	.28**	.40**	
PT	Predisposition to trust	.19**	.30**	.20**	.18**	.14**	.27**	.83**

** Correlations significant at the 0.01 level

Table A12: One-way ANOVA results for the seven factor *industry* structure and predisposition to trust measure

	Supervisors (1,457)			Employing Company (1,488)			Occupational Group (8,487)			Number of years offshore (5,492)			Number of years on installation (5,483)			Company (3,473)		
Factor	F	$p.$	η^2	F	$p.$	η^2	F	$p.$	η^2	F	$p.$	η^2	F	$p.$	η^2	F	$p.$	η^2
Senior management	5.22	.05	.01	11.84	.01	.02	3.81	.01	.06	1.78	ns.	-	2.91	.05	.03	11.12	.01	.07
Contractors	.07	ns.	-	.44	ns.	-	1.82	ns.	-	.39	ns	-	1.38	ns.	-	1.19	ns.	-
Safety reps.	.11	ns.	-	8.07	.01	.02	1.04	ns.	-	1.19	ns.	-	.79	ns.	-	1.94	ns.	-
Workmates	1.63	ns.	-	5.12	.05	.02	2.16	.05	.03	.75	ns.	-	.20	ns.	-	1.63	ns.	-
Supervisors	8.24	.01	.02	7.37	.01	.02	1.92	ns.	-	.83	ns.	-	1.21	ns.	-	3.94	.01	.03
Safety officers	9.18	.01	.02	9.05	.01	.02	2.15	.05	.03	1.93	ns.	-	.66	ns.	-	3.31	.05	.02
Generalised others	5.62	.05	.01	1.11	ns.	-	.96	ns.	-	1.26	ns.	-	1.70	ns.	-	.19	ns.	-
Predisposition trust	.01	ns.	-	.02	ns.	-	1.78	ns.	-	.77	ns.	-	.91	ns.	-	1.68	ns.	-

Table A13: Direct logistic regression results from the seven *industry* factors and predisposition to trust measure

Factor	Accidents/Incidents Offshore		Accident/incidents on Installation		Near-miss Involvement	
	Wald Statistic (z)	*p.*	*Wald Statistic (z)*	*p.*	*Wald Statistic (z)*	*p.*
Senior management	14.71	.01	15.85	.01	21.61	.01
Contractors	3.26	ns.	4.20	.05	10.16	.01
Safety rep.	7.96	.01	6.71	.01	5.70	.05
Workmates	12.61	.01	5.12	.05	5.88	.05
Supervisor	15.33	.01	10.82	.01	7.62	.01
Safety officer	6.27	.05	6.17	.05	4.47	.05
Generalised others	2.45	ns.	2.18	ns.	4.14	.05
Predisposition to trust	1.35	ns.	.94	ns.	.69	ns.

Table A14: Forward Stepwise Logistic Regression results from seven *industry* factors and predisposition to trust measure

Accidents/incidents Offshore				Accidents/incidents on Installation				Near miss Involvement			
Factor	***Wald (z)***	*p.*	*Exp.(B)*	*Factor*	*Wald (z)*	*p.*	*Exp.(B)*	*Factor*	*Wald (z)*	*p.*	*Exp.(B)*
Supervisors	15.33	.01	.97	Senior Management	15.85	.01	.98	Senior Management	21.44	.01	.98

Note: Exp.(B) = expected change in beta weight with a one unit increase in the factor score

Appendix J: Reliability estimates of factors in the best fitting models extracted from CFA for each subscale and each set of data

Installation (Map) data			Industry data		
Subgroup	*Factor*	*α value*	*Subgroup*	*Factor*	*α value*
Management	Trust	.91	*Workmates*	Trust	.90
	Distrust	.89		Distrust	.78
Contractors	Trust	.85	*Supervisors*	Specific Trust	.85
	Distrust	.79		Specific Distrust	.71
Op. company	Trust	.91		General Trust	.93
	Distrust	.88		General Distrust	.76
			Management	Specific Trust	.89
				Specific Distrust	.79
				General Trust	.83
				General Distrust	.81
			Contractors	Specific Trust	.89
				Specific Distrust	.71
				General Trust	.80
				General Distrust	.79
			Op. company	Trust	.90
				Distrust	.89